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Comparison of Routing Protocols with Performance Parameters for Different Number of Nodes

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***Abstract*—**a mobile ad-hoc network (MANET) is a self-starting dynamic network comprising of mobile nodes that is connected through a wireless medium forming rapidly changing topologies. MANET is infrastructure less and can be set up anytime, anywhere. This paper presents the study of protocol properties of MANET routing protocols and analyzed them with respect to different number of nodes. The routing protocols considered in this study are Bellman-Ford, DSR and WRP. The study among these routing protocols are based on protocol property parameters such as End-to-End Delay, Packet delivery ratio, Drop Ratio and Normalized Routing Load (NRL) with respect to different number of nodes. After the simulation we have observe that Bellman-Ford and WRP has lower delay in comparison to DSR. DSR has higher delivery ratio and lower drop ratio in comparison to Bellman-ford and WRP. DSR and Bellman-Ford has lower (better) routing overhead WRP.

Keyword: **-** Delay, DSR, Mobile Ad-hoc Network, NRL, PDR, WRP.

I. INTRODUCTION

A Mobile Ad-Hoc Network (MANET) is a self-configuring network of mobile nodes connected by wireless links, to form an arbitrary topology. The nodes are free to move randomly. Thus the network's wireless topology may be unpredictable and may change rapidly. Minimal configuration, quick deployment and absence of a central governing authority make ad hoc networks suitable for emergency situations like natural disasters, military conflicts, emergency medical situations etc. Many previous studies have used Random Waypoint as reference model. However, in future MANETs are expected to be used in various applications with diverse topography and node configuration. Widely varying mobility characteristics are expected to have a significant impact on the performance of the routing protocols like Bellman-Ford, DSR and WRP. The overall performance of any wireless protocol depends on the duration of interconnections between any two nodes transferring data as well on the duration of interconnections between nodes of a data path containing n-nodes. We will call these parameters averaged over entire network as "Average Connected Paths". A mobile ad hoc network is a collection of wireless mobile nodes that dynamically establishes the network in the absence of fixed infrastructure. One of the distinctive features of MANET is each node must be able to act as a router to find out the optimal path to forward a packet. As nodes may be mobile, entering and leaving the network, the topology of the network will change continuously. MANET provides an emerging technology for civilian and military applications.

Figure 1 Relationship between protocol performance and mobility model

A fundamental problem in ad hoc networking is routing i.e. how to deliver data packets among mobile nodes efficiently without predetermined topology or centralized control, which is the main objective of ad hoc routing protocols. Since mobile ad hoc networks change their topology frequently, routing in such networks is a challenging task. Moreover, bandwidth, energy and physical security are limited. MANETs are autonomous and decentralized wireless systems. Nodes are the systems or devices i.e. mobile phone, laptop, personal digital assistance, MP3 player and personal computer that are participating in the network and are mobile. They can form arbitrary topologies depending on their connectivity with each other in the network. These nodes have the ability to configure themselves and because of their self-configuration ability, they can be deployed urgently without the need of any infrastructure. Internet Engineering Task Force (IETF) has MANET working group (WG) that is devoted for developing IP routing protocols. Routing protocols is one of the challenging and interesting research areas for researchers. Many routing protocols have been developed for MANETs. The Mobile ad-hoc network is characterized by energy constrained nodes [3], bandwidth constrained links and dynamic topology. One of the important research areas in MANET is establishing and maintaining the ad hoc network through the use of routing protocols. Though there are so many reactive routing protocols available, in this paper we consider Bellman-Ford, DSR and WRP for performance comparisons due to its familiarity among all other protocols. These protocols are analyzed based on the important metrics such as End-to-End Delay, Packet delivery ratio, Drop Ratio

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and Normalized Routing Load with respect to different number of nodes.

II. RELATED WORK

Authors [1] work with AODV, DSR and LAR1 routing protocols with mobility and MAC Layer protocols. Authors [3] have compared performance of two protocols- AODV and DSR different number of source and have concluded which protocol are better. Author [4], work with AODV routing protocol with varying the nodes. Most of the routing protocols are qualitatively enabled but lot of simulation studies were carried out in the paper by B. Mohammed [5] to review the quantitative properties of routing protocols. In our study we have compared two quantitative properties(packet delivery ratio and normalized routing overhead) of AODV,DSR and DSDV routing protocols when run over different models constructed by taking four different scenarios including varied mobility in terms of pause time and speed of nodes ,varied traffic connection and varied network size. From the above mentioned studies, we can conclude that although routing protocols has been compared from each other with respect to performance under different number of nodes. From the above studies I have decided to go through the study of Routing Protocols like bellman-ford, DSR and WRP with Respect to Performance Parameters for Different Number of Nodes. For our study we choose Bellman-Ford, DSR and WRP routing protocols and four performance metric End-to End delay, Packet Delivery Ratio, Drop Ratio and Normalized Routing Load [2].

Table 1 Parameters for simulation evaluation

Parameter	Value
Traffic Pattern	CBR
Simulation Time	600 Seconds
Terrain-Dimensions	(500*500), (750*750), (1000*1000) and (1250*1250)
Number of Nodes	10, 20, 30 and 40
Node Placement	Uniform
Mobility	Random-Waypoint
Min. Speed Of Node	0 M/S
Max. Speed Of Node	20 M/S
Pause Time	50 Sec.
RADIO-FREQUENCY	2.4e9 (in heltz)
RADIO-BANDWIDTH	2000000 (in bits per second)
RADIO-TX-POWER	15.0 (in dBm)
Mac-Protocol	802.11
Routing-Protocol	Bellman-Ford, DSR, WRP

III. SIMULATION RESULT

To analyses and simulate the different scenarios for comparison, the Glomosim network simulator [6] is being used. For this firstly the scenario is created then after simulation the results are analyses from the analyses option. In this paper we have used nodes model in which we are varying the nodes from 10 to 40 and simulate the network with following parameters as shown in given Table 1. To analyses and simulate the different scenarios for comparison, the Glomosim network simulator [6] is being used. For this firstly the scenario is created then after simulation the results are analyses from the analyses option. In order to compare Bellman-Ford, DSR &WRP on the basis of changing the nodes, random waypoint mobility model is selected for a scenario having 10, 20,30 and 40 nodes using tertian dimension 500*500, 750*750, 1000*1000 and 1250*1250 respectively. Pause time here used is 50 second and maximum speed is 20 m/s. From the graph of delay verses Nodes, in fig 2, it is seen that Bellman-Ford and WRP has lower delay in comparison to DSR. And it is also seen that as we increase the number of nodes delay is also increasing. From the graph of packet delivery ratio versus nodes in fir 3, it is seen that DSR has higher throughput in comparison to WRP and Bellman-Ford. And here we can see that as we increase the number of nodes the PDR is decreases.

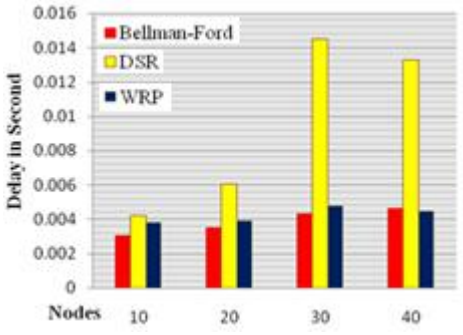

Figure 2 Delays vs. Number of Nodes

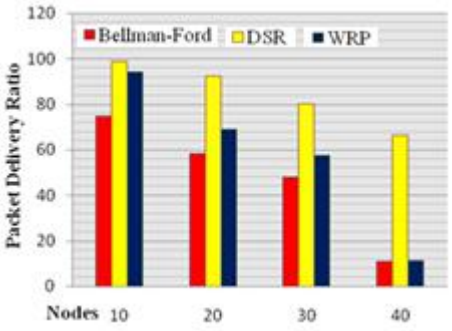

Figure 3 Packet Delivery Ratios vs. Number of Nodes

From the above graph of drop ratio versus nodes in fig 4, it is seen that DSR has lower drop ratio in comparison to Bellman-Ford and WRP. Drop ratio is increases as the node is increases. From the below graph of routing overhead versus nodes in fig 5, it is seen that DSR and Bellman-Ford has lower overhead in comparison with WRP. And here we can see that as we increase the nodes the routing overhead also increases.

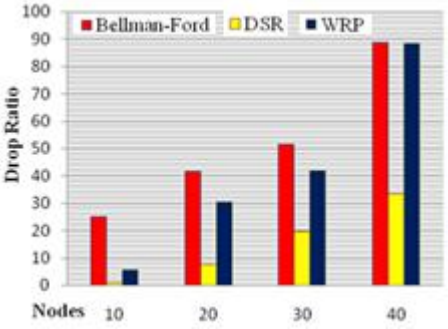

Figure 4 Drop Ratio vs. Number of Nodes

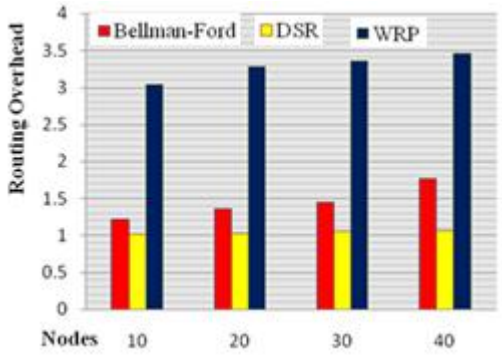

Figure 5 Routing Overhead vs. Number of Nodes

IV. CONCLUSION

In this paper, analysis of Bellman-Ford, DSR &WRP routing protocols is done on node model to understand that which one performs well in which set of conditions. Focus is mainly done on the network parameters like delay, packet delivery ratio, drop ratio and routing overhead. Bellman-Ford and WRP has lower delay in comparison to DSR. DSR has higher delivery ratio and lower drop ratio in comparison to Bellman-ford and WRP. DSR and Bellman-Ford has lower (better) routing overhead WRP. As we increases the nodes delay is also increases. For varying the number of nodes packet delivery ratio decreases. And with increasing the number of nodes routing overhead increases. In future work we can use other routing protocols like DSDV, OLSR, TORA, ABR and ZRP, for calculate performance metric like Jitter, Routing overhead on other network models.

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