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RESEARCH ARTICLE

Different QoS Based Simulation Evaluation of AODV Protocol Using Direct Sequence for 1 Mbps and 11 Mbps Using OPNET

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Abstract— Mobile Ad-Hoc network (MANET) is a network of mobile nodes that can communicate with each other without using any centralized control or fixed infrastructure .In this paper analysis of the performance of AODV routing protocol is done with the use of OPNET simulation tool, we created a 27 mobile nodes networks on data rate 1 and 11 Mbps and transmission power 0.005 watts with buffer size 256000 bits the time of simulation was 1200 sec. AODV routing protocol is compared in terms of AODV Route Discovery time, FTP Download Response Time(sec), HTTP Object Response Time (sec), WLAN Delay (sec) and AODV Total Cached Replies Sent in scenario for the simulation analysis and performances. According to the resulted performance AODV performed better in 11 Mbps then 1 Mbps. The simulation result of the research has practical reference value for further study.

Keywords— AODV, MANET, QOS, OPNET

I. INTRODUCTION

The Ad hoc On-Demand Distance Vector (AODV) algorithm enables dynamic, self-starting, multi-hop routing between participating mobile nodes wishing to establish and maintain an ad hoc network. It is a relative of the Bellman-Ford distant vector algorithm, but is adapted to work in a mobile environment. In AODV, every node maintains a table, containing information about which neighbor to send the packets to in order to reach the destination. MANET is a dynamic distributed network. Due to the dynamic nature the network topology keep changes randomly. AODV allows mobile nodes to respond to link breakages and changes in network topology in a timely manner. The success of communication depends on cooperation of other nodes. [1]

Routing protocol is the major issue in data communication's performance of MANET. Hence, routing protocol required is to be effective and accurate so as to handle mobility of nodes and to give best utilization to technology. In this paper performance of AODV protocol is evaluated by using FTP and HTTP application type of IEEE 802.11a/b/g WLAN Standard. [2]

II. RELATED WORK

Sandeep Kaur [1] Mobile Ad hoc network is concept of communication that mobiles nodes want to communicate using dynamic topology. The important characteristics of having dynamic topology is node can change position quite frequently. Nodes consists laptops and personal digital assistants and are often very limited in resources like CPU capacity, storage capacity, battery lifetime and bandwidth. The routing protocol should minimize the control traffic and calculate route only when they receive request. In this paper they present simulation analysis of the AODV Protocol consider two networks one having smaller nodes and other having larger nodes.

Anjali [2] analyzed the performance of AODV, OLSR and GRP routing protocols is evaluated for FTP based application traffic on IEEE 802.11 WLAN Standard and 48 Mbps data rate. The network performance is evaluated by using OPNET simulator based on various quantitative metrics- Network Load, Throughput, Retransmission Attempts and Media Access Delay by varying physical characteristics and number of nodes. A comparative performance analysis of these protocols have been carried out in this paper and in the last conclusion will be presented which demonstrate that performance of routing protocols differs by varying the network and selection of accurate routing protocol according to the network ultimately influences the efficiency of the network in a magnificent way.

Ravinder Ahuja [4] evaluated performance of three types of routing protocols (AODV, OLSR and ZRP) based on random waypoint mobility model. In this paper they analyze and compare the performance of protocols using Qualnet 4.5 from scalable network .These routing protocols were compared in terms of Packet delivery ratio, Average end-to end delay and Throughput when subjected to change in no. of nodes and pause time. Simulation results show that Reactive protocols better in terms of packet delivery ratio and throughput

III. MANET ROUTING PROTOCOLS

In a wireless network, simultaneous packet transmission by nearby nodes is often undesirable. This is because any resulting collision between these packets may cause a receiving node to fail to receive some or all of these packets. The vision of mobile ad hoc networking is to support robust and efficient operation in mobile wireless networks by incorporating routing functionality into mobile nodes. Such networks are envisioned to have dynamic, sometimes rapidly-changing, random, multi-hop topologies which are likely composed of relatively bandwidth-constrained wireless links. A number of routing protocols are created to be implemented on MANET categorized in three different types according to the functionality. Here in this paper we are discussing about AODV protocol which comes under the Reactive Protocols category.[5]

Reactive routing protocols do not make the nodes initiate a route discovery process until a route to a destination is required. This leads to higher latency but lower overhead. Reactive Protocols are bandwidth efficient. Route is determined when a path is required by a node to forward packets. Therefore, overhead routing is decreased because search for the route is not required on which packet is not sent. [6]

AODV is an on-demand routing algorithm in that it determines a route to a destination only when a node wants to send a packet to that destination. Routes are maintained as long as they are needed by the source. AODV is capable of both unicast and multicast routing. [8]

IV. **SIMULATION SETUP**

We used software known as OPNET Modeler to conduct this work, Which is a tool provided by the OPNET Technologies in order to undertake the experimental evaluation; the version named OPNET Modeler 14.5 has been adopted for study [7]. OPNET is one of the most extensively used commercial simulators based on Microsoft Windows platform, which incorporates most of the MANET routing parameters compared to other commercial simulators. It simulates the network graphically and gives the graphical structure of actual networks and network components.

TABLE I
SIMULATION PARAMETERS

Simulation Parameter	**Value**
Simulator	OPNET Modular 14.5
Area	1200*1200
Network Size	27 Nodes
Data Rate	1, 11 Mbps
Mobility Model	Random waypoint
Traffic Type	FTP, HTTP
Simulation Time	1200 sec
Address Mode	IPV4
Standard	IEEE 802.11 Direct Sequence
Routing Protocol	AODV

TABLE II
AODV PARAMETERS

Attribute	**Value**
Hello Interval(sec)	Uniform(1,1.1)
Allowed Hello Loss	1
Net Diameter	28
Node Traversal Time(sec)	0.04
Route Error Rate Limit (pkts/sec)	5
Timeout Buffer	2
TTL Increment	2
TTL Threshold	7
Local Add TTL	2
Packet Queue Size (Packets)	Infinity
Local Repair	Enabled
Addressing Mode	IPV4

TABLE III
WIRELESS LAN PARAMETERS

Attribute	Value
Physical Characteristics	Direct Sequence
Data Rate	1,11 Mbps
Short Retry Limit	7
Long Retry Limit	4
Max Receive Lifetime (sec)	0.5
Buffer Size(bits)	256000
Roaming Capability	Disabled

Fig. 1 shows the simulation environment of scenario containing 27 WLAN mobile nodes, one fixed WLAN Server, Application definition, Profile definition and Mobility config. We configured the nodes in the scenario to work with 1 Mbps and 11 Mbps data rate.

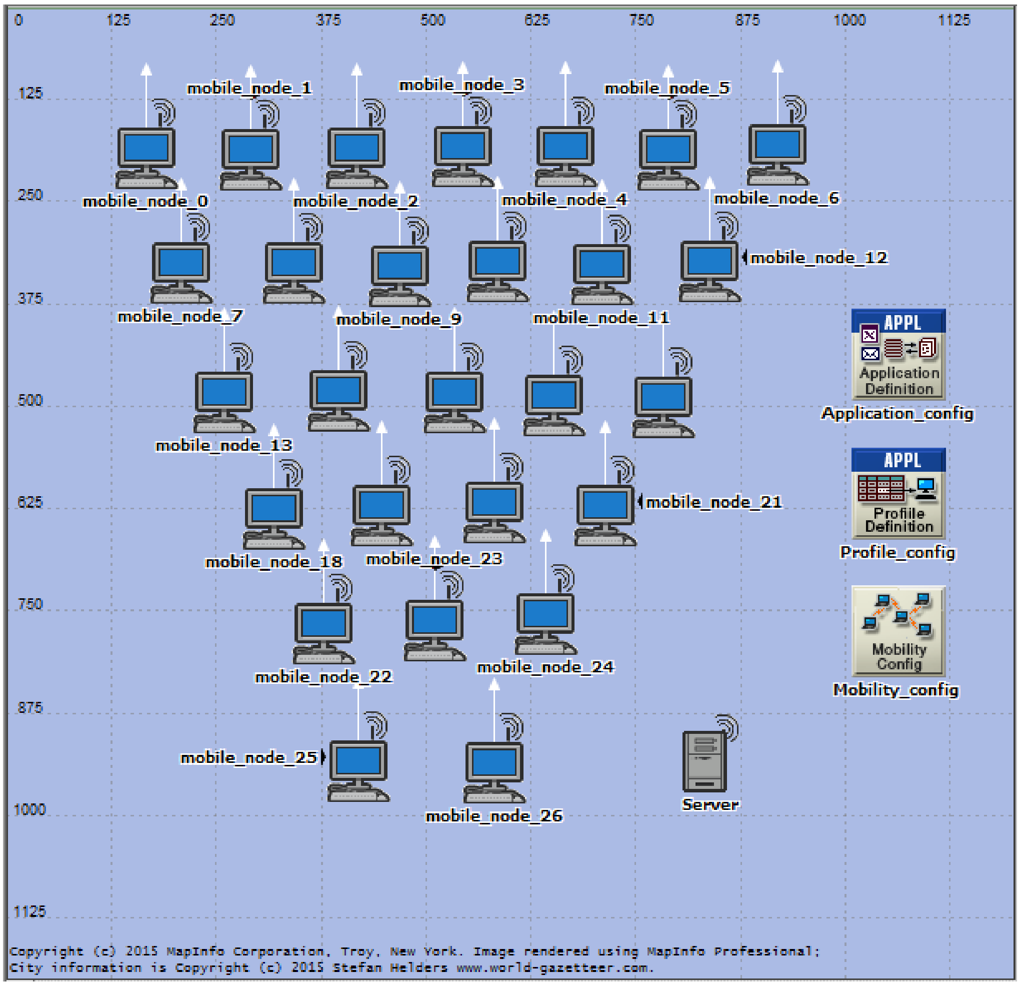

Fig. 1 Network Model for 27 Nodes scenario

V. PERFORMANCE METRICS

A. AODV Route Discovery time

This is how we can check the AODV Route Discovery time i.e. the time taken to find out the route for the process.

B. FTP Download Response Time(sec)

Time elapsed between sending a request and receiving the response packet. Measured from the time a client application sends a request to the server to the time it receives a response packet. Every response packet sent from a server to an FTP application is included in this statistic.

C. HTTP Object Response Time (sec)

Time elapsed between sending a request and receiving the response packet. Measured from the time a client application sends a request to the server to the time it receives a response packet. Every response packet sent from a server to an HTTP application is included in this statistic.

D. WLAN Delay (sec)

It is the time taken by a packet from the movement it is transmitted on the network by source node to reach the destination node.

E. AODV Total Cached Replies Sent

This is how we can check the AODV Total Cached Replies Sent i.e. the cached replies sent from throughout the process.

VI. SIMULATION RESULTS AND ANALYSIS

Figure (2 - 6) below shows AODV Route Discovery time, FTP Download Response Time(sec), HTTP Object Response Time (sec), WLAN Delay (sec) and AODV Total Cached Replies Sent in 27 mobile nodes scenario for IEEE 802.11 standard at 1 Mbps and 11 MBPS data rate with OLSR. The color scheme is showing the protocols behavior in different graphs which gives the average values. From these average values we will conclude the behavior of all these routing protocols.

A. AODV Route Discovery time

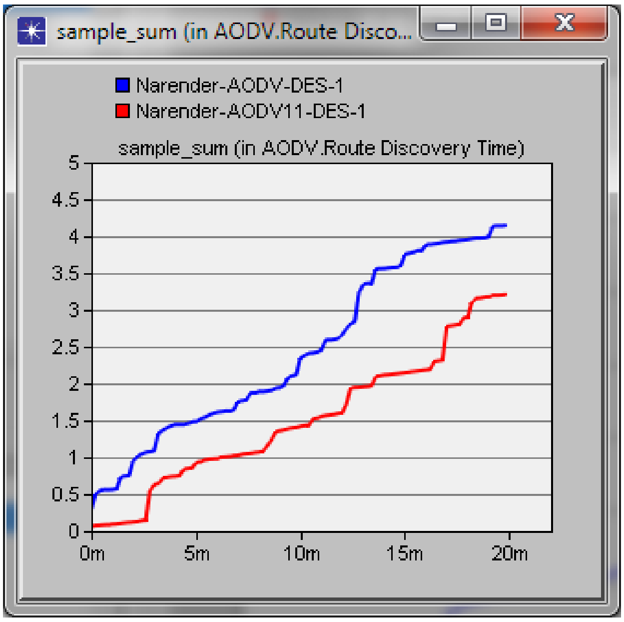

Fig. 2 Sample Sum for *AODV Route Discovery time* in 1 and 11 Mbps

According to simulation, as we can see in Fig. 2, AODV have performed better for 11 Mbps than 1 Mbps.

B. FTP Download Response Time (sec)

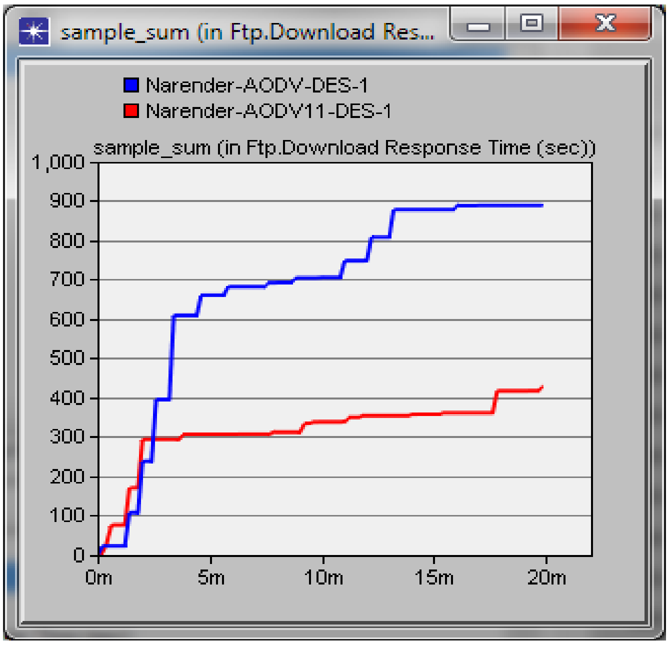

Fig. 3 Sample Sum for *FTP Download Response Time (sec)* for AODV in 1 and 11 Mbps

According to simulation, as we can see in Fig. 3, FTP Download Response time in AODV 1Mbps is higher than 11 Mbps hence we can say that AODV performed better for 11 Mbps than 1 Mbps.

C. HTTP Object Response Time (sec)

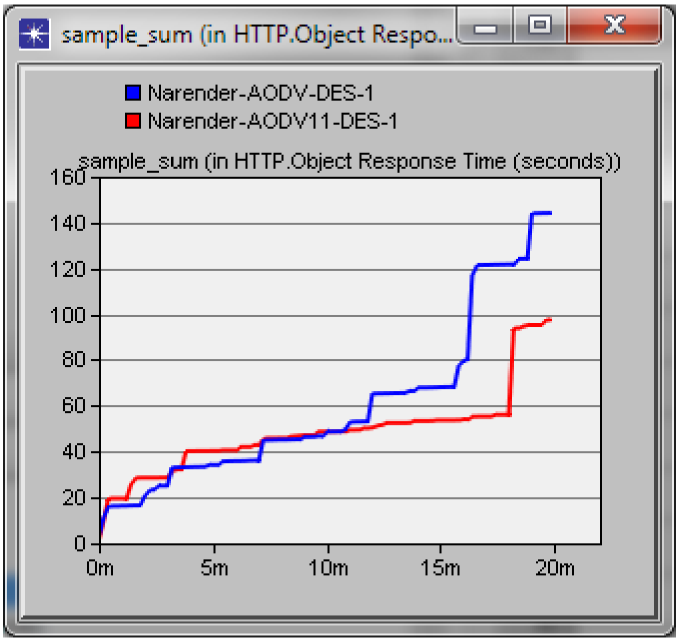

Fig. 4 Sample Sum for *HTTP Object Response Time (sec)* for AODV in 1 and 11 Mbps

According to simulation, as we can see in Fig. 4, HTTP Object Response time in AODV is higher in 1 Mbps than 11 Mbps.

D. WLAN Delay (Sec)

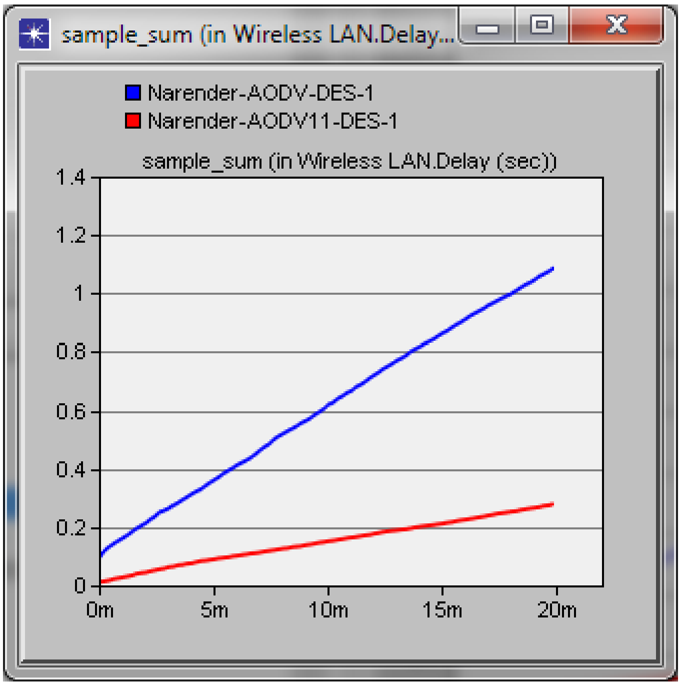

Fig. 5 Sample Sum for Wireless LAN Delay for AODV in 1 and 11 Mbps

According to simulation, as we can see in Fig. 5, Wireless LAN Delay in AODV for 1 Mbps is higher than AODV 11 Mbps. Hence here also AODV have performed better than 1 Mbps in 11 Mbps.

E. AODV Total Cached Replies Sent

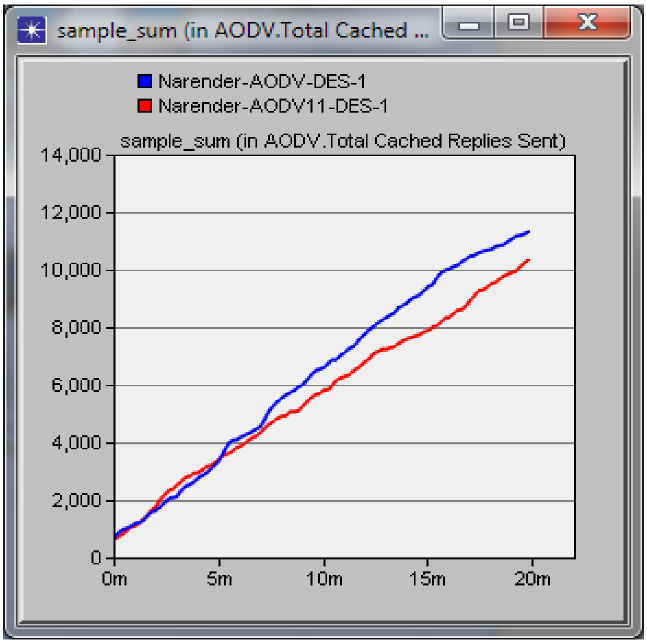

Fig. 6 Sample Sum for *AODV Total Cached Replies Sent* in 1 and 11 Mbps

According to simulation, as we can see in Fig. 6, Total cached replies sent in 1 Mbps are higher than 11 Mbps.

VII. **CONCLUSION**

In this paper performance of AODV is evaluated for metrics like Route Discovery time, FTP Download Response Time (sec), HTTP Object Response Time (sec), WLAN Delay (sec) and AODV Total Cached Replies Sent by using 27 nodes scenario with IEEE 802.11 Direct Sequence WLAN Standard in 1 Mbps and 11 Mbps. From the above discussion we find out that AODV performs better in all above terms for 11 Mbps then 1 Mbps.

TABLE 5
RESULTING VALUES

S. No.	**Performance Metrics**	**AODV (1 Mbps)**	**AODV (11 Mbps)**
1	Route Discovery time	More	Less
2	Download Response Time	More	Less
3	Object Response Time	More	Less
4	WLAN Delay	More	Less
5	Total Cached Replies Sent	More	Less

As from the table it is clear that AODV works better in 11 Mbps data rate than 1 Mbps data rate. The simulation result of the research has practical reference value for further study.

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