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Performance Evaluation of AODV and DSR Routing Protocols under Constrained Situation

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Abstract*:* A mobile ad hoc network is multi-hop wireless network with dynamically and frequently changing topology. The power, energy and bandwidth constraints of these self organized systems have made routing a challenging problem. No of routing protocols has been developed to find routes with minimum control overhead and network resources. Extensions are done on conventional protocols to improve the throughput. The simulation has shown that there is certainly a need for a special protocol in constrained situation. This paper gives the overview on comparison of AODV and DSR on demand routing protocols in constrained situation and shows that AODV out performs DSR in constrained situation.

Keywords: DSR, AODV, CAODV, CDSR, GLOMOSIM Simulator

I. INTRODUCTION

A mobile ad hoc network (MANET) is a collection of mobile nodes sharing a wireless channel without any centralized control or established communication back bone. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each router must forward traffic unrelated to its own use. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet. They may contain one or multiple and different transceivers between nodes. This results in a highly dynamic, autonomous topology.

II. MANET ROUTING PROTOCOLS

Manet routing protocols can be divided into three categories-

- Proactive or table-driven routing protocols
- Reactive or on-demand routing protocols
- Hybrid protocols

A. Pro-active or table-driven routing protocols

These protocols try to maintain consistent and Up-to-date routing information from each node to every other node in the.

B. Reactive or On-demand routing protocols

They maintain information of only active paths to the destination.

C. Hybrid Protocols: Some protocols combine the two different stretiges.They dive the n/w into zones (cluster) and run proactive protocols into cluster and reactive protocols outside the cluster.

1) Ad hoc On-Demand Distance Vector Routing (AODV) AODV is a reactive routing protocol. It minimizes the number of broadcasts by creating routes based on demand. When any source node wants to send a packet to a destination, it broadcasts a route request (RREQ) packet. The neighboring nodes in turn broadcast the packet to their neighbors and the process continues until the packet reaches the destination. During the process of forwarding the route request, intermediate nodes record the address of the neighbor from which the first copy of the broadcast packet is received. This record is stored in their route tables, which helps for establishing a reverse path. If additional copies of the same RREQ are later received, these packets are discarded. The reply is sent using the reverse path. For route maintenance, when a source node moves, it can reinitiate a route discovery process. If any intermediate node moves within a particular route, the neighbor of the drifted node can detect the link failure and sends a link failure notification to its upstream neighbor. This process continues until the failure notification reaches the source node. Based on the received information, the source might decide to re-initiate the route discovery phase.

2) Dynamic Source Routing (DSR) - Dynamic Source Routing (DSR) is a reactive protocol based on the source route approach. In Dynamic Source Routing (DSR), the protocol is based on the link state algorithm in which source initiates route discovery on demand basis. The sender determines the route from source to destination and it includes the address of intermediate nodes to the route record in the packet. DSR was designed for multi hop networks for small Diameters. It is a beaconless protocol in which no HELLO messages are exchanged between nodes to notify them of their neighbors in the network.

III.PROBLEM STATEMENT

This paper compares the two reactive protocols AODV and DSR using GloMoSim simulator and finds in constrained situation AODV out performs DSR.Earlier analysis shows that if we use MANET normal situations then

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DSR outperform AODV .This paper proposed a better protocol if situation is constrained and we use MANET for long time.

IV. PERFORMANCE METRICS

The main objective of this paper is comparing the performance of AODV and DSR routing protocols under normal and constrained situations using following metrics:

1) Packet Delivery Ratio-The packet delivery ratio in this simulation is defined as the ratio between the number of packets sent by constant2w bit rate sources ("CBR, application layer") and the number of received packets by the CBR sink at destination.
Packet Delivery Ratio: ∑CBR packet rcvd by CBR link/∑CBR packet sent by CBR sources
It describes the percentage of packets which reach the destination.

2) End-to-End Delay-There are possible delays caused by buffering during route discovery latency, queuing at the interface queue, retransmission delays at the MAC, and propagation and transfer times. Once the time difference between every CBR packet sent and received was recorded, dividing the total time difference over the total number of CBR packets received gave the average end-to-end delay for the received packets. This metric describes the packet delivery time: the lower the end-to-end delay the better the application performance.
Average end-to-end delay-$\sum_1^n$CBRsenttime-CBRrcvtime/$\sum_1^n$CBRrecv

3) Routing overhead-It is the number of packet generated by routing protocol during the simulation and can be defined as:
Overhead= $\sum_n^i$ overhead
Where overhead is the control packet number generated by node I. The generation of an important overhead will decrease the protocol performance.

4) Throughput-Throughput of the routing protocol means that in certain time the total size of useful packets that received at all the destination nodes. The unit of throughput is Kilobits per second (Kbps).

V. SIMULATION

Simulation provides a complete platform for the analysis of MANET routing protocols. GloMoSim (Global Mobile Information system simulator) is used as the simulator to compare two protocols AODV and DSR in constrained situation. GloMoSim simulates networks with up to thousands of nodes linked by a heterogeneous communications capability that includes multicast, asymmetric communications using direct satellite broadcasts, multi-hop wireless communications using ad-hoc networking, and traditional Internet protocols.

1) Packet Delivery Ratio- The figure (1) shows that packet delivery ratio of AODV is better in constrained situation than DSR. As the no. of nodes increases PDR also increases. In constrained AODV the PDR almost increased by 5%.

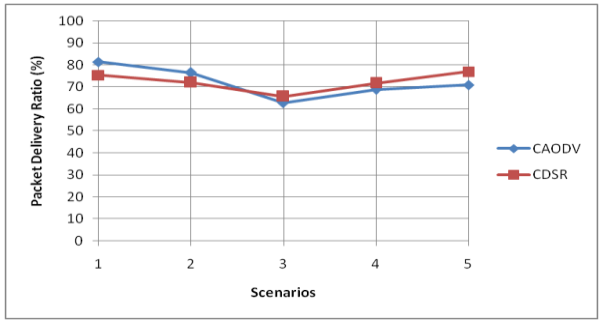

Fig.1 packet deliver ratio in percentage (%)

2) Average End-To-End Delay-The below given figure(2) shows that end to end delay is very high in DSR in constrained situation almost more than twice as compared to constrained AODV. So when the number of nodes increases delay in DSR is also increased.

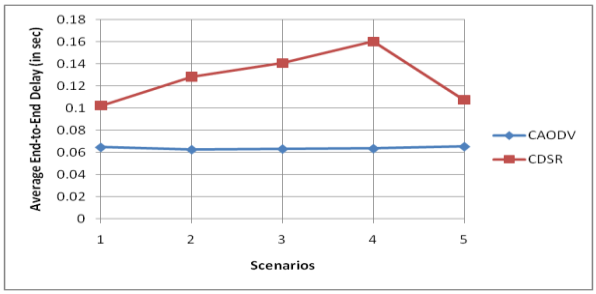

Fig.2 Average end-to-end delay in seconds

3) Routing Massages (Routing Overhead)-The figure (3) shows that number of massages during the routing was very less. Initially outing massages are more but overall they were very less as compared to DSR during the complete path. If routing overhead is less then more number of data packets can be sent with minimum delays so improves overall performance.

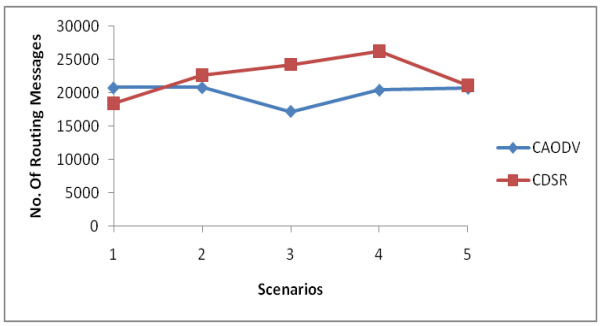

Fig.3 Routing Messages

4) Throughput-The figure (4) shows that overall throughput is better for AODV in constrained situation rather than DSR. Routing overhead was initially high in AODV but once the packet starts it is much lesser than DSR. Packet

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delivery ratio is almost 5% higher than in constrained AODV as compared to constrained DSR.

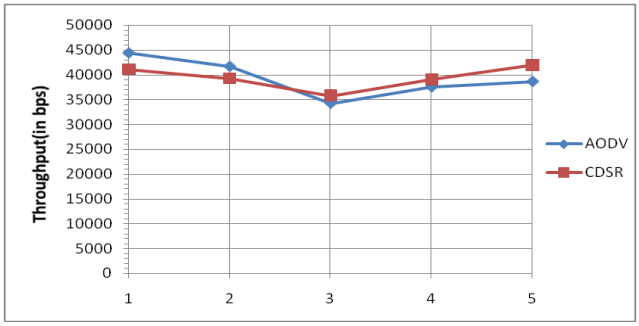

Fig.3 Overall Throughput

VI. CONCLUSION AND FUTURE SCOPE

This paper compare the performance of two reactive (DSR and AODV) routing protocols under constrained situation using three different scenarios. Simulation was done on GloMoSim simulator.

Scenario 1 shows that initially the packet delivery ratio is high in constrained AODV than in constrained DSR.If we use MANET for the short duration than constrained AODV performs better but If MANET is used for the long time both protocols can be used because they perform at the same level.

Scenario 2 show that average end-to-end delay is very high in constrained DSR.It increases with the number of nodes so at this situation constrained AODV must be used.

Scenario 3 shows that initially routing massages are very high in constrained AODV than in DSR.If we have large amount of data to transfer than constrained AODV must be used but constrained DSR should be prefer for the small amount of data transfer.

Future Scope of AODV under constrained situation can be extended to various fields-

Now a day's multimedia applications like videos, audios, and text and real time applications consumes much network resources. Constrained AODV improves overall Quality of Service (QoS) by avoiding unnecessary traffic and consumes less network resources for multimedia and real time applications as it has high packet delivery ratio.

Today's world energy is the most important and cost effective constraint in any field. As AODV is a reactive protocol means routes are created when needed so the energy can be saved by avoiding routes which are not serving any purpose.

AODV under constrained situation shows expanded security scope and guard against several attacks by detecting next hop used in data transfer from source to destination.

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