

Effective Performance of Dynamic Source Routing Protocol on Random Waypoint Model (RWM) Using CBR

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Article Info

Article history:

Received Jun 30th, 2012

Revised July 10th, 2012

Accepted July 28th, 2012

Keyword:

Ad hoc network
Routing protocol
DSR
WRM
CBR
Qualnet 5.0.2

ABSTRACT

Mobile ad hoc network is a collection of wireless nodes that communicate to each other without using any infrastructure, access point, or centralized network. Each nodes have own capability to receiving and forwarding packet each other device in mobile ad hoc network. In this article, showing the performance of dynamic source routing protocol based on the broadcasting data on nodes placement scenarios using random waypoint model (RWM). Broadcast packet on CBR that means constant bit rate data transfer constantly on random waypoint model and showing the effective performance of dynamic source routing protocol in mobile ad hoc network (MANET).The performance analysis is based on different network metrics such as Number of Hop Counts, Number of Routes Selected, Number of RREP Received, and Number of RREQ discarded for loop, Number of RREQ received, Number of Duplicate RREQ received, Number of RREQ Retried, and Number of Data Packets Dropped for no route, Number of RREQ Forwarded, Number of RREQ TTL expired and Residual Battery Capacity.

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1. INTRODUCTION

Wireless ad hoc network is a collection of mobile nodes. which dynamically form a temporary network communicate without using any existing infrastructure, access point or central administration. Mobile ad hoc networks are quick and easy deployment of ad-hoc network makes them feasible to use in military, search and rescue operation, meeting room and sensor networks. In MANET, nodes can move randomly thus, each node function as a router and forward packet to each other device. Due to high node mobility network topology changes frequently. Wireless networks are playing a major role in the area of wireless communication. Now we are using wireless networks in military applications, industrial applications and even in personal area networks. Previously, the main difference between wireless and wired networks was only in communication channel. There exist physical medium in wired networks, while on the other side physical medium doesn't exist on the wireless networks. Wireless networks became very popular in different applications considering the following factors: ease of installation, reliability, cost, and bandwidth, total required power, security and performance of network . All networks were however based on fixed infrastructures. Most common infrastructure based wireless networks are cordless telephone, cellular networks, Wi-Fi, Microwave communication, Wi-MAX, Satellite communication and RADAR. MANET stands for Mobile Ad hoc Network.

It is a decentralized autonomous wireless system which consists of free nodes .The aim of this article is to perform Dynamic Source Routing protocol showing effective performance compared to other

routing protocol on random waypoint model with the help of constant bit rate using simulation tools Qualnet 5.0.2.

A. DYNAMIC SOURCE ROUTING

The dynamic source routing protocol (DSR) [1, 2, 3, 6] is an on demand or reactive routing protocol in mobile ad hoc network (MANET). DSR protocol provides two main mechanisms that work together to allow the discovery and maintenance of source route in the ad hoc network. Route discovery is the mechanism by which a node S wishing to send a packet to a destination node D obtains a source route to D. Route discovery is used only when S attempts to send a packet to D and does not already know a route to D. Route maintenance is the mechanism by which node S is able to detect, while using a source route to D if the network topology has changed such that it can no longer use its route to D because a link along the route no longer works. When route maintenance indicates a source route is broken, S can attempt to use any other route it happens to know to D or it can invoke route discovery again to find a new route for subsequent packets to D. Route maintenance for this route is used only when S is actually sending packets to D.

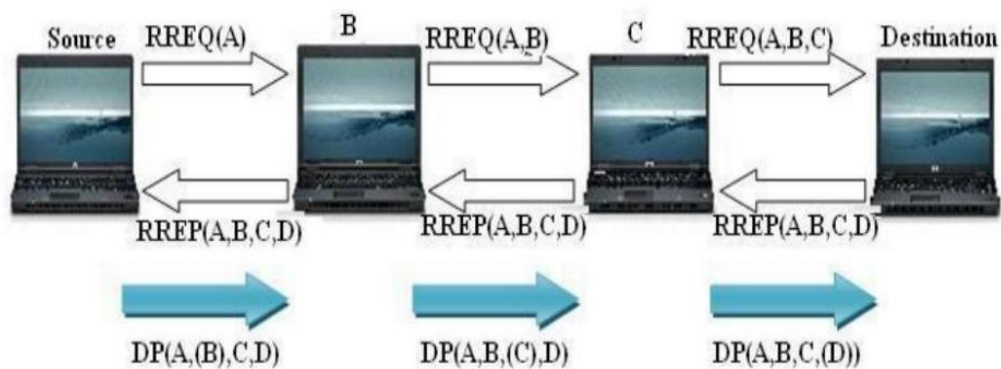


Figure 1 Route Discovery Procedures in MANET Using DSR

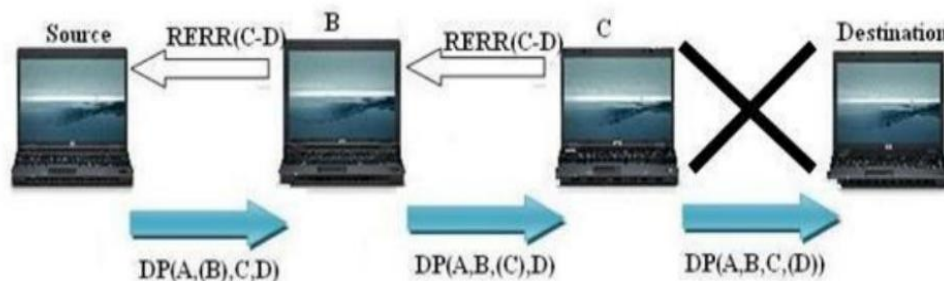


Figure 2 Route Maintenance Procedure in MANET Using DSR

B. RANDOM WAYPOINT MOBILITY (RWM) MODEL

The node repeats this, throughout the simulation. We simulate three scenarios each scenario was run for 300 sec (simulation time). All the simulations show the required results. Under simulation we check the behavior of DSR. In random waypoint mobility (RWM) model, the nodes randomly select a position, move towards it in a straight line at a constant speed that is randomly selected from a range, and pause at that destination. We get multiple graphs from simulations like first we get for delay, second is for the network load, and third one is for the throughput. Main goal of our simulation was to model the behavior of the routing protocols. We collected DES (global discrete event statistics) on each protocol and Wireless LAN. We examined average statistics of the delay, network load and throughput for the MANET. A campus network was modeled within an area of 1500m x 1500m. The mobile nodes were spread within the area. We take the CBR traffic to analyze the effects on routing protocols. We configured the profile with CBR application. The nodes were wireless LAN mobile nodes with data rate of 11Mbps. Random waypoint mobility model was used in this simulation. The mobility model used is simple and it shows more good mobility behavior. Mobile nodes move at a constant speed of 100 m/s, and when they reach the destination, the pause time is 15 sec and after that they choose a new random destination [5,6].

C. CONSTANT BIT RATE (CBR)

Constant Bit Rate (CBR) [6] is a traffic generator. This UDP-based client-server application sends data from a client to a server at a constant bit rate. Random Waypoint mobility model in random waypoint mobility model, the nodes randomly selects a position, moves towards it in a straight line at a constant speed that is randomly selected from a range, and pauses at that destination. The node repeats this, throughout the simulation. In the simulation, Constant Bit-Rate (CBR) traffic flows are used with 4 packets/second and a packet size of 512 bytes.

2. PARAMETERS FOR SIMULATION SETUP

Table 1. Parameters for simulation setup scenarios

Parameters	Values
No of Nodes	15 Nodes
Area	1500m*1500m
Routing Protocols	DSR
Fading Model	Rayleigh
Shadowing Model	Constant
Energy Model	Mica Motes
Battery Model	Simple linear model
Terrain File	DEM
Node Placement	Random node placement
Simulation time	300 sec
Channel frequency	2.4Ghz
Traffic Source	CBR
Weather-Mobility Interval	100 ms
Propagation-Pathloss-Model	Two Ray Model
PHY-Model	PHY802.11b
Data Rate	2 Mbps
Antenna-Model	Omnidirectional
Mobility-WP -max speed	10 m/sec
Mobility-WP-Pause time	15Sec
Battery-Charge-Monitoring-Interval	60Sec

3. SIMULATION SCENARIOS FOR 15 NODES PLACEMENT

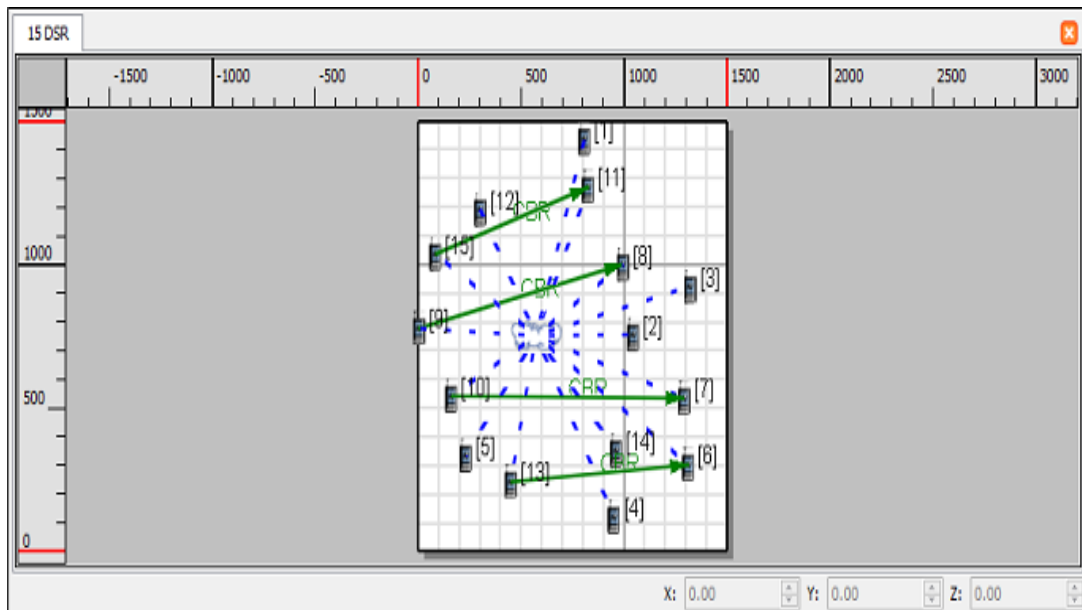


Figure 3. Showing the performance of 15 node placement Scenarios

A. PERFORMANCE METRIC

1. **Number of Hop Counts:** Accumulated number of hops of all routes found by DSR at a node.
2. **Number of Routes Selected:** Total number of new routes found by a node.
3. **Number of RREP Received:** Total number of Route Replies received by a node.
4. **Number of RREQ discarded for loop:** Total number of Route Requests discarded for detecting a routing loop.
5. **Number of RREQ received:** Total number of Route Requests received by a node.
6. **Number of Duplicate RREQ received:** Total number of duplicate Route Requests received.
7. **Number of RREQ Retried:** Total number of Route Requests retransmitted by a node.
8. **Number of Data Packets Dropped for no route:** Total number of packets dropped from DSR packet buffer because of no route.
9. **Number of RREQ Forwarded:** Total number of Route Requests forwarded by a node.
10. **Number of RREQ TTL expired:** Total number of Route Requests received by a node which was not relayed because of expiration of TTL.
11. **Residual Battery Capacity:** This model estimates the remaining service life of the battery at any time in the simulation. One important characteristic of the battery is that some amount of energy will be wasted when the battery is delivering the energy required by the circuit.

B. PERFORMANCE RESULT OF DYNAMIC SOURCE ROUTING PROTOCOL VS NODES

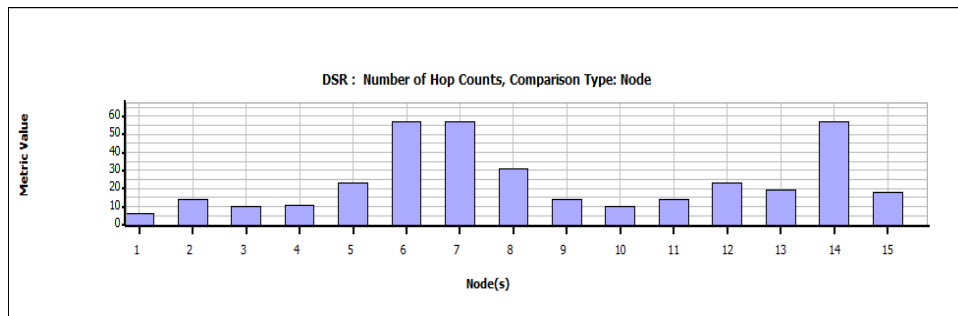


Figure 4 Number of Hop Counts Vs Nodes

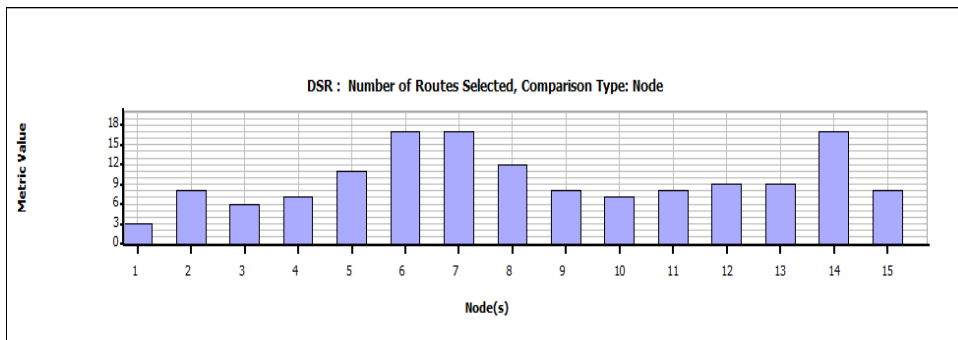


Figure 5 Number of Routes Selected Vs Nodes

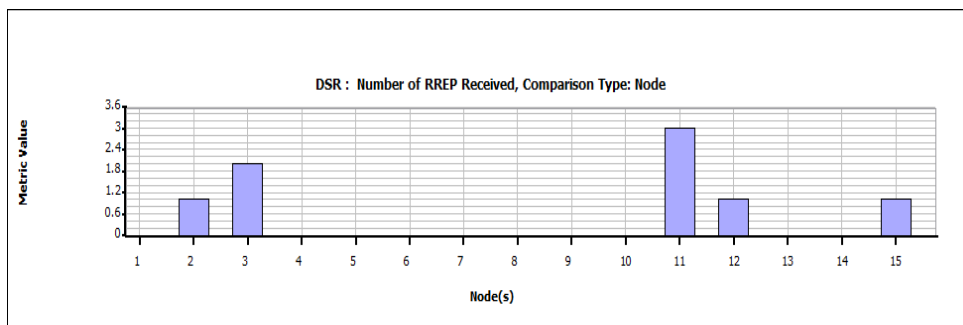


Figure 6 Number of RREP Received Vs Nodes

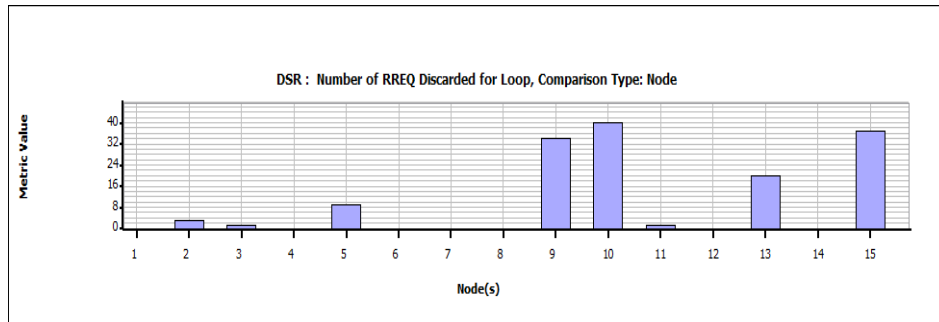


Figure 7 Number of RREQ discarded for loop Vs Nodes

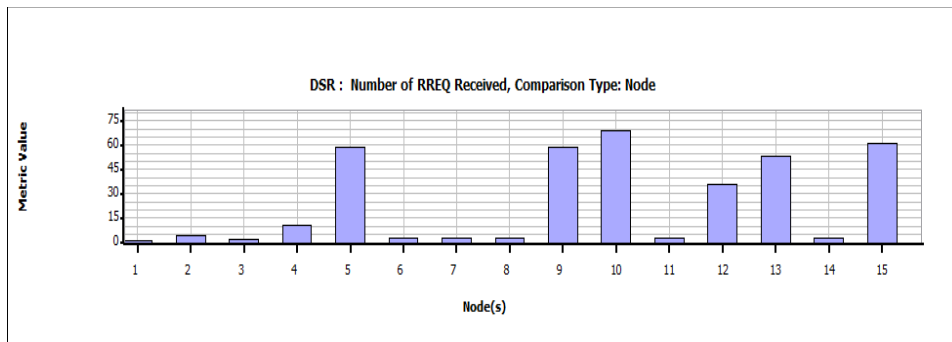


Figure 8 Number of RREQ received Vs Nodes

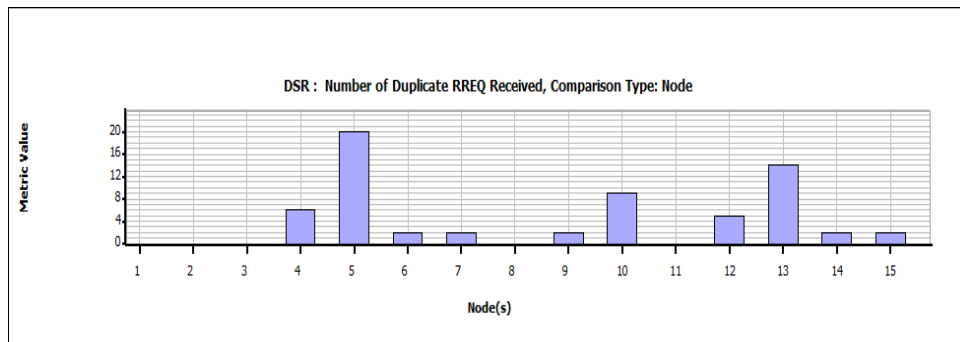


Figure 9 Number of Duplicate RREQ received Vs Nodes

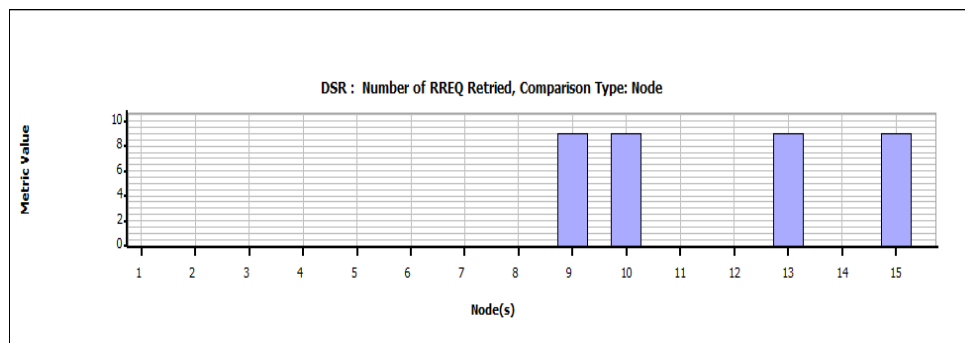


Figure 10 Number of RREQ Retried Vs Nodes

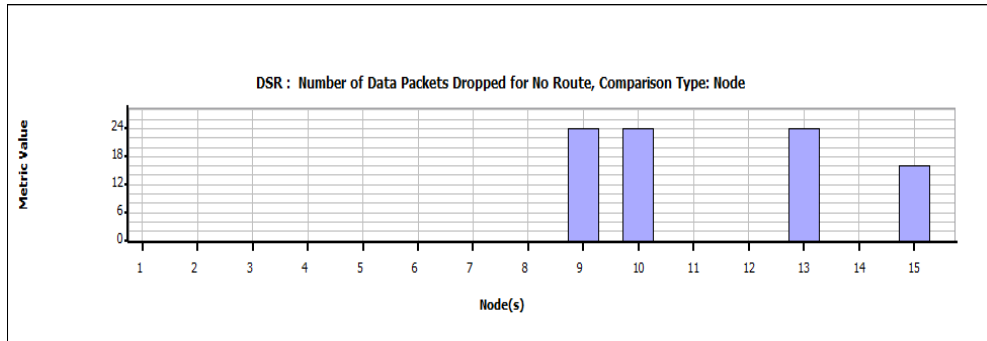


Figure 11 Number of Data Packets Dropped for no route Vs Nodes

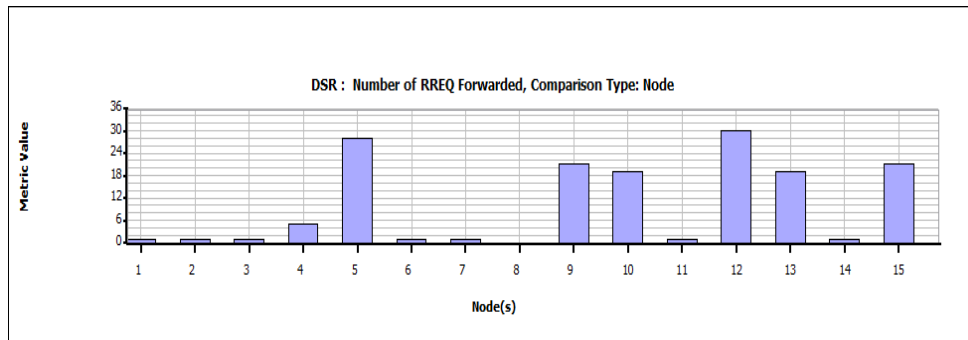


Figure 12 Number of RREQ Forwarded Vs Nodes

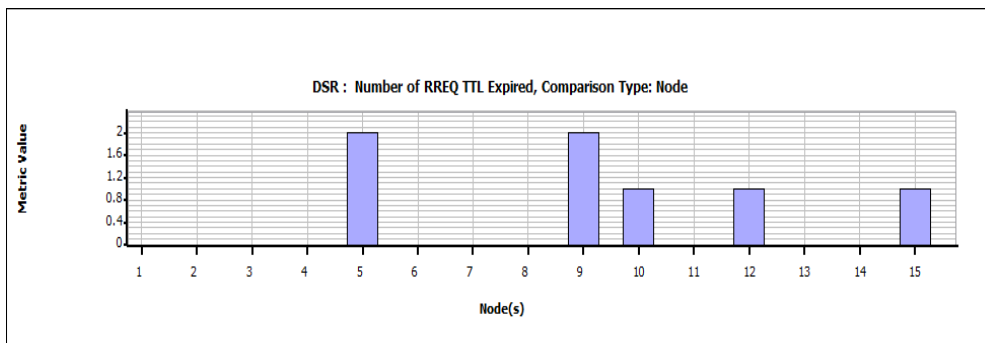


Figure 13 Number of RREQ TTL expire Vs Nodes

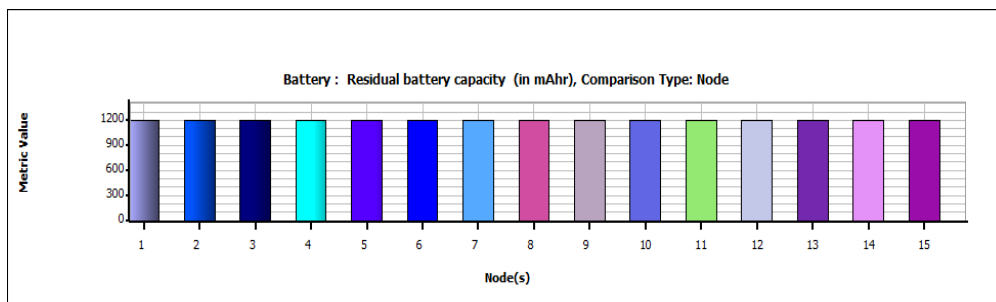


Figure 14 Residual Battery Capacity Vs Nodes

4. CONCLUSION

In this article showing the performance of dynamic source routing protocol using qualnet 5.0.2 simulation tools as compared to other routing protocols on random waypoint model using constant bit rate (CBR). This article mainly gives effective performance on the performance metric such as Number of Hop Counts, Number of Routes Selected, Number of RREP Received, and Number of RREQ discarded for loop, Number of RREQ received, Number of Duplicate RREQ received, Number of RREQ Retried, and Number of Data Packets Dropped for no route, Number of RREQ Forwarded, Number of RREQ TTL expired and Residual Battery Capacity.

ACKNOWLEDGEMENTS

Jogendra Kumar thanks Mr. Sandipvijay Head of the Department (HOD) and Professor of Electronic Communication & Engineering in DIT (Dehradun Institute of Technology) Uttarakhand by recognized UTU (Uttarakhand Technology University) Dehradun, Uttarakhand ,INDIA and also Thanks Mr. S.K Verma HOD CSED G.B. Pant Engineering College Pauri Garhwal Uttarakhand ,INDIA give me opportunity and provided simulation tools Qualnet 5.0.2 to complete this article on Effective Performance of Dynamic Source Routing Protocol on Random Waypoint Model (RWM) Using CBR

REFERENCES

- [1] Shaily Mittal, Prabhjot Kaur, " PERFORMANCE COMPARISION OF AODV, DSR and ZRP ROUTING PROTOCOLS IN MANET'S," International Conference on Advances in Computing, Control, and Telecommunication Technologies , IEEE computer society .pp 165-168,2009.
- [2] Parma Nand, Dr. S. C. Sharma, " Routing Load Analysis of Broadcast based Reactive Routing Protocols AODV, DSR and DYMO for MANET" International journal of grid and distributed computing vol.4, No.1, PP 81-92, March 2011
- [3] SreeRangaRaju, Jitendranath Mungara, " Performance Evaluation of ZRP over AODV and DSR in Mobile Ad hoc Networks Using Qualnet" European Journal of Scientific Research ISSN 1450-216X Vol.45 No.4, pp.658-674, 2010
- [4] C.Siva Rammurthy and B.S. Manoj , "Ad hoc wireless networks architectures and protocols" ISBN 978-81-317-0688-6, 2011.
- [5] The Qualnet 5.0.2 simulator tools online available www.scalable-networks.com
- [6] Draft-ietf-manet-dsr-07, "The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks (DSR)",

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Jogendra Kumar received his B.E. degree in Computer Science & Engineering from H.N.B Garhwal University Srinagar Uttarakhand (India) in G.B. Pant Engineering College Pauri Garhwal, Uttarakhand, (India) 2008 and he is currently doing M.Tech (CSE) degree from UTU University Dehradun Uttarakhand (India) in G.B. Pant Engineering College Pauri Garhwal, Uttarakhand, (India) with Registration ID No CSE1053545 and he is a member of International Association of Engineers (IAENG), Member ID:121623, Internet Society (USA), Member ID: 77364 , International Association of Computer Science and Information Technology (IACSIT), Member ID : 80344753 His research interest includes mobile ad hoc networks and wireless sensor networks systems and also published various research papers in leading international journal & conferences.