Performance Analysis of WRP,BELLMAN & AODV Routing protocols for MANET

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Abstract – A Mobile Ad-Hoc Network (MANET) is formed by a cluster of mobile nodes (hosts) and can be quickly deployed without any predetermined infrastructure. The developments in wireless technology in the present age have created networks with low cost and low power consumption. One of such networks which subsist is called as Mobile Ad-hoc network which is characterized by wirelessly connected nodes with frequent change in network topology. As the nodes are connected wirelessly a routing mechanism (routing protocols) is required for successful transmission of packets. Sometimes two or more nodes sending the information simultaneously results in collisions. Hence medium access controls (MAC protocols) are required for efficient transmission and avoiding collision. In this research work performance of various attributes like throughput, packet delivery ratio and end-to-end delay for three Routing protocols (WRP, BELLMAN and AODV) is analyzed by increasing the mobility of node. The performance of these three routing protocols is completed on Glomosim Simulator and we concluded that AODV perform well in increasing mobility.

Index Terms – WRP, BELLMAN, AODV, MAC, MANET

1. INTRODUCTION

According to the dependence on the fixed infrastructure, mobile wireless networks can be classified into infrastructure networks and infrastructure-less networks. Mobile Ad Hoc Networks are infrastructure-less networks i.e. do not rely on a permanent infrastructure and have the ability of quick deployment in response to application requirements. These networks are autonomously self-organized and self-configured mobile wireless networks [1]. Hosts of the MANETs function as routers and routers determine and maintain routes to other hosts in the network. Routing is one of the active research areas for mobile ad hoc networks. Due to issues involved in MANET[1] such as mobility of nodes, resource constraints (limited battery life, limited processing power, limited bandwidth, etc.), hidden and exposed terminal problems, routing protocols used in wired network cannot be used in MANETs. Hence MANETs require specific routing protocols that address the above issues.

The Mobile Ad hoc Network is describe by random movement of mobile nodes in wireless circumstances in order to find the best possible path between sources to destination; routing protocols are used in wireless communication. As there is no dedicated path between the nodes a routing approach is helpful in exploring the shortest path. The wireless networks are generally composed of two types infrastructure based network and Ad-hoc network. In case of infrastructure based networks there is a central station called access point (AP) which provide a wireless link between AP and a mobile data terminal equipment having antenna (can be a notepad computer or a laptop).The routing procedure is also forbidden by these access points, in such environment range of transmission is fixed. While in case of Ad-hoc networks the base station or access point is absent. Every node present in the network performs all the functions of base station and routing decisions are also taken by them. MANET or the mobile ad-hoc network is a flexible and self-configuring network containing large number of wirelessly connected independent nodes. The most widely used routing protocol in ad-hoc network is DSR, WRP and LAR1 due to their reactive nature in topology change may. A lot of works on this network is done by researchers in order to have energy efficient routing protocols [6].

1.1 DESCRIPTION OF THE PROTOCOLS

This section briefly explains the W R P , BELLMAN and AODV routing protocol that are being studied in this paper.

1.1.1 (WRP) Protocol

The Wireless Routing protocol (WRP) is a Proactive unicast routing protocol for ad hoc networks (MANETs) WRP is similar to Distance sequenced distance vector routing (DSDV), inherits the properties of the distributed bellman-ford algorithm. it differs from DSDV in table maintenance and in the update procedures .while DSDV[7] maintains only one topology table,WRP[8] uses a set of tables to maintain more accurate information. The table that are maintained by a node are the following: distance table (DT), routing table (RT),link cost table(LCT),AND A Message retransmission list (MRL).

B. BELLMAN

The routing protocols based on the Bellman (or distance vector) algorithm.This algorithm has been used for routing

computations in computer networks .Since the early days of the ARPANET. The particular packet formats and protocol described here are based on the program " routed", which is included with Berkeley distribution. It has become a defacto standard for exchange of routing information among gateway and hosts .This protocol is most useful as an "Interior gateways protocol". In a nationwide network such as the current Internet, it is very unlikely that a single routing protocol will used for the whole network

C. AODV(Ad hoc On-Demand Distance Vector (AODV)

The Ad hoc On-Demand Distance Vector (AODV) [2, 8] is an on-demand routing protocol that enables dynamic, self-starting, multihop routing between participating mobile nodes wishing to establish and maintain an ad hoc network. AODV allows mobile nodes to obtain routes quickly for new destinations, and does not require nodes to maintain routes to destinations that are not in active communication. This protocol performs Route Discovery using control messages route request (RREQ) and route reply (RREP), whenever node wishes to send packet to destination. To control network wide broadcast of RREQs, the source node uses an expanding ring search technique. The forward path sets up in intermediate nodes in its route table with a lifetime association using RREP. AODV allows mobile nodes to respond to link breakages and changes in network topology in a timely manner. When either destination or intermediate node moves, a route error (RERR) is sent to the affected source nodes. When a source node receives the (RERR), it can reinitiate the route discovery if the route is still needed. Neighborhood information is obtained from broadcast Hello packet.

2. PERFORMANCE PARAMETERS

In order to evaluate the performance of ad hoc network routing protocols, the following metrics were considered:

A. Throughput

Throughput [3] is the average rate of successful transmission of packet from source to destination

B.Packet delivery Ratio (PDR)

PDR [4] is the ratio of the number of data packets successfully delivered to the destinations to those generated by CBR sources.

C. Average End-to-End delay

It is the average time from the beginning of a packet transmission at a source node until packet delivery to a destination. This includes delays caused by buffering of data packets during route discovery, queuing at the interface queue, retransmission delays at the MAC, and propagation and transfer times.

Table 1. Parameters for simulation evaluation

Parameter	**Value**
Protocols	WRP BELLMAN and AODV
Traffic Type	CBR
Simulation Duration	500 seconds
Packet Size	512 bytes
Pause Time	40 sec
Number of Nodes	20
TERRAI-DIMENSIONS	2500 * 2500
Mobility model	Random way point

3. SIMULATION RESULTS

To analyses and simulate the different scenarios for comparison, the Glomosim network simulator [5] is being used. For this firstly the scenario is created then after simulation the results are analyses from the analyses option.

3.1. Comparison of WRP,BELLMAN & AODV by changing the node mobility.

In order to compare WRP,BELLMAN & AODV on the basis of mobility, random waypoint mobility model is selected for a scenario having 20 nodes and the speed of nodes is gradually increased from 10m/s to 40m/s.

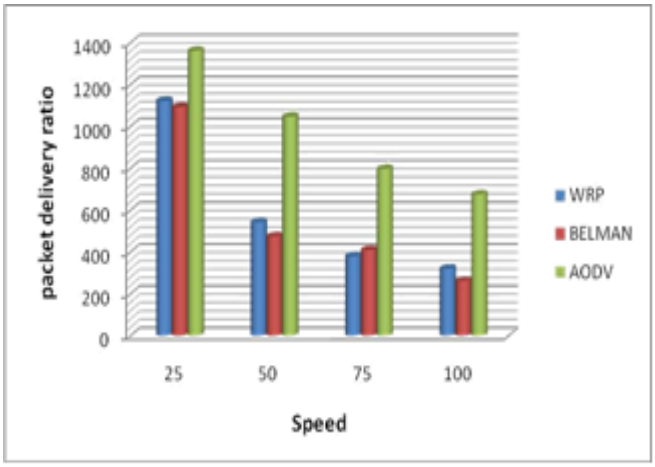

Fig 1. Packet Delivery Ratio vs. Speed

From the graph of packet delivery ratio verses mobility, in fig 1, it is seen thatAODV has better PDR in comparison to WRP and BELLMAN.

In fig 2, it is seen that WRP and BELLMAN has minimum delay in comparison to AODV. And the delay is increases as the mobility increases.

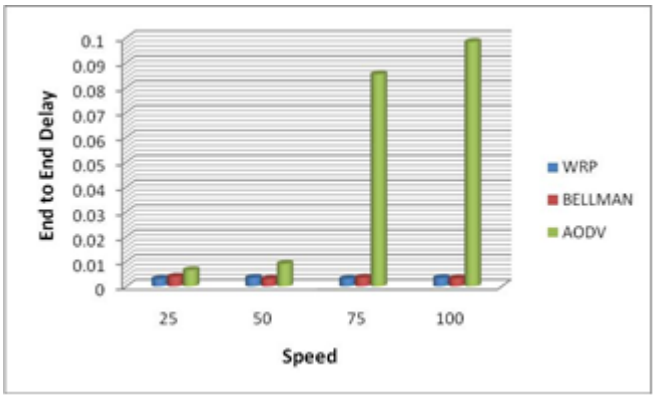

Fig 2. End to End Delay vs. Speed

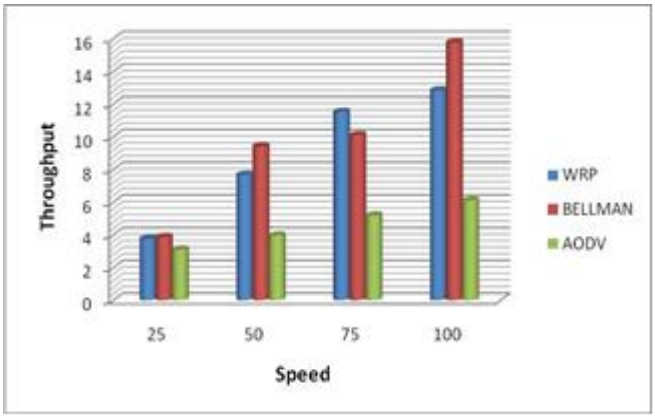

Fig 3. Throughput vs. Speed

In fig 3, it is seen that BELLMAN has higher throughput in comparison to WRP and AODV. And it also seen that as the mobility increases the Throughput decreases.

4. CONCLUSION

In this paper, analysis of WRP,BELLMAN & AODV routing protocols is done to understand that which one performs well in which set of conditions. Focus is mainly done on the network parameters like packet delivery ratio, end to end delay and throughput. By changing the mobility, scenario & it is seen that as the mobility is increased AODV performs well in comparison to WRP and BELLMAN[7]. And it is also observe that as the mobility increases their PDR and Throughput decreases and their delay increases. In the scenario with single source & multiple destinations, WRP outperforms, hence AODV and BELLMAN performs well in increasing mobility.

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