Comparative Performance Study of Zone Routing Protocol over AODV and DSR Routing Protocols on Constant Bit Rate (CBR)

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ABSTRACT
Ad hoc wireless network is a collection of mobile nodes that can move independently any direction without any infrastructure, access point in a wireless network. In this article showing the performance analysis on the basis of constant bit rate (CBR) in routing protocol ZRP, AODV and DSR in mobile ad hoc network .In this article simulate the performance of routing protocol ZRP, AODV and DSR taken performance metric First Packet sent (s), Last Packet sent (s), Total Bytes sent, Total Packet sent, Throughput client (bits/s), First Packet Received (s), Last Packet Received (s), Total Bytes Received, Throughput Server (bits/s) using Qualnet simulation tools 5.0.2 in mobile ad hoc network (MANET).

Keywords
Ad hoc Network, Routing Protocol Zone Routing Protocol, AODV, DSR, QualNet 5.0.2 etc.

1. INTRODUCTION
A mobile ad hoc network is a set of wireless nodes that communication directly without needs any access point, infrastructure in a wireless network. Mobile nodes can move randomly through router has a capability to forwarding a packet from source to destination .due to mobility of nodes topology change frequently as compared to other network. Mobile ad hoc network have own capability to control mobility of nodes in wireless network. Mobile ad hoc network routing protocol divided into three category proactive routing, reactive routing and hybrid routing protocol like DSDV [7], FSR [10], AODV [1, 3, 4, 9, 10], DSR[1, 3, 6], ZRP [1, 3, 6, 10] etc. this paper basically discuss three routing protocol performance

On the basis CBR [2, 6, 10, 11] CBR means constant bit rate which send data from source to destination at fixed rate.CBR apply from source nodes (9,10,12,18) to destination (2,3,15,16) in nodes placement scenarios.

Table I. Category of mobile ad hoc network (MANET) routing protocol.

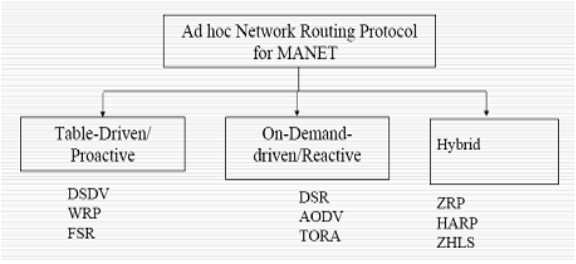

Table 1 for Routing Protocol in MANET

1.1 Proactive Routing Protocol: Proactive routing or table driven routing protocol means which update routing table periodically and maintain routing information up to date .proactive routing protocol like

- Destination sequenced Distance vector routing (DSDV) [7]
- wireless routing protocol(WRL) [7,8]
- Fisheye State Routing (FSR) [10]

1.2 Reactive Routing Protocol: In reactive routing protocol paths are searched only when needed. A route discovery operation invokes a route-determination procedure; active routes may be disconnected due to node mobility. Therefore, route maintenance is an important operation of reactive routing protocols ad hoc networks.

- The Dynamic Source Routing (DSR) [1, 3, 6]
- Ad hoc on- demand Distance Vector routing (AODV) [1, 3, 4, 9, 10]

1.3 Hybrid Routing Protocol: Hybrid routing protocol is a combination of proactive routing and reactive routing protocol like

- Zone Routing Protocol (ZRP) [1, 3, 6, 10]

2. ROUTING PROTOCOL OF MANET
2.1 Ad hoc on demand routing protocol (AODV): Ad hoc on demand routing protocol (AODV) [1, 3, 4, 9, 10] is a Reactive routing or on demand routing protocol that means to maintain the routing information only when needs about the active paths. Routing information is maintained in routing tables at nodes and every mobile node keeps a next-hop routing table, which contains the destinations to which it currently has a route. In case AODV when a source S node wants to send packets to the destination D but no route is available, it initiates a route discovery operation. In the route discovery operation, the source broadcasts route request (RREQ) packets. A RREQ includes addresses of the source S and the destination D, the broadcast ID, which is used as its identifier, the last seen sequence number (Seq. no) of the destination as well as the source node's sequence number (Seq. no) . Sequence numbers (Seq. no) are used for remove the duplicate rout and provides loop-free, up-to-date routes. Discovery operation reduce the flooding overhead, a node discards RREQ.

2.2 Distance Source Routing (DSR): The dynamic source routing protocol (DSR) [1, 3, 6] is an on demand or reactive routing protocol to maintain routing information efficient manner as compared to table driven

routing protocol because this maintain route information only needed. Dynamic source routing network is completely self-organizing and self-configuring requiring no existing network infrastructure or administration. DSR protocol has two main mechanisms

- **Route discovery:** Route discovery is the mechanism by which source node S wishing to send a packet to a destination node D obtains a source route to destination D. Route discovery is used only when S attempts to send a packet to D and does not already know a route to destination D.
- **Route maintenance:** Route maintenance is the mechanism by which source node S is able to detect .while using a source route to destination D. When route maintenance indicates a source route is broken. Source node S can attempts to use any other route it happens to know to destination node D. route maintenance for this route is used only when source node S is actually sending packets to destination node D.

2.3 Zone Routing Protocol (ZRP): The Zone Routing Protocol (ZRP) [1, 3, 6, 10] combines both reactive routing and pro-active routing protocols into a hybrid routing protocol. ZRP routing protocol divided into zones.

- **Intrazone Routing Protocol (IARP):** Interazone routing protocol (IARP) [3, 6, 10] to communicate with the interior nodes of within zone with limited radius of the zone. It works fast when topology change, local neighborhood of a node may change rapidly because controlling all information of within zone. Thus node periodically updates the routing information or you can say that this also called table driven routing protocol.
- **Interzone Routing Protocol (IERP):** The global reactive routing or on demand routing component of the ZRP the Interzone Routing Protocol (IERP) [1, 3, 10]. It better works outside the zone. IERP handled route discovery when change the way. When you need to broadcast a route request to the entire node to used Bordercast Resolution Protocol (BRP) [2, 3].

3. SIMULATION PARAMETERS SETUP

Simulation setup is done using QualNet5.0.2 [11] simulator tools. We studied the performance of AODV, DSR and ZRP routing protocol for random waypoint node placement models at constant bit rate (CBR)

Table 2 Parameter Values for scenarios

Parameter	Values
Area	700m*700m
No of nodes	20
Routing protocol	AODV,DSR,ZRP
Mobility model	Random waypoint model
Simulation time	120 sec
Traffic source	CBR
Channel frequency	2.4 GHz
Data rate	2 Mbps
Path loss-model	Two ray model
Antenna-model	Omni directional
Shadowing-Model	Constant
PHY-Model	PHY802.11b

4. SIMULATION NODES PLACEMENT SCENARIOS

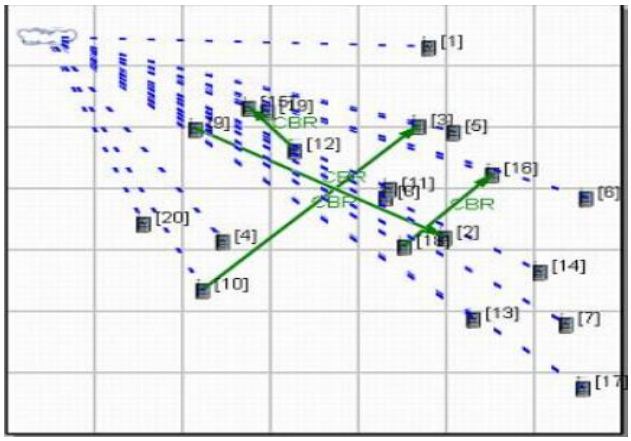

Fig. 1 Simulation Nodes Placement Scenarios

5. ANIMATION VEIW OF CBR SCENARIOS

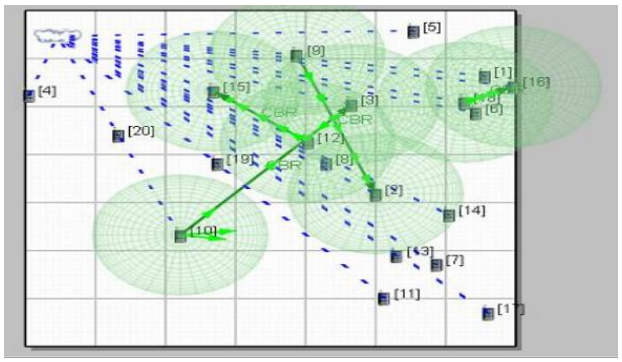

Fig. 2 Animation Views of CBR Scenarios

6. PERFORMANCE METRICS

Constant Bit Rate (CBR) [2, 6, 10, and 11] 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. To evaluate the performance of routing protocols, we used different quantitative metrics to compare the performance of AODV, DSR and ZRP routing protocol. They are First Packet sent (s), Last Packet sent (s), Total Bytes sent, Total Packet sent, Throughput client (bits/s), First Packet Received (s), Last Packet Received (s), Total Bytes Received, Throughput Server (bits/s).

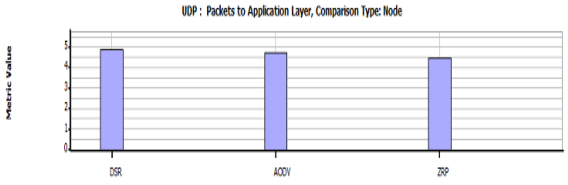

Fig. 3 UDP packet sent to application layer Vs routing protocol.

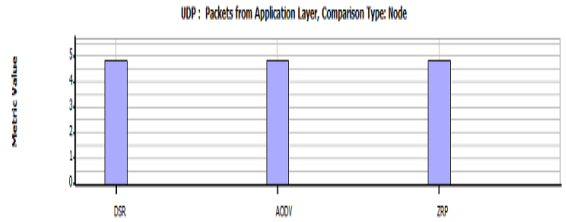

Fig. 4 UDP: packet received from application layer Vs routing protocol

In figure [3,4] (UDP) User Datagram Protocol (UDP) is a connection-less transport protocol that provides best-effort data transmission service in version of IPv4, IPv6 .A transport protocol provides end-to-end data transport services. It serves the Application Layer and allows multiple Application Layer sessions to be multiplexed on the transport services and TCP is a connection-based protocol and provides reliable data transmissions with congestion control and flow control. UDP is a simple, connection-less protocol. QualNet also implements another transport protocol, the Traffic Extension to Resource Reservation Protocol (RSVP-TE), which is a special protocol for distributing the labels for MPLS networks.

6.1 CBR CLIENT PERFORMANCE METRICS

- **First Packet sent (s):** Time when first packet was sending in seconds by Constant bit rate (CBR)
- **Last Packet sent (s):** Time when last packet was sending in seconds by Constant bit rate CBR
- **Total Bytes sent:** Total number of bytes sends
- **Total Packet sent:** Total number of packet was send
- **Throughput (bits/s):** Throughput at the client (bits/s)

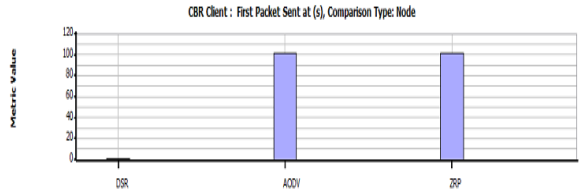

Fig. 5 First Packet sent (s) Vs routing Protocols

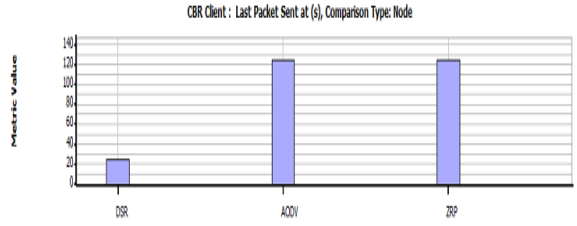

Fig.6 Last Packet sent (s) Vs routing Protocols

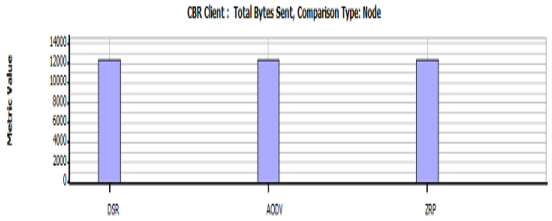

Fig. 7 Total Bytes sent Vs routing Protocols

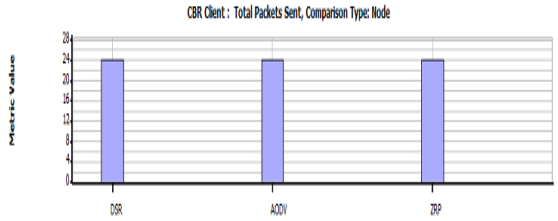

Fig. 8 Total Packet sent Vs routing Protocols

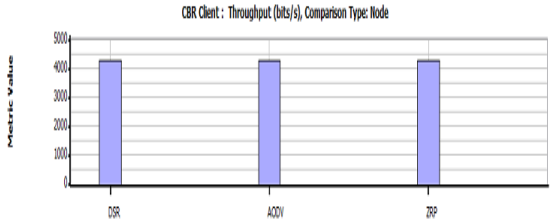

Fig. 9 Throughput (bits/s) Vs routing Protocols

6.2 CBR SERVER PERFORMANCE METRICS

- **First Packet Received (s):** Time when first packet was received in seconds by Constant bit rate CBR
- **Last Packet Received (s):** Time when last packet was received in seconds by Constant bit rate CBR
- **Total Bytes Received:** Total number of bytes received
- **Total Packet Received:** Total number of packet was received
- **Throughput (bits/s):** Throughput at the server (bits/s)

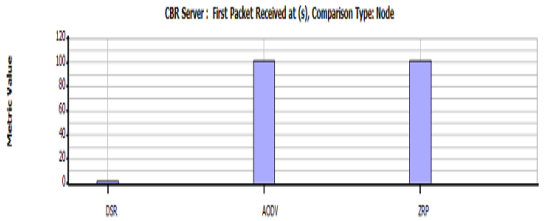

Fig. 10 First Packet Received at (s) Vs routing Protocols

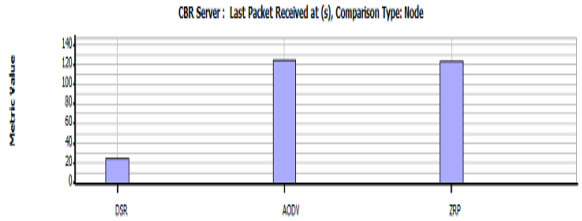

Fig. 11 Last Packet Received at (s) Vs routing Protocols

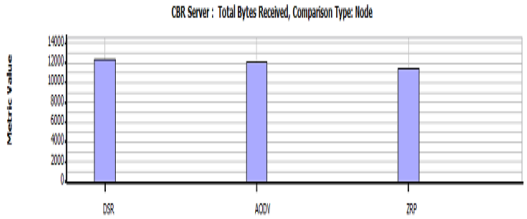

Fig.12 Total Bytes Received Vs routing Protocols

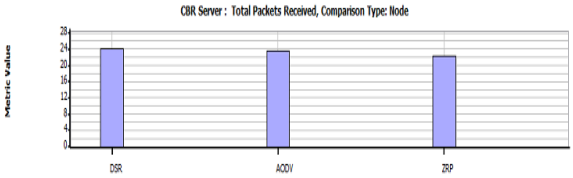

Fig. 13 Total Packets Received Vs routing Protocols

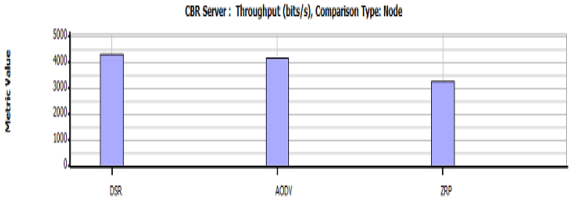

Fig. 14 Throughput (bits/s) Vs routing Protocols

7. CONCLUSION

In this paper, firstly discuss various category of routing protocol mainly three type routing protocol proactive, reactive, and hybrid routing protocol then we have simulate the performance comparative analysis based on constant bit rate (CBR) of three routing protocol AODV, DSR and ZRP in mobile ad hoc network (MANET). In this used various performance metrics First Packet sent (s), Last Packet sent (s), Total Bytes sent, Total Packet sent, Throughput client (bits/s), First Packet Received (s), Last Packet Received (s), Total Bytes Received, Throughput Server (bits/s) . These performance metrics given the better comparative performance at CBR (constant bit rate) using Qualnet simulation tools 5.0.2 in mobile ad hoc network (MANET).

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Jogendra Kumar received his B.E. degree in Computer Science & Engineering from H.N.B Garhwal University Shrinagar Uttarakhand (India) in 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). His research interest includes mobile ad hoc networks (MANET) and wireless sensor networks systems.

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