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Adaptive Routing In Mobile Adhoc Networks And Comparison Between Routing Protocols Aodv And Dsr For Apu Strategy

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ABSTRACT: *The Adhoc networks becomes very popular everyone is using these networks because of which we need to maintain up-to-date positions of their immediate neighbors for making effective forwarding decisions. Periodic broadcasting of beacon packets that contain the geographic location coordinates of the nodes is a popular method used by most geographic routing protocols to maintain neighbor positions. We propose the Adaptive Position Update (APU) strategy for geographic routing, which dynamically adjusts the frequency of position updates based on the mobility dynamics of the nodes and the forwarding patterns in the network. Our theoretical analysis, which is validated by NS2 simulations of a well known geographic routing protocol, Greedy Perimeter Stateless Routing Protocol (GPSR), shows that APU can significantly reduce the update cost and improve the routing performance in terms of packet delivery ratio and average end-to-end delay in comparison with periodic beaconing and other recently proposed updating schemes. And Also comparing the performance and simulations of two on-demand routing protocols DSR and AODV for this APU strategies.*

KEYWORDS:*Ad hoc On Demand Distance Vector (AODV), Distance Source Routing (DSR), Mobile Ad Hoc Network (MANET).*

I. INTRODUCTION

Geographic routing protocols are becoming an attractive choice for use in mobile adhoc networks. The underlying principle used in these protocols involves selecting the next routing hop from amongst a node's neighbors, which is geographically closest to the destination. Since the forwarding decision is based entirely on local knowledge, it obviates the need to create and maintain routes for each destination. The forwarding strategy employed in the aforementioned geographic routing protocols requires the following information: (i) the position of the final destination of the packet and (ii) the position of a node's neighbors.

The former can be obtained by querying a location service such as the Grid Location System (GLS) .To obtain the latter, each node exchanges its own location information with its neighboring nodes. However, in situations where nodes are mobile or when nodes often switch off and on, the local topology rarely remains static. Hence, it is necessary that each node periodically broadcasts its updated location information to all of its neighbors. These location update packets are usually referred to as beacons.

Position updates are costly in many ways. Each update consumes node energy, wireless bandwidth, and increases the risk of packet collision at the medium access control (MAC) layer. Packet collisions cause packet loss which in turn affects the routing performance due to decreased accuracy in determining the correct local topology (a lost beacon broadcast is not retransmitted). A lost data packet does get retransmitted, but at the expense of increased end-to-end delay. For example, if certain nodes are frequently changing their mobility characteristics (speed and/or heading), it makes sense to frequently broadcast their updated position. However, for nodes that do not exhibit significant dynamism, periodic broadcasting of beacons is wasteful.

In this paper, we propose a novel beaconing strategy for geographic routing protocols called Adaptive Position Updates strategy (APU) using AODV and DSR Protocol. Our scheme eliminates the drawbacks of periodic beaconing by adapting to the system variations. APU incorporates two rules for triggering the beacon update process. The first rule, referred as Mobility Prediction (MP), uses a simple mobility prediction scheme. The second rule, referred as On-Demand Learning (ODL), aims at improving the accuracy of the topology along the routing paths between the communicating nodes. ODL uses an on-demand learning strategy, whereby a node broadcasts beacons when it overhears the transmission of a data packet from a new neighbor in its vicinity. Also comparing the performance and simulations of two on-demand routing protocols DSR and AODV for this APU strategies.

II. LITERATURE REVIEW

DREAM was one of the first protocols that incorporated position information within a routing protocol. In DREAM, each node maintains a position database that stores position information about all other nodes within the network. Of course, this approach is not scalable and requires a large number of beacon updates. The position updates could be adapted to the node mobility. However, no details or practical strategies are discussed. In location information is used to predict the expiration time of the link between two mobile nodes, known as the Route Expiration Time (RET). The routing protocol always selects routes with the largest RET for data forwarding. However, they only consider topology-based routing protocols in their work. In our work, we adopt a similar prediction scheme but use it for triggering the beacon updates. As the communication in Ad-hoc networks greatly depend on the efficient working of each node, it is rather very important to indentify such selfish nodes. From many years the researchers are trying to find out a solution for the security and misbehavior problems of MANETS and ended up with some finest techniques that either avoided selfish nodes or worked a way out even in their presence. However the introduction of AODV and DSR routing protocol can be rated the best of all these techniques.

III. METHODOLOGY

There are three module in the proposed system: - (1) Nodes are created and showing communication between them.(2)Using following rules we can find shortest path between source and destination. (3) Simulation and Comparison of DSR and AODV Routing Protocols in MANETs.

3.1Adaptive Position Update (APU):-

We begin by listing the assumptions made in our work: (1) all nodes are aware of their own position and velocity. (2) All links are bi-directional. (3) The beacon updates include the current location and velocity of the nodes, and (4) data packets can piggyback position and velocity updates and all one-hop neighbors operate in the promiscuous mode and hence can overhear the data packets. Upon initialization, each node broadcasts a beacon informing its neighbors about its presence and its current location and velocity. Following this, in most geographic routing protocols such as GPSR, each node periodically broadcasts its current location information. The position information received from neighboring beacons is stored at each node. Based on the position updates received from its neighbors, each node continuously updates its local topology, which is represented as a neighbor list. Only those nodes from the neighbor list are considered as possible candidates for data forwarding. Instead of periodic beaconing, APU adapts the beacon update intervals to the mobility dynamics of the nodes and the amount of data being forwarded in the neighborhood of the nodes. APU employs two mutually exclusive beacon triggering rules, which are discussed in the following.

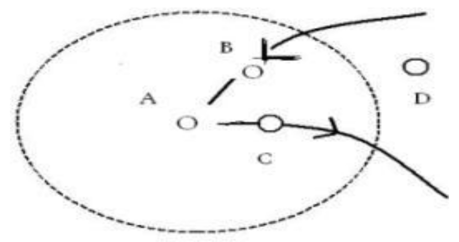

Figure.1: Simple mobility scenario in an Ad Hoc network.

3.1.1 Mobility Prediction (MP) Rule :-

This section shows the importance of mobility prediction in routing Ad Hoc networks, by giving a simple mobility scenario. Fig.1 represents an Ad Hoc networks containing four nodes which are A, B, C and D. A is stable, C moves slowly towards A and B moves rapidly away from A and D. A has data packets to send to D. It finds that to reach D, packets can pass either through B, or through C. If A chooses B as intermediate node, then the communication will not last long time since the link (A,B) will be rapidly broken, due to the mobility of B. But if A, takes into account the mobility of B and C, it will choose C as intermediate node because the expiration time of the link (A,C) is superior to that of (A, B), since C have chance to remain in A transmission range, more than B. The fact that A chooses C as next hop to reach D contributes to the selection of the path which has the greatest expiration time or the most stable path.

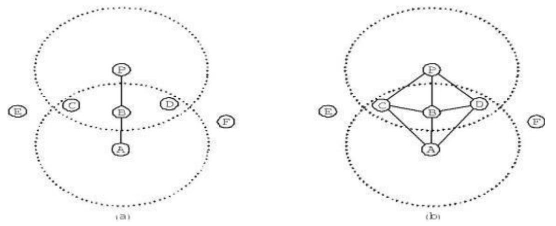
Figure. 2: An example illustrating the ODL

The MP rule thus, tries to maximize the effective duration of each beacon, by broadcasting a beacon only when the position information in the previous beacon becomes inaccurate. Further, highly mobile nodes can broadcast frequent beacons to ensure that their neighbors are aware of the rapidly changing topology.

3.1.2 On-Demand Learning Rule(ODL):-

The MP rule solely may not be sufficient for maintaining an accurate local topology. Hence, it is necessary to devise a mechanism which will maintain a more accurate local topology in those regions of the network where significant data forwarding activities are on-going. This is precisely what the *On-DemandLearning (ODL)* rule aims to achieve. As the namesuggests, a node broadcasts beacons *on-demand*, **i**.e. in response to data forwarding activities that occur in the vicinity of that node

Figure. 2 illustrates the network topology before node A starts sending data to node P . The solid lines in the figure denote that both ends of the link are aware of each other. The initial possible routing path from A to P is A-B-P. Now, when source A sends a data packet to B, both C and D receive the data packet from A. As A is a new neighbor of C and D, according to the ODL rule, both C and D will send back beacons to A. As a result, the links AC and AD will be discovered. Further, based on the location of the destination and their current locations, C and D discover that thedestination P is within their one-hop neighborhood. Similarly when B forwards the data packet to P, the links BC and BD are discovered. Fig. 4(b) reflects the enriched topology along t he routing path from A to P .Note that, though E and F receive the beacons from C and D, respectively, neither of them respond back with a beacon. Since E and F do not lie on the forwarding path, it is futile for them to send beacon updates in response to the broadcasts from C and D. In essence, ODL aims at improving the accuracy of topology along the routing path from the source to the destination, for each traffic flow within the network.

3.2. Classification of Routing Protocols:-

Classification of routing protocols in mobile ad hoc network can be done in many ways; the routing protocols can be categorized as Proactive (Table Driven), Reactive (on-demand) and Hybrid depending on the network structure.

A. Proactive routing protocols

Proactive protocols perform routing operations between all source destination pairs periodically, irrespective of the need of such routes. These protocols attempt to maintain shortest path routes by using periodically updated views of the network topology. These are typically maintained in routing tables in each node and updated with the acquisition of new information. Proactive protocols have the advantage of providing lower latency in data delivery and the possibility of supporting applications that have quality-of-service constraints.

B. Reactive routing protocols

Reactive protocols are designed to minimize routing overhead. Instead of tracking the changes in the network topology to continuously maintain shortest path routes to all destinations, these protocols determine routes only when necessary. Typically, these protocols perform a route discovery operation between the source and the desired destination when the source needs to send a data packet and the route to the destination is not known. Main idea in on-demand routing is to find and maintain only needed routes. The different types of On Demand driven protocols are Ad hoc On Demand Distance Vector (AODV), Dynamic Source routing protocol (DSR), temporally ordered routing algorithm (TORA), Ad-hoc On-demand Multipath Distance Vector Routing (AOMDV). Our discussion is limited to two on-demand ad-hoc routing protocols DSR and AODV.

1.Dynamic Source Routing (DSR)

The Dynamic Source Routing (DSR) is an on demand source routing protocol that employs route discovery and route maintenance procedures similar to AODV. In DSR, each node maintains a route cache with entries that are continuously updated as a node learns new routes. Similar to AODV, a node wishing to send a packet will first inspect its route cache to see whether it already has a route to the destination. If there is no valid route in the cache, the sender initiates a route discovery procedure by broadcasting a route request packet, which contains the address of the destination, the address of the source, and a unique request ID. As this request propagates through the network, each node inserts its own address into the request packet before rebroadcasting it. As a consequence, a request packet records a route consisting of all nodes it has visited. Once a request packet arrives at the destination, it will have recorded the entire path from the source to the destination. In symmetric networks, the destination node can unicast a response packet, containing the collected route information, back to the source using the exact same path as taken by the request packet. In networks with asymmetric links, the destination can itself initiate a route discovery procedure to the source, where the request packet also contains the path from the source to the destination. Once the response packet (or the destination’s request packet) arrives at the source, the source can add the new route into its cache and begin transmitting packets to the destination. Similar to AODV, DSR also employs a route maintenance procedure based on error messages, which are generated whenever the link layer detects a transmission failure due to a broken link. Compared to proactive routing protocols, DSR shares similar advantages and disadvantages as AODV. Unlike AODV, each packet in DSR carries route information, which allows intermediate nodes to add new routes proactively to their own caches. Also, DSR’s support of asymmetric links is another advantage compared to AODV.

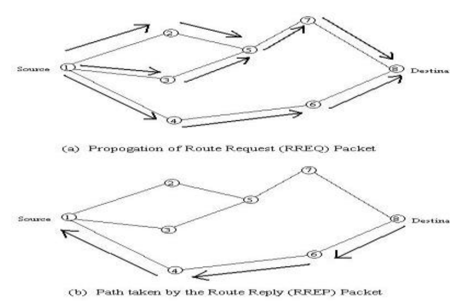

Figure 3: Creation of route in DSR

2.Ad Hoc on Demand Distance Vector (AODV)

The ad hoc on-demand distance-vector (AODV) routing protocol is an on-demand routing protocol; all routes are discovered only when needed, and are maintained only as long as they are being used. Routes are discovered through a route discovery cycle, whereby the network nodes are queried in search of a route to the destination node.

Route Discovery

When a source node has data packets to send to some destination, it checks its routing table to determine whether it already has a route to that destination. If so, it can then utilize that route to transmit the data packets. Otherwise, the node must perform a route discovery procedure to determine a route to the destination.

Route maintenance

In an ad hoc network, links are likely to break due to the mobility of the nodes and the ephemeral nature of the wireless channel. Hence, there must be a mechanism in place to repair routes when links within active routes break. An active route is defined to be a route that has recently been utilized for the transmission of data packets.

The above Figure 4 illustrates an AODV route lookup session. Node A wants to initiate traffic to node J for which it has no route. A transmit of a RREQ has been done, which is flooded to all nodes in the network. When this request is forwarded to J from H, J generates a RREP. This RREP is then unicast back to A using the cached entries in nodes H, G and D.

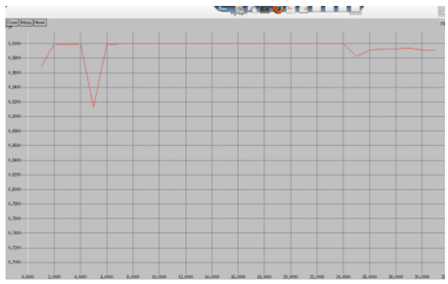

Figure: 6 Graphical Representation of DSR protocol for Packet Data Ratio

AODV builds routes using a route request/route reply query cycle. When a source node desires a route to a destination for which it does not already have a route, it broadcasts a route request (RREQ) packet across the network. Nodes receiving this packet update their information for the source node and set up backwards pointers to the source node in the route tables. In addition to the source node's IP address, current sequence number, and broadcast ID, the RREQ also contains the most recent sequence number for the destination of which the source node is aware. A node getting the RREQ may send a route reply (RREP) if it is either the destination or if it has a route to the destination with corresponding sequence number greater than or equal to that contained in the RREQ. If this is the case it unicast a RREP back to the source. Otherwise, it rebroadcasts the RREQ. Nodes keep track of the RREQ's source IP address and broadcast ID. If they receive a RREQ which they have already processed, they discard the RREQ and do not forward it.

IV. RESEARCH TOOL USED

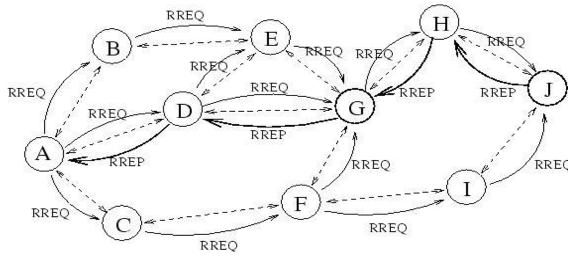

Figure 4: A possible path for a route replies if a wishes to find a route to J

SIMULATION TOOL (NETWORK SIMULATOR 2)widely known as NS2, is simply an event driven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulation of wired as well as wireless network functions and protocols (e.g., routing algorithms, TCP, UDP) can be done using NS2 It consists of two simulation tools. The network simulator (ns) contains all commonly used IP protocols. The network animator (NAM) is use to visualize the simulations. Ns-2 fully simulates a layered network from the physical radio transmission channel to high-level applications The simulator was originally developed by the University of California at Berkeley and VINT project the simulator was recently extended to provide simulation support for ad hoc network by Carnegie Mellon University (CMU Monarch Project homepage, 1999). NS2 consists of two key languages: C++ and Object-oriented Tool Command Language (OTcl) while the C++ defines the internal mechanism (i.e., a backend) of the simulation objects, the OTcl sets up simulation by assembling and configuring the objects as well as scheduling discrete events (i.e., a frontend). As shown in figure The C++ and the OTcl are linked together using TclCL After simulation, NS2 outputs either text-based or animation-based simulation results. To interpret these results graphically and interactively, tools such as NAM (Network AniMator) and XGraph are used.

V. WORK PLAN

This APU scheme is compatible with any geographic routing protocol. In this study, we have incorporated the APU strategy in the popular GPSR protocol, which we refer to as GPSR-APU. In this section, we present a simulation-based comparison of GPSR-APU with the original GPSR scheme. We initially use a random topology which allows us to study the effect of varying the node mobility on the performance of GPSR-APU. In addition, we have also studied the effect of the traffic load on APU using a realistic vehicular network. The percentage of data packets that were routed over the shortest-hop path to the destination. Since in geographic routing protocols, each node is unaware of the entire network topology, the forwarding path chosen may be longer than the optimal shortest-hop path. Also evaluated the performance of DSR and AODV using ns-2. Comparison was based on the packet delivery fraction, throughput and end-to-end delay. AODV gives better performance as compared to DSR and DSR in terms of packet delivery fraction and throughput but worst in terms of end-to end delay. We have also seen that DSR routing protocol is best in terms of end-to-delay in both Static and dynamic network for each set of maximum connection

VI. RESULT ANALYSIS

Some important performance metrics can be evaluated. The MP ruleuses mobility prediction to estimate the accuracy of the location estimate and adapts the beacon update interval accordingly, instead of using periodic beaconing. In ODL rule nodes along with the data forwarding path to maintain an accurate view of the local topology by exchanging beacons in response to data packets. The performance of DSR and AODV using NS-2 Simulator tool for the APU Strategy is given below.

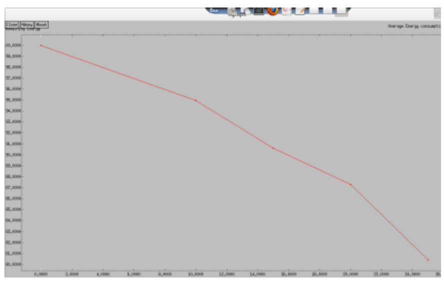

Figure: 7 Graphical Representation of DSR protocol for Average Energy Consumption

6.1: DSR PROTOCOL

6.1.1: Throughput Graph:

Throughput is low in initial stage then starts increasing at certain point of time then become constant. It gives throughput in kbps.

6.1.2 Packet Data Ratio Graph:

DSR require more packets to broadcast in the network. So that Packet Data Ratio is large throughout the data transmission.

6.1.3 Average Energy Consumption Graph:

In the initial stage it requires more energy then it gradually decreases till the end.

6.2 AODV PROTOCOL

6.2.1 Throughput Graph:

Throughput is low in initial stage then starts increasing at certain point of time then become constant.

6.2.2 Packet Data Ratio Graph:

Packet Data Ratio is increasing gradually with time at a certain time it becomes constant.

6.2.3 Average Energy Consumption Graph:

In the initial stage it requires more energy then it gradually decreases till the end.

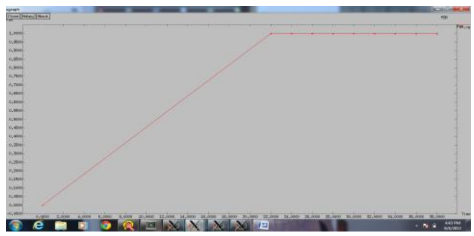

Figure 9: Graphical Representation of DSR protocol

6.3 COMPARISON GRAPHS OF DSR AND AODV PROTOCOLS

6.3.1 Throughput Graph:

AODV Protocol and DSR Protocol both go slowly at the initial stage but at the later stage AODV Protocol gives throughput very fast then DSR Protocol.

6.3.2 Packet Data Ratio Graph:

PDR in AODV Protocol increases gradually with time and at a certain point of time it becomes constant. But in case of DSR Protocol PDR is more throughout the communication. This specifies that PDR is more in case of DSR Protocol then AODV Protocol.

6.3.3 Average Energy Consumption Graph:

The Average Energy Consumption Graph shows that DSR Protocol consumes more energy than AODV Protocol.

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VII. CONCLUSION

We proposed the Adaptive Position Update (APU) strategy to address these problems. The APU scheme employs two mutually exclusive rules. The MP rule uses mobility prediction to estimate the accuracy of the location estimate and adapts the beacon update interval accordingly, instead of using periodic beaconing. The ODL rule allows nodes along the data forwarding path to maintain an accurate view of the local topology by exchanging beacons in response to data packets that are overheard from new neighbors.

AODV and DSR are very similar, but AODV mechanisms are easier to implement and to integrate with other mechanisms using other different routing protocols. AODV maintains only one route per destination. This is one of the major problems in AODV, since every time a route is broken; a route discovery has to be initiated. This leads to more overhead, higher delays and high packet lost. On the other hand, DSR seems to be more stable and has less overhead than AODV. DSR can make use of multiple paths and does not send a periodic packet as AODV. Moreover, it stores all usable routing information extracted from overhearing packets. However, these overheard route information could lead to inconsistencies.

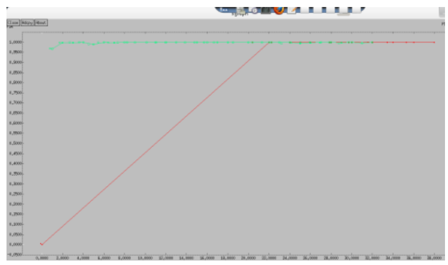

Figure 12: Comparison Graph AODV and DSR protocols for Packet Data Ratio

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