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PERFORMANCE ANALYSIS OF REACTIVE ROUTING PROTOCOLS IN CHAIN MOBILITY MODELS

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ABSTRACT

Mobility models are the foundation of the simulation study of various protocols in Mobile Adhoc Networks. The comparative Performance of Dynamic Source Routing and Adhoc On-Demand Distance Vector routing protocols using the two Chain Mobility Models against Performance parameters like Throughput, Packet Delivery Fraction, End to End Delay is presented in this paper. The study is oriented towards deployment of sparse ad-hoc networks by suitably selecting the number of nodes. With the help of NS-2 simulator performance of Reactive Routing Protocols in Chain mobility models is analysed and hence comparative study is put farward.

Keyword: Adhoc networks, Mobility Models, Mobility Models, Performance parameters, NS2

1. INTRODUCTION

Ad hoc generally signifies a solution designed for a specific problem and not intended to be adapted to other purposes.Wireless network refers to any type of computer network that is not connected by cables of any kind [1]. A wireless ad hoc network is a decentralized type of wireless network [2] and it does not rely on a preexisting infrastructure. Each node participates in routing by forwarding data for other nodes, and so the determination of which nodes forward data is made dynamically based on the network connectivity.In mobile ad hoc network (MANET) mobile nodes communicate with each other without centralized control or established infrastructure [3,6]. Mobile Node's (MN) that are within each other's radio range can communicate directly, while distant MN's rely on their neighboring MN's to forward packets. Each MN acts as either a host or a router. MN's are free to join or leave the network at any point of time, resulting in a highly dynamic network environment [1]. The advantages of such a network are rapid deployment, robustness, flexibility and inherent support for mobility. Ad hoc networks, due to their quick and economically less demanding deployment, find distributed computing, emergency operations, wireless mesh networks, wireless sensor networks and hybrid networks [10].

Mobile ad hoc networks have numerous practical applications, such as emergency and relief operations, military exercises and combat situations, and conference or classroom meetings. Each of these applications can potentially involve different mobility patterns, with movement dependent on interactions among participants and the environment.

Routing protocols for Mobile ad hoc networks can be classified into two main categories [5]. Proactive (table-driven routing) and Reactive (on-demand routing). Table-driven routing protocols attempt to maintain consistent, up-to-date routing information from each node to every other node in the network. Destination Sequenced Distance Vector, Optimised Link State Routing are example. On-demand routing protocols were designed to reduce the overheads in Table-Driven protocols by maintaining information for active routes only. On-Demand routing protocols can be classified into two categories. In source routing DSR(Dynamic Source Routing) protocol each data packets carry the complete path from source to destination. Therefore, each intermediate node forwards these packets according to the information in the header of each packet.In hop-by-hop routing AODV(Adhoc On- Demand Distance Vector protocol) each data packet only carries the destination address and the next hop address. Therefore, each intermediate node in the path to the destination uses its routing table to forward each data packet towards the destination. The routes are adaptable to the dynamically changing environment of MANETs, since each node can update its routing table when they receiver fresher topology information and hence forward the data packets over fresher and better routes. Using fresher routes also means that fewer route recalculations are required during data transmission. A Mobility model is used to describe the movement pattern of the mobile nodes. Random Waypoint (RW) model [12,13] is the most widely used due to its simplicity. The Manhattan (MH) model [14] is used to emulate the movement pattern of mobile nodes on streets environment. Hierarchical routing based Reference Point Group Mobility model (RPGM) [14, 15], has a logic center (group leader) to determine the movement of the whole group. The result of survey [11] shows that about 75.5% MANET papers, published in ACM from 2000-2005, used simulation to test their

research. Impact of mobility models [20] on performance of protocol in MANET is studied by various researchers. Performance metrics parameters like Throughput, Data Packet Delivery Ratio [21] are used with mobility models to compare the routing protocols. The rest of the paper is organized as follows: Section 2 describes the traditional mobility models and Reactive routing protocols for Adhoc networks. Section 3 describes the simulation scenario and results. Section 4 concludes the paper.

2. RELATED WORK

Reactive Adhoc routing protocols can be divided into two categories[5]. The Dynamic Source Routing (DSR) [22] is one of the purest example of an on demand routing protocol that is based on the concept of source routing. Each data packets carry the complete path from source to destination ie it maintains multiple route cache entries for each destination. Therefore, each intermediate node forwards these packets according to the information in the header of each packet. The major drawback with source routing protocols is that in large networks they do not perform well. This is due to two main reasons; firstly as the number of intermediate nodes in each route grows, then so does the probability of route failure. Secondly, as the number of intermediate nodes in each route grows, then the amount of overhead carried in each header of each data packet will grow as well.

In hop-by-hop routing each data packet only carries the destination address and the next hop address ie it has one entry per destination. Therefore, each intermediate node in the path to the destination uses its routing table to forward each data packet towards the destination. The advantage of this strategy is that routes are adaptable to the dynamically changing environment of MANETs, since each node can update its routing table when they receiver fresher topology information and hence forward the data packets over fresher and better routes. Using fresher routes also means that fewer route recalculations are required during data transmission. The disadvantage of this strategy is that each intermediate node must store and maintain routing information for each active route and each node may require being aware of their surrounding neighbors through the use of beaconing messages (Adhoc on demand distance vector).

One of the characteristics of Ad-hoc networks is their mobility. What pattern a node moves will have a significant impact on the network performance. The mobility model has been widely used for evaluating the performance of protocols in traditional Ad-hoc networks. Random Waypoint model [12, 13] is the most widely used due to its simplicity. The Manhattan model [14] is used to emulate the movement pattern of mobile nodes on streets environment. Hierarchical routing based Reference Point Group Mobility model [14,15] has a logic center or group leader to determine the movement of the whole group.

3. SIMULATION SCENARIOS

Parameter	Value
Simulator	NS-2 (2.34)
Protocols	DSR,AODV
Send Rate	0.125 sec
Simulation Area	500*500
Traffic Type	CBR(UDP)
Maximum number of Nodes	25
Node Movement Model	Chain Campus, Chain Test Random

4. RESULT INVESTIGATIONS

Based on the simulation analysis in section 3, we can see that the Throughput of the network with DSR and AODV the routing protocols is same for Chaintest Random and Chain Campus mobility models. This is the case when the no of mobile modes is less or upto 20 as shown in figure 2.

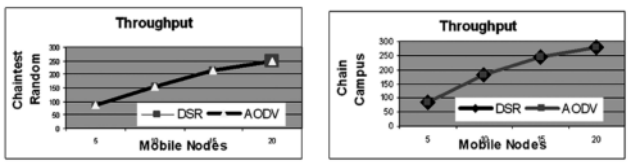

Figure 2: Throughput of Reactive Routing Protocols using Mobility Models

The Packet Delivery Fraction for DSR and AODV the routing protocols is same for Chaintest Random mobility models. In case of chain Campus model the PDF is consistent for AODV but with DSR it varies from 1.0 to 0.9988 when the number of mobile nodes varies from 5 to 20 as shown in figure 3.

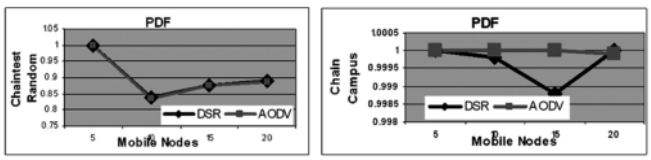

Figure 3: Packet Delivery Fraction of Reactive Routing Protocols using Mobility Models

With Chaintest Random Model the End to End Delay for AODV is consistent. Simulation results shows that with DSR protocol End to End Delay varies from 8.22 to 17.92. Further in case of Chain Campus Model the End to End Delay for both Routing protocols increases as the number of mobile nodes increases from 5 to 20 as shown in figure 4.

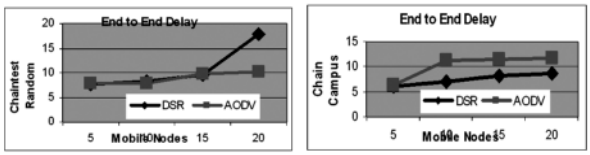

Figure 4: End to End Delay of Reactive Routing Protocols using Mobility Models

5. CONCLUSION

In this paper, using the NS-2 simulation, we have evaluated the performance of reactive routing protocols using the performance metric like Throughput, Packet Delivery Fraction and End-to-End Delay.The AODV and DSR protocols shows consistent increase of End-to-End Delay in Chain Campus mobility model while in case of Chaintest Random model DSR has more delay as Compare to AODV. The reactive routing protocols has same throughput with Chaintest Random and Chain Campus models when number of mobile nodes is up to 20.Reactive routing protocols has same PDF for Chaintest Random mobility models. AODV with chain Campus model has consistent PDF but with DSR it reduces slightly when the number of mobile nodes varies.

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