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An Analytical Comparison of Reactive Protocols in Mobile Network

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Abstract :- Mobile communication is most required communication network in today's scenarios. In such network, different kind of data is communicated over the network. The main consideration in such network is given to routing protocol used for the communication. The presented work is about to identify the effective mobile protocol by performing a comparative analysis. In this work, a simulation based analysis is performed on reactive protocols. The work is simulated in NS2 environment. Results obtained from the system shows AODV is most effective routing protocol.

Keywords : AODV, Reactive Protocol, Analytical Study, Simulation based

I INTRODUCTION

A mobile area network is one of the most busy networks that is opened worldwide for new users. But because of this publicly open nature of the network, there are number of internal issues with the network. These issues includes the security, QOS, route optimization etc. To perform the communication over the network, there are number of predefined protocols. These protocols are responsible to provide a secure and reliable communication over the network. To understand the basic formation of mobile network, it is required to understand the actual communication flow over the network. As the communication initiate between two nodes called source and the destination, a series of intermediate nodes are elected dynamically to perform the communication. These intermediate nodes are elected based on the blind mutual trust with neighboring nodes. Another important property of these network is the capability to work without any infrastructure or any centralized system. Each node over the network can play the role of a router as well as the host. The network is not bounded to any geographical restriction and no energy restriction apply on the mobile nodes. Mobile network is been used in many application areas such as battlefield, vehicular area communication etc. It also applied to some emergency services such as disaster recovery and relief activities.

A) Routing Protocols

A protocol is responsible to perform end to end communication. MANET adapts the TCP/IP structure to perform the end to end communication over the network. As the mobile network having the mobility features because of which it works on modified TCP/IP model. To take the routing decisions, there are number of associated routing protocols. These all protocols are divided in three main categories called reactive protocols, proactive protocols and hybrid protocols. These all protocols are listed in figure 1.

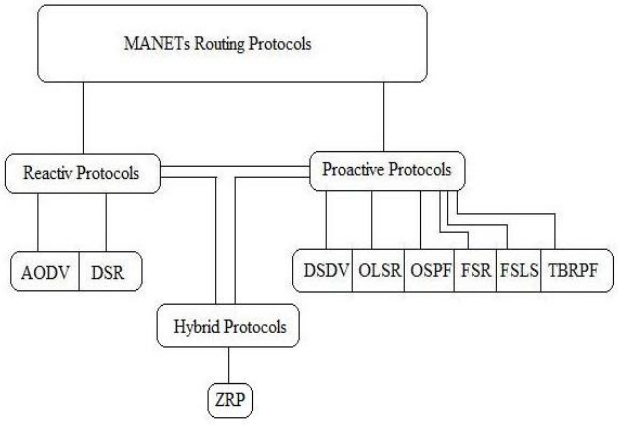

Figure 1 : Routing Protocols

The reactive protocols are also known as on-demand protocols, It means they need not to identify the initial route to perform the communication at the source end. Instead, as the communication performed, each node identify its best neighbor and perform the communication with that node. The reactive protocols generate the route dynamically between the source and the destination. To identify the best neighbor, they use flooding technique. The information is only flooded, data is transmitted only to the specified route.

These protocols are designed for the adhoc network by using the traditional distance vector routing approach. These kind of protocols maintains the routing information for each node in the form of a table. The route creation and updation is done periodically after the fixed intervals. This updation is done under different parameters regardless to the mobility, intervals etc. These protocols generates the significant number of data session to perform effective communication over the network. Hybrid routing protocols are the new generation protocols that contains the characteristics of both reactive and proactive protocols. These systems are improves the scalability vector and allowing nodes to form some backbone to reduce the overhead of route discovery. These protocols are zone based or cluster based that maintain the routes to near nodes and determine the route for far away nodes using route discovery approach.

B) Flooding

Flooding is the approach used by reactive protocols to search the best neighbor among neighboring nodes. It broadcast the request to all neighboring nodes till the destination node is not arrived. Flooding does not require any topological information or the hardware to broadcast the route request. Once the route request populated, it gets the reply from the nodes. Out of these nodes, the effective neighbor is selected as the next hop in the route and communication is performed using that node.

C) Gossiping

It is an intelligent flooding approach in which the information is broadcast to random nodes instead of all neighbor nodes. Once the neighbor node receive data, it randomly identify next sensor node for the communication. The main advantage of this approach is the avoid to the implosion problem as it does not send duplicate messages.

II REACTIVE PROTOCOLS

As discussed above, the reactive protocols does not have any centralized controller to maintain the route or to store the routing information. Some of these protocols are described here under

A) DSR (Dynamic Source Routing)

It is the on-demand routing protocol. It is one of most efficient and simple protocol used in wireless adhoc network to perform multi hop communication. As of reactive protocol, it does not require any centralized controller instead it is a completely self configuring network protocol. The complete routing mechanism adapted by DSR is divided in two main stages called route discovery and route maintenance. The route information of DSR is regularly modified to identify the new effective routes. Once the route is identified, the packets are transmitted over that route. This route information is sent by the sender node once the specific route is discovered. To perform the route discover, the route request(RREQ) is broadcasted and the route information is obtained in the form of route reply(RREP). As some node want to send some information, the RREQ is broadcasted to all its neighboring nodes using flooding approach. These neighboring nodes accept the RREQ message and broadcast it to its neighboring nodes; the process is repeated till the destination node not arrived.

In this protocol, each node is having a separate route cache to store the discovered routes. When a node broadcast the request, it check the internal cache for the destination node. This cache concept reduces the memory overhead that occur when the route discover is done. If a route is already in route cache then there is no need of broadcast it again. As a message reached to the destination node, it contains the complete information about the route as shown in figure 2.

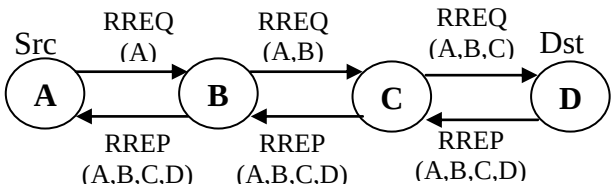

Figure 2 : Route Generation by DSR

Once the route is identified, the next stage is route maintenance. This process is completed using two type of messages called Route Error (RERR) and Route Acknowledgement (ACK). As a node receive message successfully, the ACK is send to the sender. In same way

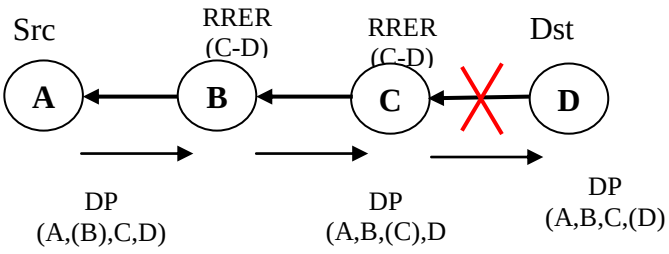

Figure 3 : Route Maintenance in DSR

as the packets transmitted successfully the next neighboring nodes gets the acknowledgement. If some problem occur during the communication RERR message is transmitted to the sender. The route maintenance process is shown in figure 3.

B) AODV (Active On-Demand Distance Vector)

As the name suggest it creates the route only on demand from the destination node. This protocol support both the unicast as well as multicast routing. It maintain the route till is desired by the source. It is a tree based protocol that creates a tree with group members while performing the multicast communication. These group members are connected in a tree form using intermediate nodes or directly. The sequence number is assigned to all communicating nodes to keep track on all nodes. To perform the communication over the network there are three kind of communicating messages called RREQ(Route Request), RREP (Route Reply) and RERR (Route Error). Like DSR, AODV also broadcast the Route request to neighboring nodes and keep the request alive for a fix time period. It also contains the information about the number of hops on which the message is forwarded. Each node contains the information including the broadcast id and the sequence number of the node. As a node receive the message, it send a route reply message to the originator of route request. If some link breakage occur on the active route, a loss message RERR will be generated to notify other nodes about the link break. The routing process followed by AODV is shown in figure 4.

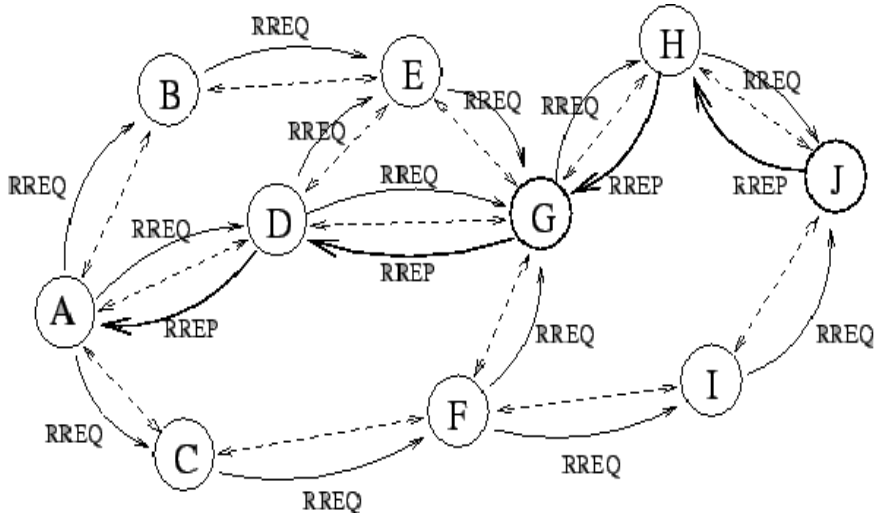

Figure 4 : Routing Process of AODV

The route information maintained in the routing table are

- Destination
- Next hop
- Number of hops
- Destination sequence number
- Active neighbors for this route
- Expiration time for this route table entry

III. RESULT ANALYSIS

In this present work, the analysis of these two routing protocols i.e. DSR and AODV is done under different parameters. The basic parameters taken for the analysis are shown in table 1.

Table 1 : Simulation Parameters

Parameter	Value
Number of Nodes	20
Coverage Area	800x800
Traffic Type	CBR
Propagation Model	Two-Ray Ground
MAC Type	802.11
Mobility Model	Random
Packet Size	512
Protocol	DSR/AODV
Simulation Time	10 sec
Communication Delay	.01 sec

Presented work is analyzed under different parameters including throughput, pakey delay, packet loss rate etc. The analysis is here presented in the form of graph, shown as under.

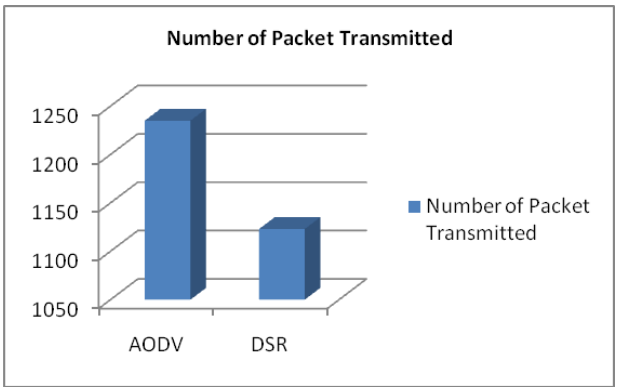

Figure 5 : Packet Transmitted (AODV Vs. DSR)

As we can see in figure 5, the packet successfully transmitted in case of AODV are more than DSR. It shows that when the heavy communication is performed over the network AODV protocol is more effective.

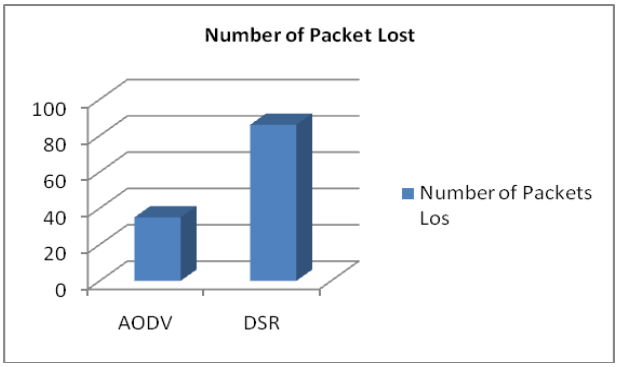

Figure 6 : Packet Lost (AODV Vs. DSR)

Here figure 6 is showing the comparision of two reactive protocols in terms of number of packets lost. As shown

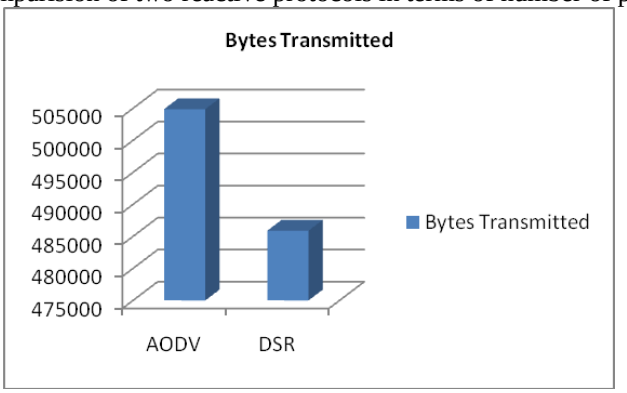

Figure 7 : Bytes Transmitted (AODV Vs. DSR)

Here figure 7 is showing the comparsion of DSR and AODV protcol in terms of total number of bytes transmitted. As shown in the figure, AODV has transmitted more number of bytes in the specified time interval. It shows AODV protocol is more effective than DSR protocol.

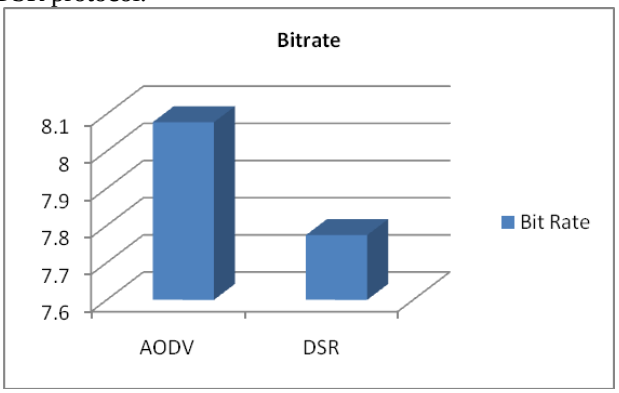

Figure 8 : Bit rate Analysis (AODV Vs. DSR)

in the figure data loss in case of DSR protocol is higher than AODV. It means AODV is more effective than DSR. The comparison of these two protocols in terms of bit rate is shown in figure 8. As we can see, the bit rate of AODV is higher than DSR protocol. It shows that the AODV is more efficient and it can provide transmit data with higher data rate.

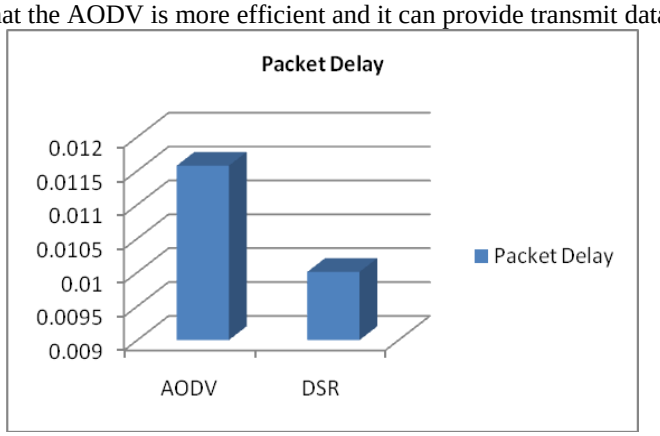

Figure 9 : Packet Delay Analysis (AODV Vs. DSR)

Here figure 9 is showing the analysis of AODV and DSR protocols in terms of packet delay. As we can see, the AODV taken the higher delay between the packet transmission. Packet delay is one of the reasons for the effectiveness of AODV protocol. Whereas the delay between the packets in DSR is lower so that higher data loss occurs in case of DSR.

The results obtained driven from the above parameters shows that AODV protocol is more effective, reliable and efficient than DSR protocol. We can see that AODV provide the higher bit rate and packet transmission over the network whereas the packet loss in case of AODV is lesser.

IV. CONCLUSION

In this paper, the analysis of two reactive protocols is shown under different parameters. The protocols considered here are AODV and DSR and the parameters considered here are packet delay, packet transmission, packet loss and the bit rate. All parameters shows that the AODV protocol is more effective where high rate transmission is performed over the network.

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