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Ad-hoc on Demand Distance Vector Protocol Analysis in Large & Small Scale MANET Scenarios

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Abstract- Mobile Ad-hoc network (MANET) is a self-configuring network formed with wireless links by a collection of mobile nodes without using any fixed infrastructure or centralized management. In November 2001 the MANET (Mobile Ad-hoc Networks) Working Group for routing of the IEFT community has published the first version of the AODV Routing Protocol (Ad hoc On Demand Distance Vector). AODV belongs to the class of Distance Vector Routing Protocols (DV). AODV is an 'on demand routing protocol' with small delay. That means that routes are only established when needed to reduce traffic overhead. AODV supports Unicast, Broadcast and Multicast without any further protocols. In this paper we present simulation analysis of the AODV Protocol comparing 45 & 25 nodes set up, with profile configuration and application configuration, mobility configuration & a server" using 'Opnet simulator'.

Index Terms: AODV Protocol, MANET SCENARIOS, OPNET Simulation.

I. INTRODUCTION

Ad-hoc On-Demand Distance Vector (AODV) routing protocol is a reactive routing protocol that creates a path between source and to destination only when required. Routes are not established until any node sends route discovery message that the node want to communicate or transmit data with other node in the network. Routing information is stored in source node and destination node, intermediate nodes dealing with data transmission. The AODV reactive routing protocol requests a route when needed and does not maintain a complete list of all possible routes. It supports the use of symmetric links and periodically transmits hello messages to discover and maintain links. In general, when a source node needs to establish a route to some destination node, it broadcasts a ROUTE REQUEST message to its neighbours.

This Approach reduces the memory overhead, minimization of the network resources, and runs well in high mobility scenario. The communication between nodes involves main three procedures known as path discovery, Path establishment and path maintenance. Three types of control messages are used to run the algorithm, i.e. Route Request (RREQ), Route Reply (RREP) and Route Error (RERR).

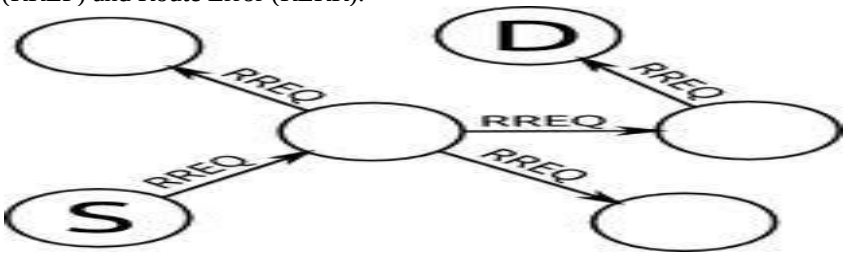
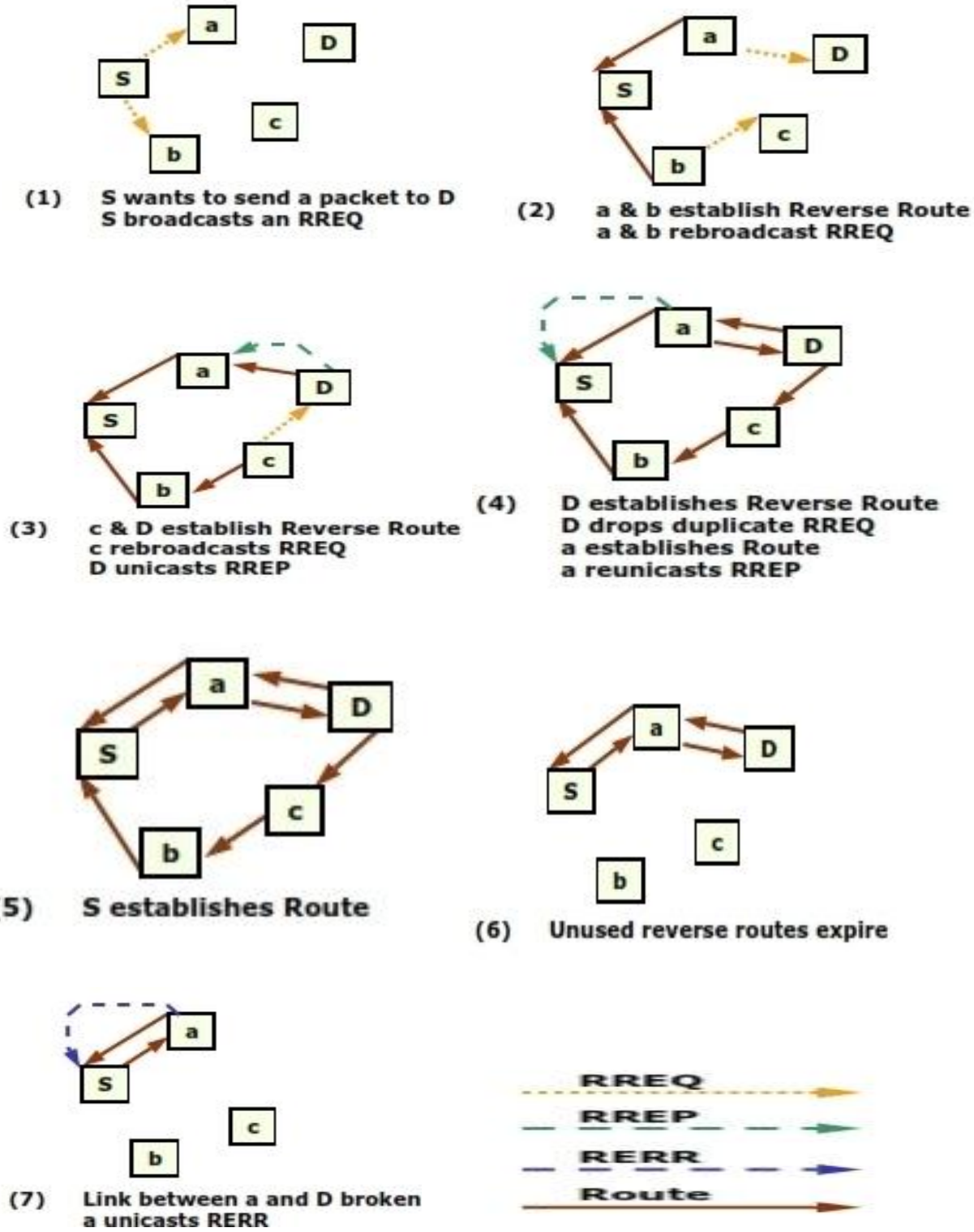


Fig 1: AODV packets routing pattern

When the source node wants to send some data t o the destination node, Source will issue the route discovery procedure. The source node will broadcast route request packets to all its accessible neighbours'. The intermediate node receiving request (RREQ) will check the request whether he is destination or not. If the intermediate node is the destination node, will reply with a route reply message (RREP). If not the destination node, the request will be forwarded to other neighbour nodes. Before forwarding the packet, each node stores the broadcast identifier and the node number from which the request came. Timer is used by the intermediate nodes to delete any entry when no reply is received for the request. The broadcast identifier, source ID are used to detect whether the node has received the route request message previously or not. It prevent from the redundant request receiving in same nodes. The source node may receive more in that case it will determine later which message will be selected on the basis of hop counts. When any link breaks down due to the node mobility, the node will invalidate the routing table. All destinations will become unreachable because of loss of the link. Then it will create a route error (RERR) message. The node sends the RERR upstream to the source node. When the source receives the Route reply message, it may reinitiate route discovery if it still requires the route.

II. AODV ROUTE ESTABLISHMENT PATTERN



It is a reactive routing protocol, meaning that it establishes a route to a destination only on demand. In contrast, the most common routing protocols of the Internet are proactive, meaning they find routing paths independently of the usage of the paths. AODV is, as the name indicates, a distance-vector routing protocol. AODV avoids the counting-to-infinity problem of other distance-vector protocols by using sequence numbers on route updates, a technique pioneered by DSDV. AODV is capable of both unicast and multicast routing.

III. ANALYZING MANET PERFORMANCE OVER AODV PROTOCOL

This research analysis is carried out by using discrete event simulation software "operational network evaluation tool" this is the most extensively used simulator based on Microsoft windows platform by which most of routing parameters can be analyzed when compared to other commercial simulators available. Here the network setup done for analyzing

AODV protocol for two different large & small scenarios are as follows "wireless server, profile configuration, application configuration, mobility configuration and two different set of workstations i.e. (45 nodes large scenario & 25 nodes small scenario).the parameters which has been used are as follows.

Simulation parameter	Value
Simulator	OPNET 14.5
Area	900X900 (m)
Network size	45 nodes large scale, 25 nodes small scale
Mobility Model	Random way point
Traffic Type	FTP Comparison
Simulation Time	300 sec
Address Mode	Auto assigned ipv4 to all.
Packet Reception power threshold	-95

IV. EXPERIMENTAL PERFORMANCE METRICS

We have analyzed the performance of an AODV protocol by two different setups of 45 large nodes & 25 small nodes to evaluate the traffic parameter in presence of source & destination on same distance for both scenarios. Initially we carried out first scenario as fewer nodes, as they have been configured in first scenario & larger nodes have been configured in second scenario. Here we have assigned ip address for source & destination nodes, the remaining nodes have auto IP addressing assignment individually.

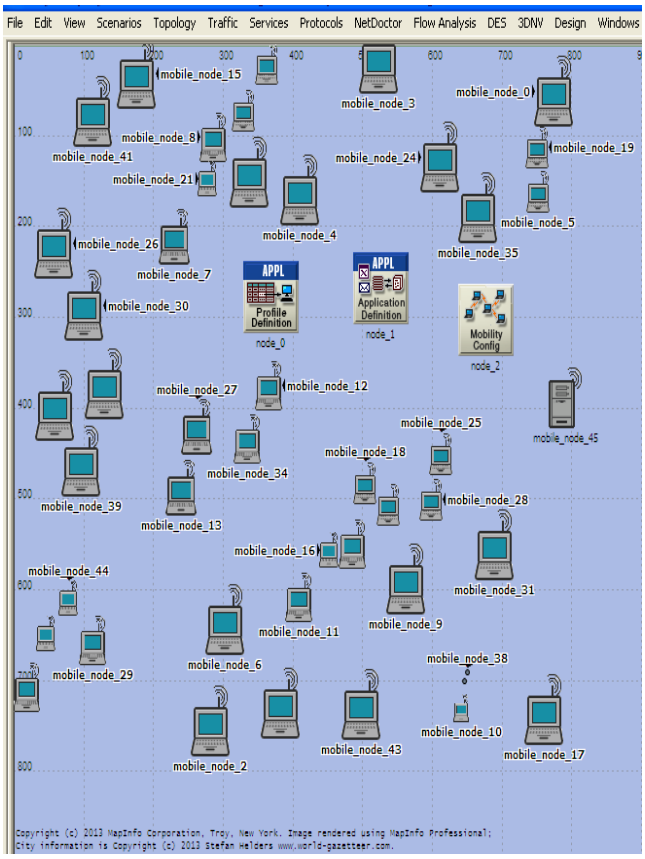


Fig 3: Scenario having 45 nodes (MANET workstations)

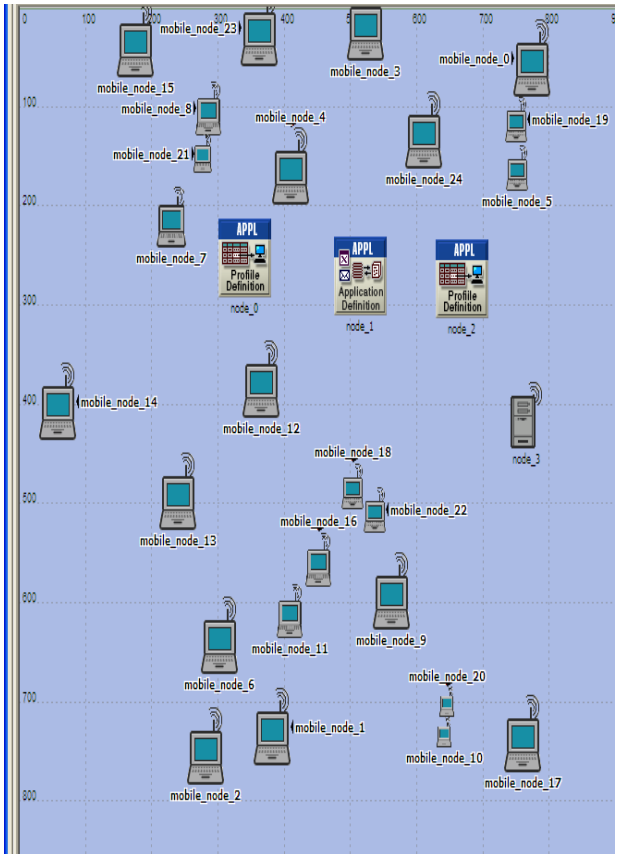


Fig 4: Scenario having 25 nodes (MANET workstations)

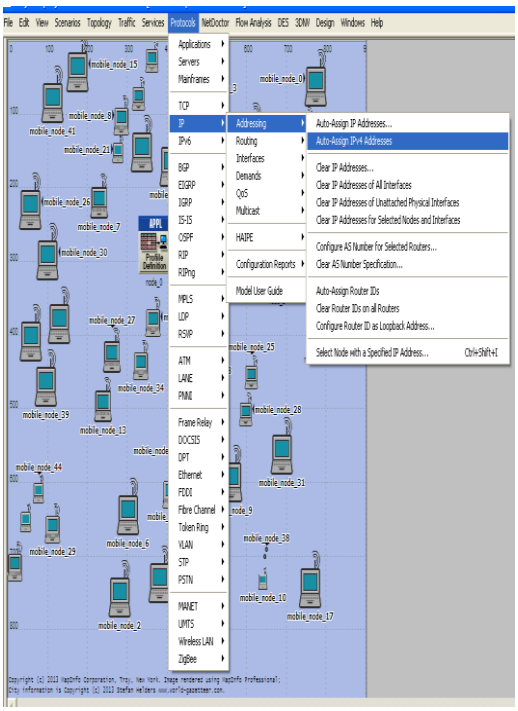


Fig 5: Auto assigning IPV4 addressing to all working nodes

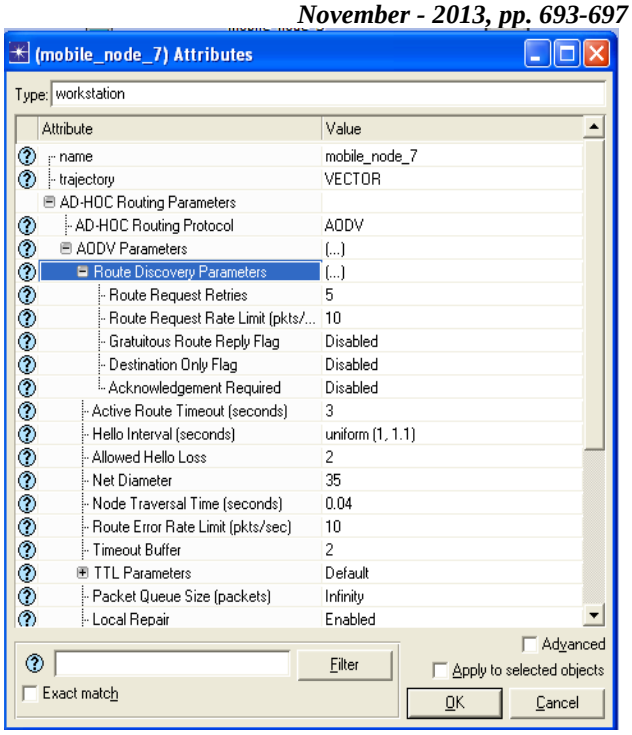


Fig 6: Attributes of given mobile nodes for both (45 & 25) large and small scale MANET scenarios.

Mobile node attributes & server node attributes are meant for setting up different attribute values which will be helpful, guides & operates the workstations & server as per the attribute settings assign to a given list of work stations & server.

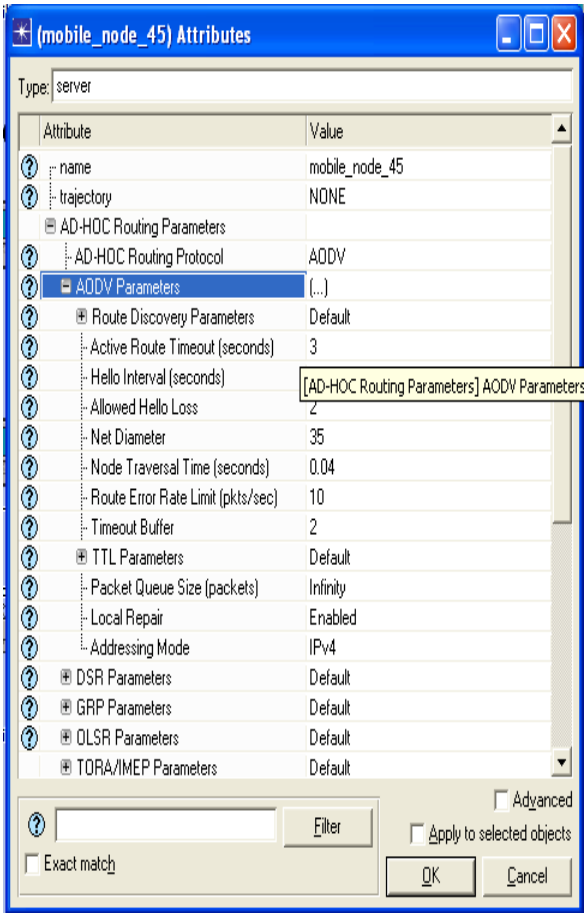


Fig 7: Attributes of a given MANET Server node

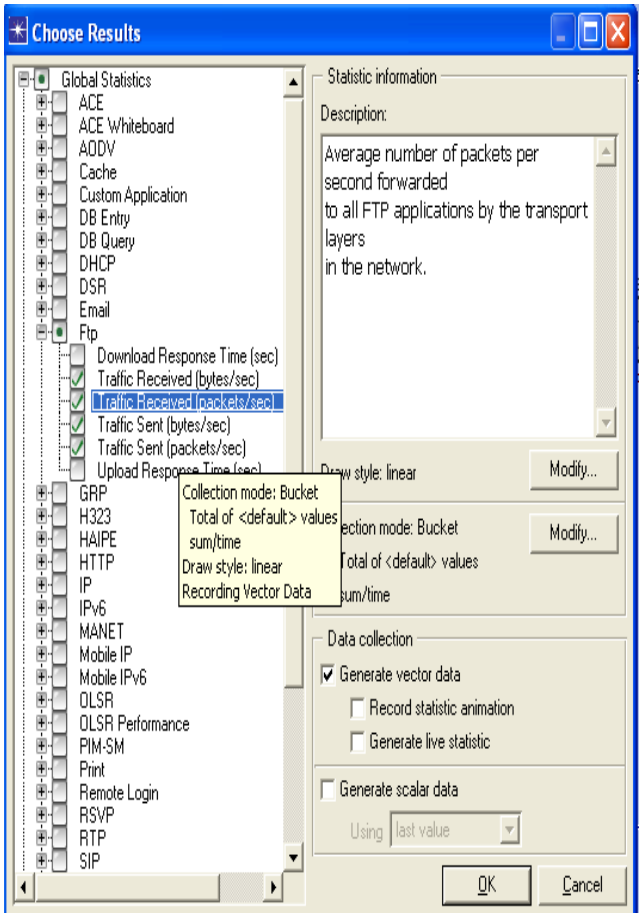


Fig 8: Results statistical selection with respect to

File Transfer Protocol.

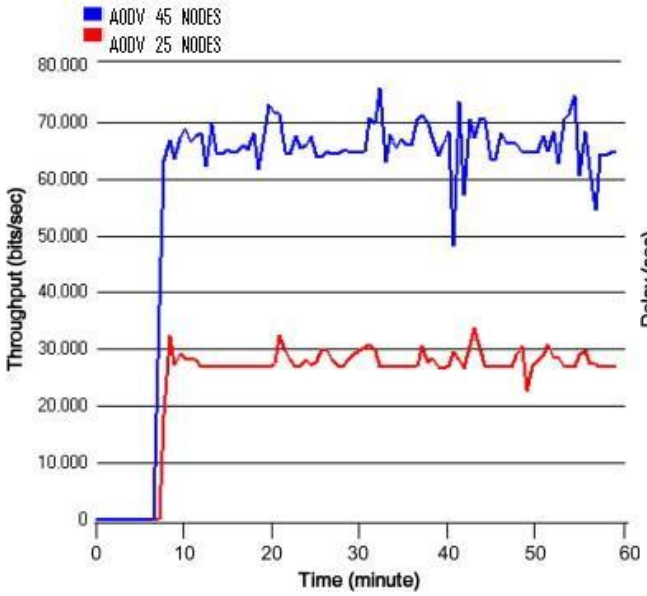


Fig 9: Comparing the throughput of "45&25" MANET nodes scenarios

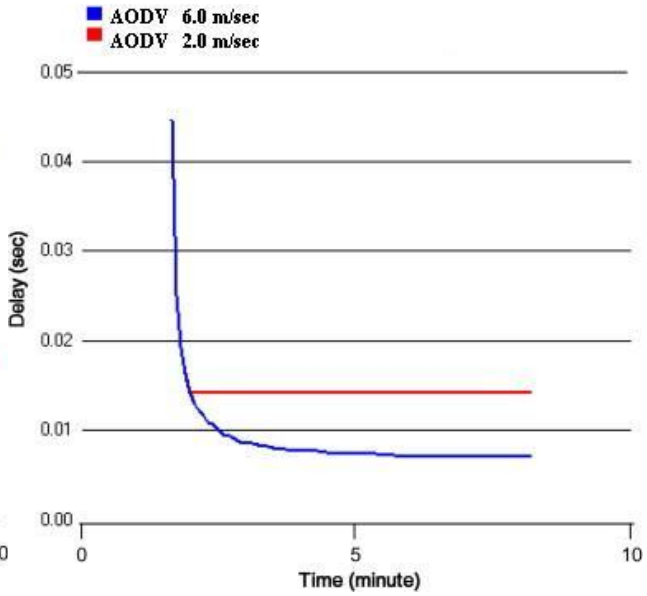


Fig 10: Comparison result in the delay of packet transfer

Here in Fig (9) shows the throughput comparison of two different networks with capacity of 45 nodes & 25 nodes each, here its clear that throughput of larger nodes is more then that of lesser nodes (25-nodes) with respect to simulation parameters stated. Here in Fig (10), result states that the delay in data transmission gets increase as there is an increase in nodes i.e. (6.0 m/sec data delay is for AODV protocol with 45 nodes & 2.0 m/sec data delay is for 25 nodes AODV configured network) which in deed increases the traffic of a given network. Lesser nodes generates less delay for data transmission in an AODV routing Protocol when compared to the scenario with large number of nodes when specified and conducted via file transfer protocol for a given compared scenario.

V. CONCLUSION

In this paper the performance of AODV routing Protocol is made under a given traffic load on FTP, node mobility is of 10m/sec, The simulated result of two different scenarios with 45 nodes & 25 nodes network setup by implementing AODV protocol in an "OPNET" which is a network simulation tool and here we conclude that with lesser node size AODV gives impressive results in delay metrics but for throughput and routing loads, AODV performs well for larger nodes network size as the performance results itself speaks about it. As the through put is considerable good using AODV protocol for large scenarios.

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