Comparative Performance Evaluation of AODV over CBR and TCP Traffic

[1]Deepti Verma, [2]Deepika Chandrawanshi
[1]SoS in CS & IT, Pt. Ravishankar University Raipur, Chhatisgarh, India
[2]National Institute of Technology, Raourkela, Orisa, India

Abstract
Mobile ad hoc network is a collection of wireless mobile nodes dynamically forming a network topology without the use of any existing network infrastructure. The purpose of this paper is to compare the performance of TCP and CBR traffic in AODV Mobile Ad hoc network. When the TCP protocol is used there is a "guaranteed delivery". The CBR service category is used for connections that transport traffic at a consistent bit rate, where there is an inherent dependence on time synchronization between the traffic source and destination. Simulation results have also shown the difference characteristics of the MANETs routing protocols where the on-demand protocols performs show the result in metrics namely Packet Delivery Fraction (PDF) and Average end-to-end delay by varying Pause time. Also the performance is an interesting issue. As we increase the number of Pause time for performing the simulation of AODV routing protocol, the PDF and End to End delay changes, hence the performance parameters changes. As a result of our studies, we conclude the comparative performance between the CBR and TCP traffic over AODV exhibits a better performance in terms of packet delivery fraction and average end-to-end delay.

Keywords
MANETs, TCP/CBR, Simulation, Packet Delivery fraction (PDF), and average to End-to- End delay.

I. Introduction

A Mobile Ad hoc Networks (MANETs) represents a structure of wireless mobile nodes that can freely and dynamically self-organize in to uninformed and temporary network topologies, allowing people and devices to seamlessly communicate without any pre-existing communication structural design. A big challenge in the design of ad hoc networks is the development of dynamic routing protocols that can efficiently find routes between two nodes. Each node in the network also acts as a router, forwarding data packets for other nodes[1]. Our objective is to carry out a efficient performance study of routing protocol Ad hoc On Demand Distance Vector (AODV) [2,3] for ad hoc networks. Such a network may operate in a impartial manner, or may be connected to the larger Internet [4].This paper provides a simulation study that identifies network performance and evaluation when the AODV routing protocol were used in networks. The rest of the paper is ordered as follows: The AODV routing protocol coordination is summarized in section II. The simulation environment and performance metrics are described in Section III. We present the experimental results in section IV and the conclusion is presented in section V.

II. AODV Coordination

AODV (Ad-hoc On-demand Distance Vector) is a loop-free routing protocol for ad-hoc networks. It is designed to be self-starting in an environment of mobile nodes, with standing a variety of network behaviors such as node mobility, link failures and packet losses. The AODV protocol consists of two important mechanisms, Route Discovery and Route Maintenance [5]. The Ad Hoc On-Demand Distance Vector routing protocol (AODV) is an advance of the Destination Sequenced Distance Vector routing protocol (DSDV). The Ad Hoc on Demand Distance Vector (AODV) routing protocol provides uncast, broadcast and multicast communications in ad hoc mobile networks [4]. it searches for routes between nodes only as desired by source nodes; these routes are maintained as long as they are required by the sources [6].

The essential functionality of AODV includes:

- RREQ and RREP messages (for route discovery):- AODV initiates a route discovery process using Route Request (RREQ) and Route Reply (RREP). The source node will create a RREQ packet containing its IP address, current sequence number, the destination's IP address, the destination's last sequence number and the broadcast ID. The broadcast ID is incremented each time the source node initiates RREQ. The requests are sent using RREQ message and the information in connection with creation of a route is sent back in RREP message [7].
- RERR messages, HELLO messages, & originator lists (for route maintenance):- In this Performance When a link break in an active route is detected, the broken link is invalid and a RERR message is sent to other nodes, If the nodes have a route in their routing table with its link, the route will be erased. Source Node sends once again a route request to his neighbor nodes. Or a node on the way to the destination can try to find a route to Destination. That mechanism is called: Local Route Repair.
- Hop counts:-The number of hops from the Originator IP Address to the Destination IP Address [5].

III. Simulation Environment

Here we give the highlighting for the evaluation of performance of Ad Hoc routing protocol AODV with varying the number of Pause time for CBR and TCP Connections. The simulations have been performed using network simulator NS-2 version 2.24 running on Fedora 10 is an open source discrete event simulation tool, which means it simulates events such as sending, receiving, forwarding and dropping packets.

A. Simulation Mode I for CBR and TCP Connections

We consider a network of nodes placing within a 550m X 550m area. The performance of AODV is evaluated by keeping the network speed, node, constant and changeable the Pause time for CBR Table1 and TCP Table2 shows the simulation parameters used in this evaluation.

ISSN : 2229-4333(Print) | ISSN : 0976-8491(Online)

Table 1: Parameters values for AODV Simulation for Traffic type CBR

Parameters	Values
Traffic type	cbr
Channel	Wireless
No. of nodes	20
Network size	550*550m
Protocol	AODV
Pause time	20,40,60,80,100ms
Simulation time	200.0s

Table 2: Parameters values for AODV Simulation for Traffic type TCP

Parameters	Values
Traffic type	tcp
Channel	Wireless
No. of nodes	20
Network size	550*550m
Protocol	AODV
Pause time	20,40,60,80,100ms
Simulation time	200.0s

B. Performance Metrics

Using of above parameter analyzed the AODV protocol; we focused on two performance metrics which are Packet Delivery Fraction (PDF) and Average End-to-End Delay.

Packet Delivery Fraction (PDF):- This is the ratio of total number of packets successfully received by the destination nodes to the number of packets sent by the source nodes throughout the simulation.

PDF= (Received Packets/sends Packets)*100

Average End to End delay: This is defined as the average delay in transmission of a packet between two nodes. A higher value of end-to-end delay means that the network is congested and hence the routing protocol doesn't perform well [8].

Average End to End delay= End to End delay/Received Packet

IV. Experimental Result

The performance of CBR and TCP Connections in AODV based on the varying the number of Pause time is done on parameters like packet delivery fraction and average end-to-end delay for CBR and TCP Connections.

Table 3 : Comparision(CBR and TCP) Result for Packet delivery fraction

Pause Time(ms)	Traffic Type CBR(pdf)	Traffic type TCP(pdf)
20	99.11	99.35
40	99.71	99.72
60	93.84	97.51
80	99.4	99.11
100	99.13	99.45

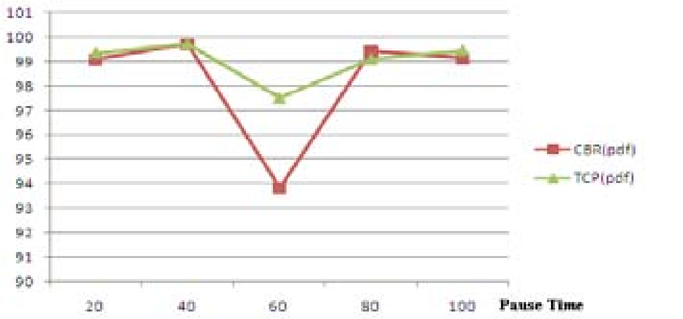

Fig.1: Graph of comparision(CBR and TCP) Result for Packet delivery fraction

In the case of different Pause time in the CBR and TCP Connections, PDF for 20ms,40ms ,60ms,80ms,and 100ms are Provide Result for CBR when pause time increas PDF low camparative of TCP .

Table 4 : Comparision(CBR and TCP) Result for End-to-End delay

Pause Time(ms)	Traffic type CBR(e-e delay)	Traffic type TCP(e-e delay)
20	13.87	316.76
40	8.6	245.28
60	304.43	577.42
80	11.77	362.81
100	24.19	383.64

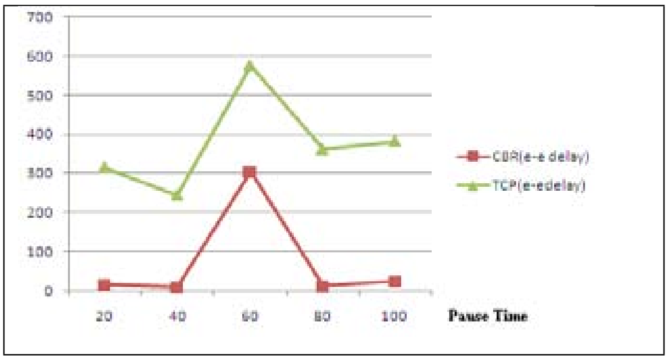

Fig. 2: Graph of comparision(CBR and TCP) Result for End-to-End delay.

In the case of different Pause time in the CBR and TCP Connections, End to End delay for 20ms,40ms ,60ms,80ms,and 100ms are Provide Result for TCP when pause time increas End to End delay Batter thean camparative of CBR in different points.

V. Conclusion

In this presented simulation work, the AODV routing protocol is evaluated for the application oriented performance metrics such as packet delivery fraction, average end-to-end delay for Mobile Ad hoc networks and have comparison with CBR and TCP traffic Connections for Different Pause Time. We find that testing a protocol using CBR traffic is not a good indicator for the AODV protocol performance when subject to TCP traffic. Finally the TCP is Batter than CBR Traffic.

VI. Acknowledgment

This Research work has been done by me at SOS in Computer Science and Information technology Pt. Ravishankar Shukla University, Raipur (C.G.).

References

[1] Nilesh. P. Bobade, Nitiket. N. Mhala, "Performance Evaluation of AODV for Mobile Ad Hoc Network with Varying Network Size", Proceedings of the International Joint Journal Conference on Engineering and Technology (IJJCET 2010)

[2] S. R. Das, C. E. Perkins, E. M. Royer, "Performance Comparison of Two On-Demand Routing Protocols for Ad Hoc Networks ", IEEE Personal Communications Magazine, Special Issue on Mobile Ad Hoc Networks, Vol. 8, No. 1, February 2001,pp.16-29.

[3] C. E. Perkins, E. M. Royer, S. R. Das, "Ad Hoc On- Demand Distance Vector (AODV) Routing", Internet Draft, draft-ietf-manet-aodv-10.txt, work in progress, 2002

[4] T.V.P. Sundararajan 1, Karthik2, A. Shanmugam3 "Security and Scalability of MANET Routing Protocols in Homogeneous & Heterogeneous Networks", Proceedings of the International Conference on Man-Machine Systems (ICoMMS) 11 – 13 October 2009, Batu Ferringhi, Penang, MALAYSIA.

[5] Dr. Aditya Goel, Ajaii Sharma, "Performance Analysis of Mobile Ad-hoc Network Using AODV Protocol", International Journal of Computer Science and Security (IJCSS), Volume (3): Issue (5)

[6] David oliver jorg, "Performance comparison of MANET Routing Protocols in different environment", IEEE,1-6,2003.

[7] Sunil Taneja, Ashwani Kush, "PERFORMANCE EVALUATION OF DSR AND AODV OVER UDP AND TCP CONNECTIONS", International Journal of Computing and Business Research (IJCBR) Volume 1, N. 1 December – 2010

[8] Vikas Singla, Rakesh Singla, Ajay Kumar,"Performance Evaluation and Simulation of Mobile Ad-hoc Network RoutingProtocols", IJEIT Vol. 1 No.1.

Deepti Verma did her graduation and post graduation from school of studies in computer sciences, pt. ravishankar Shukla University, Raipur, Chhattisgarh state, India. She has completed her M.Phil. From C.V. Raman University, Bilaspur (CG). She got Gold medal during her post graduation studies for highest marks in University. She involved in research since last four years. Her research paper has been published in different national and international journals. She presented many papers in different seminar and conferences. Currently she involved to develop novel software for different statistical methods and presently working as a lecturer in Pt. Ravishankar Shukla University, Raipur, Chhattisgarh state, India.

Deepika Chandrawanshi did her graduation from Government Engineering College, Raipur, Chhattisgarh state, India. And her M. Tech. Running From National Institute of Technology, Raourkela (Orissa).She got highest marks in University. She involved in research. Her research paper has been published in different national and international journals. She presented many papers in different seminar and conferences.