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Performance Analysis of Reactive and Proactive Routing Protocols for Mobile Ad-hoc –Networks

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Abstract- In Mobile Ad Hoc networks (MANETs) the mobility of nodes results in frequent changes of network topology making routing in MANETs a challenging task. Some studies have been reported in the literature to evaluate the performance of the proposed routing algorithms. This paper evaluates the review of the performance of AODV, DSR, DSDV and OLSR routing protocols in MANETs under CBR traffic with different network conditions. Review of these protocols show that in different conditions different protocols behave differently. These four protocols have been reviewed under different conditions.

Keywords- MANET, NS-2, TCP, Wireless, AODV, DSDV, DSR, OLSR

I. INTRODUCTION

The mobile ad hoc network (MANET) allows a more flexible communication model than traditional wire line networks since the user is not limited to a fixed physical location [1]. It is a new special network that does not have any fixed wired communication infrastructure or other network equipments. With no pre-existing fixed infrastructure, MANETs are gaining increasing popularity because of their ease of deployment and usability anytime and anywhere. So they are viewed as suitable systems which can support some specific applications as virtual classrooms, military communications, emergency search and rescue operations, data acquisition in hostile environments, communications set up in exhibitions, conferences and meetings, in battle field among soldiers to coordinate defense or attack, at airport terminals for workers to share files etc.

Mobile Ad hoc Networks (MANETs) are future wireless networks consisting entirely of mobile nodes that communicate in the absence of any centralized support. Nodes in these networks will both generate user and application traffic and carry out network control and routing duties. Routing protocols in ad hoc networks has received wide interest in the past years due to the fact that existing internet routing protocols were designed to support fixed infrastructure and their properties are unsuitable for mobile ad hoc networks. The up to date standardized protocols are classified into reactive and proactive protocols. Reactive protocols, such as AODV [9] and DSR [8], find the route only when there is data to be transmitted and as a result, generate low control traffic and routing overhead. Proactive protocols like OLSR [3] and DSDV [3], on the other hand, find paths in advance for all source and destination pairs and periodically exchange Topology information to maintain them.

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II. MOBILE ADHOC NETWORK

Due to the highly dynamic nature of mobile nodes and the absence of a central controller, traditional routing protocols used for a wired network cannot be applied directly to a MANET. Some of the considerations required in the design of MANET routing protocols include the mobility of nodes, unstable channel states and resource constraints such as power and bandwidth. In a MANET, the movement of nodes will cause communication between nodes to be disrupted from frequent path breaks and reconnections. Also, the broadcasting of radio channels can be highly unstable and the network layer has to interact with the MAC layer for available channels. In addition, power availability is often limited since the nodes are connected to batteries. There are many routing protocols as given in the Figure 1.

AODV

The Ad hoc On Demand Distance Vector (AODV) routing algorithm [1] is a routing protocol designed for ad-hoc

mobile networks. AODV is capable of both unicast and multicast routing. It is an on demand algorithm, means that it builds routes between nodes only as desired by source nodes. It maintains these routes as long as they are used by the sources. 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.

DSR

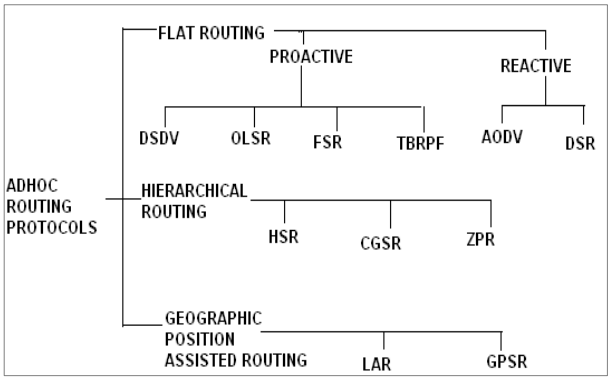
DSR [2] adopts a similar on-demand approach as AODV regarding the route discovery and maintenance processes. A key difference of DSR from AODV and other on demand protocols is the use of source routing, where the source node specifies the complete sequence of intermediate nodes for each data packet to reach its destination. The source-route information is carried by the header of the data packet. The advantage of source routing is that no additional mechanism is needed to detect routing loops. The obvious disadvantage is that data packets must carry source routes. The data structure DSR uses to store routing information is route cache, with each cache entry storing one specific route from the source to a destination. DSR makes very aggressive use of the source routing information.

DSDV

DSDV[3] is an enhancement to distance vector routing for ad-hoc networks. A sequence number is used to tag each route. A route with higher sequence number is more favorable than a route with lower sequence number. However, if two routes have the same sequence number, the route with fewer hops is more favorable. In case of route failure, its hop number is set to infinity and its sequence number is increased to an odd number where even numbers are reserved only to connected paths.

OLSR: It is a source-initiated on demand routing protocol, which uses a link reversal algorithm and provides loop-free multi-path routes to a destination node. In OLSR, each node maintains its one-hop local topology information and also has the capability to detect partitions. OLSR is proposed to operate in a highly dynamic mobile networking environment. The key design concept of OLSR is the location of control messages to a very small set of nodes near the occurrence of a topological change. The protocol performs three basic functions (a) route creation (b) route maintenance (c) route erasure.

Fig 1: Many Routing Protocols



Implementation Idea

Ad hoc wireless networks are decentralized in nature and hence routing is a central challenge in this type of network. Many routing protocols for ad hoc networks have been proposed to date. Among them, some are proactive, some are reactive and others are hybrid routing protocols. Many different ways are used by many peoples to show the difference between the performances of theses routing protocols By simulation results

III. PERFORMANCE BASED WORK

A mobile ad hoc network (MANET) is a network consisting of a set of wireless mobile nodes that communicate with each other without centralized control or established infrastructure. The mobility model should represent the realistic behavior of each mobile node in the MANET. Routing protocols for ad hoc networks are typically evaluated using simulation.

IV. SIMULATION AND RESULTS

Simulation Environment

In our scenario we take 30 nodes .The simulation is done using NS-2, to analyze the performance of the network by varying the nodes mobility. The protocols parameters used to evaluate the performance are given below:

i) Total No. of Drop Packets: It is the difference between sending and received packets.

ii) Throughput: Throughput is the average rate of successful message delivery over a communication channel.

iii) End to end Delay: It can be defined as the time a packet takes to travel from source to destination.

Simulation Parameter

Table 1: Simulation Parameters Considered

Parameters	Values
Simulator	NS-2.35
Mobility Model	Random Way Point
Antenna type	Omini Directional
Area of Map	500X500
PHY/MAC	IEEE 802.11
Routing Protocol	AODV,DSDV,DSR,OLSR
Network Traffic	TCP
Simulation Time	100sec
Antenna type	Omini

Result

For comparing the performance of all the four protocols, four routing matrices have been taken.With high mobility and high traffic.

Matrices	AODV	DSR	DSDV	OLSR
Delay	39.84	673.65	8.43	6.29
Throughput	251.37	244.54	237.09	177.15
PDR	92	89.3	86.6	64.83
NRL	0.003	0.005	0.001	0.007

By observing the above table it is found that AODV has maximum throughput under low traffic and DSDV has maximum throughput under high traffic. As network becomes dense OLSR, DSR and DSDV perform well in terms of Throughput than AODV . DSR performs well in dense networks in terms of packet delivery fraction but at the same time Normalized Routing load of OLSR is maximum among all the protocols in both the networks. DSDV has least Normalized Routing load in both low and high traffic. OLSR and DSDV give the least Jitter and Average Delay in both networks Low delay and low jitter are mainly required in voice applications (i.e. Voice over Internet Protocol (VOIP)) and real time applications (i.e. real time multi player games in mobile ad hoc environment), so OLSR and DSDV can be used there. The least the value of Normalized Routing load, least will be the wasted portion of BW that is used for exchange of routing message between nodes and more will be the BW available for transferring data between nodes. The applications like voice and video conferencing need more BW, so in this case DSDV can be used. The applications like video telephony, web games, etc. require high throughput, so in this case AODV can be used under low mobility and low traffic and DSDV can be used under high mobility and high traffic. There is high mobility of users and network nodes at the time of emergency and military operations. We have observed that as the mobility increases there is an improvement in the throughput of OLSR, DSR and DSDV. So these three protocols can be used in emergency and military applications.

V. CONCLUSION

The performance evaluation is necessary for analyzing the shortcoming of existing approaches and making the requirement with more applicable design for MANET. This paper compares the routing protocols AODV, DSDV and DSR performance in the cluster base MANET environment with increases the mobile node in the cluster for making high traffic scenario. Finding indicates that from these any single protocol is not suitable for efficient routing in different environment. DSR protocol is more applicable in small size of cluster but as size of the cluster increased AODV protocol shows drastic changes in its performance and more applicable while DSDV evaluation results are not desirable in comparison with other two reactive routing protocols.

Future Scope: In the area of MANET research, there is always scope for here for future work we can suggest energy aware approach for routing. For wireless networks, energy is always vital resource, so we have to add mechanism to minimize the energy consumption as well to present study.

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