*IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)*
*e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 10, Issue 3, Ver. II (May - Jun.2015), PP 25-31*
*www.iosrjournals.org*

# Effect of Node Density on Different Routing Protocols under Ftp and Http Applications

Abida Parveen, Paramjit Singh, Amandeep Kaur
[123] *GIMET, ASR*

***Abstract*:** *the demands of wireless networks are increasing due to extensively availability and portability of wireless mobile devices like smart phones, laptops, personal digital assistant and tablet computers, provides internet connectivity to people at any location. The topology of ad-hoc networks is uncertain and unpredictable because of its dynamic nature. In MANET, energy-constrained nodes and clear line of defense make routing a challenging task. The main aim of this paper is to evaluate and compare the QoS parameters of different routing protocols to choose the best routing protocol under FTP and HTTP application. In this paper, we have done the analyses of node density on various routing protocols under FTP and HTTP.*

***Keywords:*** *MANET, Routing Protocol, AODV, DSR, GRP, OLSR, FTP, HTTP, QoS parameters*

## I. Introduction

In twentieth century, mobile ad-hoc networks have become predominant and hot research area in industrial and academic research project due to its autonomous characteristics. The demands of wireless networks are increasing due to extensively availability and portability of wireless mobile devices like smart phones, laptops, personal digital assistant and tablet computers, provides internet connectivity to people at any location [13]. The wireless networks have categorized into cellular and ad-hoc networks: Cellular networks required well built pre-existing infrastructure like base-station. In this network, mobile devices communicate with the nearest base-station in its vicinity and hand-off process occurs when a mobile unit moves out of reach from one base-station to another. Another type of wireless networks is an ad-hoc network, do not require any rugged pre-existing infrastructure [10] and is defined as collection of self-maintaining and self-configuring mobile nodes, without centralized administration. Mobile nodes functions both as a router as well as host to forward the data wirelessly. Ad-hoc networks may be static or dynamic depending on the mobility of nodes. In static ad-hoc networks, mobility of nodes is either very small or disabled and is mostly used in wireless sensor networks. While as, in dynamic ad-hoc networks nodes are dynamic in nature. The topology of ad-hoc networks is uncertain and unpredictable. Mobile nodes are free to join any network within its vicinity. MANET finds its applications in emergency and rescue operations, in education to conduct guest lectures, commercial sectors, and military battlefields. The most prominent issue in MANET is breakage and regeneration of link at certain state because of a dynamic nature of its mobile nodes [6].

Routing protocols plays a significant role in the ad-hoc networks to forward packets from one host to another wirelessly. In MANET, routing protocols have categorized into proactive, reactive and hybrid routing protocols as shown below in figure1. In the proactive protocols, routes are predefined and maintain a routing table to keep up-to-date information about the whole network [9]. While in reactive protocols, routes between source and destination nodes are established on the on-demand basis. While as hybrid protocols possess the characteristics of both the reactive and proactive protocols to reduce latency and routing overhead, respectively. The most challenging task in MANET is to provide energy efficient routing protocol because mobile nodes in it are energy constrained. Thus, the main objective of this paper is to evaluate and compare the QoS performance metrics of different routing protocols with varying node density under FTP and HTTP applications [10].

In this paper, we have discussed routing protocols, simulation set-up and result analyzes under section II, III and IV respectively. Finally, the conclusion has discussed in section V.

## II. Routing Protocol

The mobile node determines its topology by listening from the neighboring nodes because nodes do not know the network topology when they are free to join or leave the network. The main purpose of the routing protocols is to provide an energy efficient route between the nodes for the successful delivery of packets. In ad-hoc networks, different routing protocols have deployed to forward the packets between the nodes. The classification of routing protocols is shown below in figure1.

### i) Proactive Routing Protocol

It is a category of routing protocols that maintains the routing table to keep up to date routing information about the destination nodes. Thus, it is called as the table-driven routing protocol. These protocols

are not bandwidth efficient as routes are predefined and periodically update its routing table even if there is no traffic data on the network. These protocols have high routing overhead.

Optimized Link State Routing (OLSR): It is a proactive, table-driven routing protocol in which routes are always available to exchange information between nodes without any delay. HELLO packets and Topology Control messages provide topology information of nodes being used by the network to discover the neighboring nodes [12]. Each node keeps a list of multipoint relays (MPRs) which are selected by forwarding HELLO message in between neighboring nodes. MPRs are responsible for exchanging the topology information to broadcast the Topology Control (TC) messages throughout the network. Each node uses its updated routing table to forward and deliver the packets. In order to know the link state of a node, nodes send HELLO packet periodically at predetermined intervals to the neighbor nodes. For example, if Node 1 sent HELLO packets to the neighbor Node 2 and Node 2 receives the message successfully, and then it is called asymmetric link. If both the nodes communicate each other simultaneously, then a link is called symmetric. The symmetric HELLO message is sent to the neighbors after the regular time interval to detect the links and identity of the neighboring node.

**ii) Reactive Routing Protocol**

In reactive routing protocol, the path is established on the on-demand basis when source node has to send data to the destination node. The source node broadcasts a route request (RREQ) to its neighboring nodes to initiate the route discovery phase. The connection established between the source and destination node is maintained until the route is not required or until its destination node becomes out of reach from the source.

**a) Ad-hoc On Demand Vector (AODV):** AODV is a reactive routing protocol in which the source node initiates the route discovery process only whenever needed to deliver the packets between the nodes [2]. It broadcasts route request (RREQ) message to intermediate nodes to discover the path for transmitting the packets between the source and destination [7]. Intermediate nodes check the routing table to find next hop and if the current node is the destination node, it disseminate route reply (RREP) message to the source node to establish a connection between the source and destination.

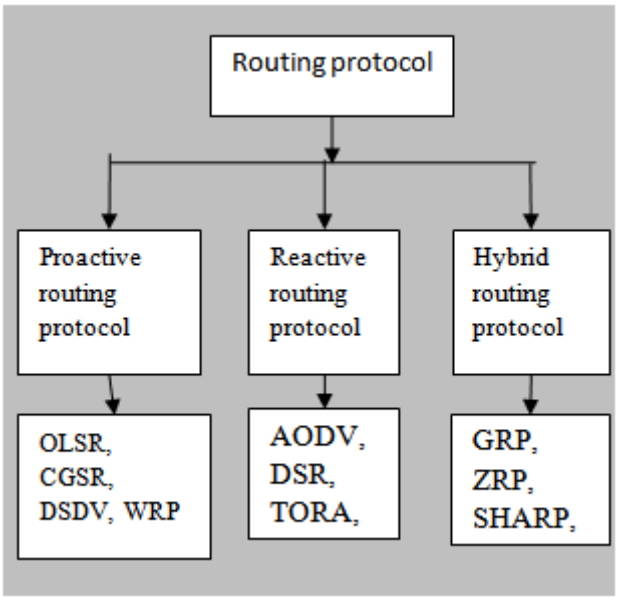


**Figure1:** Classification of Routing Protocols

**b) Dynamic State Routing (DSR):** DSR is source initiated on-demand routing protocol in which routes are determined by source node only for packet transmission [2]. It consists of route discovery and route maintenance phases. During route discovery phase, source node first checks the existence of route in the route cache and if route already exists, it send the packets through this route otherwise it initiates the route discovery process by sending route request (RREQ) message [4]. When the destination receives the route request (RREQ), it generates and broadcasts route reply (RREP) message to the source node. During route maintenance phase, route error packet is generated whenever any error occurs while transmitting the packets.

**c) Temporally-Ordered routing Protocol (TORA):** It is based on the principle of link reversal routing algorithm which enhances the adaptability and scalability of the network. In TORA, link directions are assigned by DAG in an undirected network rooted at destination, used to control the rapidly changing topology of the network [7]. TORA consists of three phases: route discovery, route maintenance and route erasure. Routes are

discovered by disseminating the query (QRY) packet throughout the network until it reaches the destination. When the destination nodes receive the query (QRY) packets, it broadcasts an update (UPD) packets which contain a height of the destination [5]. Each node receives UPD packet and sets its height higher than the height of UPD packet, and broadcasts its own UPD packet until it reaches the source node. Each node is provided with synchronized clock for maintaining the time factor of a height parameter. When the link failure is detected by any node Clear (CLR) packets are broadcasted to erasure that link and reset routing over the ad-hoc network.

**iii) Hybrid Routing Protocols (HRP)**

HRP possesses the features of both proactive and reactive protocols in order to enhance the performance of routing protocols in the network. It reduces delay and routing over-head of reactive and proactive protocols respectively. It is bandwidth efficient routing protocol. It includes zone-based routing protocol (ZRP), zone based hierarchical link state (ZHLS) routing protocol and gathering based routing protocol (GRP).

Gathering Based Routing Protocol (GRP): GRP is source initialized routing protocol in which routing path is created by source node by sending destination query (DQ) packet towards the destination node and when destination receives DQ packet, it broadcasts network information gathering (NIG) packets that contain entire information about the network [8]. NIG packets are disseminated by routers throughout the network until source node receives these packets. The main advantage of this protocol is that it reduces routing overhead and latency delay.

## III. Simulation Setup

We have created and explored many MANET scenarios by employing different routing protocols with varying node density (20, 40, 60, 80, 100,110, 120, and 130) under FTP and HTTP application within the simulation area of 1000m*1000m, using OPNET as shown below in figure2 [14]. Different routing protocols have been employed to evaluate the QoS performance parameters in terms of throughput, delay, and network load and packet delivery ratio, to choose the best routing protocol suitable for FTP and HTTP applications. Different MANET scenarios are simulated for 1000 sim seconds and implemented random waypoint mobility model with the mobility of 500m [1]. The 802.11b protocol have deployed for each mobile node with a buffer size of 256kbits at a data rate of 11kbps. The traffic under FTP and HTTP load is set to heavy load and heavy browsing respectively. The simulation parameters are shown below in tableI:

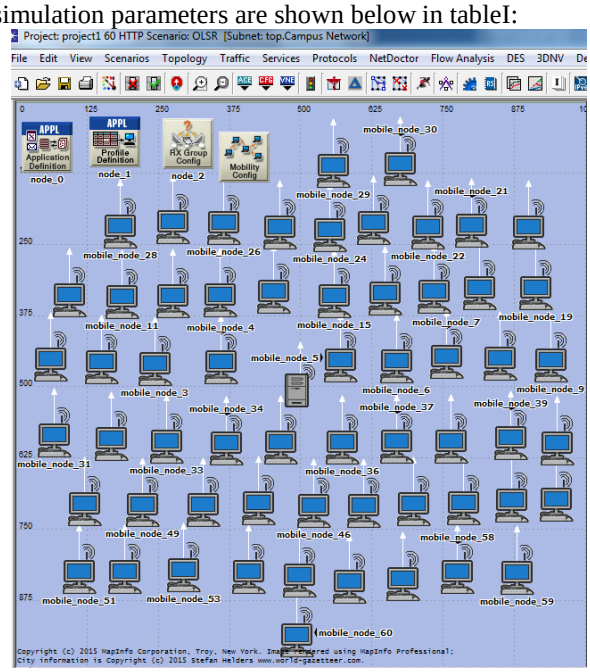


**Figure2:** MANET using OPNET

**Table 1:** Simulation Parameters

| Simulation Parameters | Value |
|---|---|
| Campus area | 1000m*1000m |
| No. of nodes | 20, 40, 60, 80, 100, 110, 120, 130 |
| Simulation Time | 1000 sim seconds |
| Routing Protocols | AODV, DSR, GRP, OLSR |
| Mobility Model | Random WayPoint mobility model |
| MAC Protocol | 802.11b |
| Data Rate | 11mbps |
| Traffic | FTP (Heavy Load), HTTP (Heavy Browsing) |

## IV. Result Analysis

We have created and designed different scenarios by employing reactive, proactive and hybrid routing protocols with varying node density within the simulation area of 1000m*1000m to analyze the QoS parameters in terms of delay, throughput, and network load and packet delivery ratio for the simulation time of 1000 seconds [5]. In this paper, QoS parameters are evaluated to scrutinize the results of varying node density on routing protocols being implemented. First of all, we evaluated and compared the throughput of different routing protocols as a function of node density under FTP and HTTP shown below in figures3 and 4, respectively [11]. Reliability and accuracy of routing protocols are measured by calculating the throughput of routing protocols, defined as how many data packets are received by destination per second. Figure3 shown below clearly depicts that OLSR have highest value of average throughput followed by AODV, GRP, and DSR respectively under FTP application. Thus, we concluded that OLSR outperforms than AODV, GRP, and DSR. The average value of throughput under HTTP application is shown below in figure4 where the horizontal axis represents number of nodes and vertical axis throughput in bits/sec. From the graph shown below in figure4 depicts that OLSR outperforms than AODV, GRP, and DSR [3]. From the result analyzes, we concluded that OLSR performs better in terms of throughput followed by AODV, GRP, and DSR under FTP and HTTP.

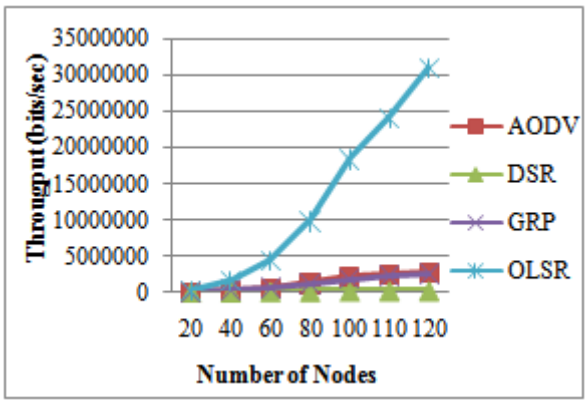


**Figure3:** Throughput under FTP

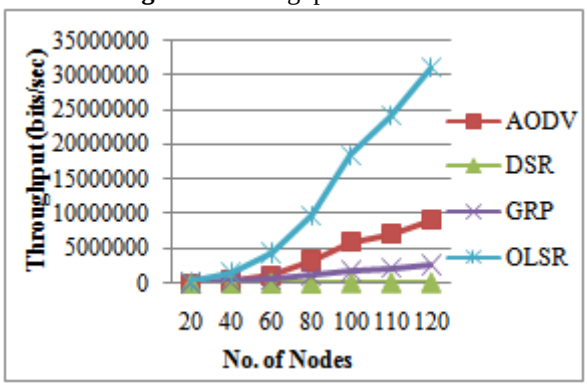


**Figure4:** Throughput under HTTP

Another QoS parameter we have evaluated and compared the delay of different routing protocols as a function of node density under FTP and HTTP is shown below in figures5 and 6, respectively. The average value of delay under FTP application is shown below in figure5 where the horizontal axis represents number of nodes and vertical axis delay in seconds. From the graph shown in figure5 depicts that OLSR protocol has least

delay followed by GRP, AODV, and DSR respectively. The average value of delay under HTTP application is shown below in figure6. From the graph shown below in figure6 depicts that OLSR outperforms than GRP, DSR, and AODV. Under HTTP application, the average value of delay for AODV is less for lower node density and increases when node density is medium than DSR protocol. While as, the average delay in OLSR is least followed by GRP under both FTP and HTTP applications. From the result analyzes, OLSR outperforms better in terms of delay followed by GRP, DSR and AODV under FTP and HTTP applications because routes are predefined and updated routing after the regular time interval.

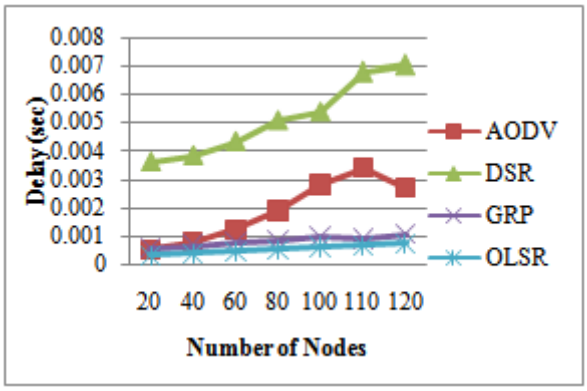


**Figure5:** Delay under FTP

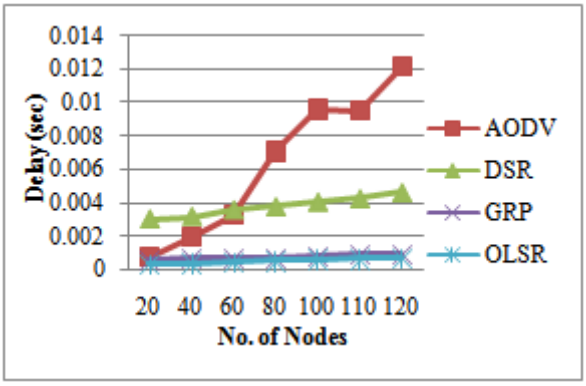


**Figure6:** Delay under HTTP

Third QoS parameter we have evaluated and compared is the network load of different routing protocols as a function of node density under the FTP and HTTP applications is shown below in figures7 and 8, respectively. The horizontal axis of the graph represents number of nodes and vertical axis network load in bits/second. Figure7 represents network load of different protocols under FTP application. From the graph shown in figure7, it clearly depicted that OLSR have high network load among all the routing protocols. While as, GRP has slightly greater load than AODV followed by DSR under FTP application [6]. It clearly depicted from figure8 that the network load of OLSR protocol is greater than other routing protocols under HTTP application. From the result analyzes, we concluded that the performance of GRP is better in terms of network load followed by AODV, OLSR, and DSR protocols under both FTP and HTTP applications.

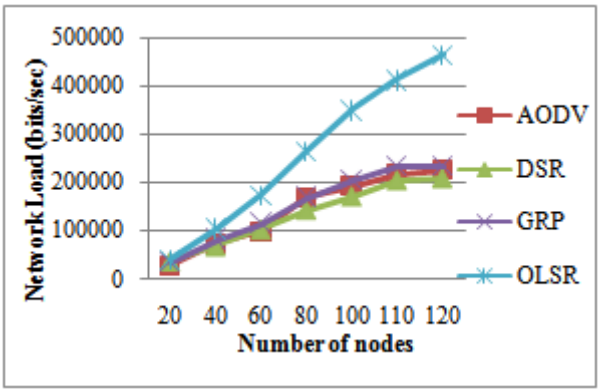


**Figure7:** Network Load under FTP

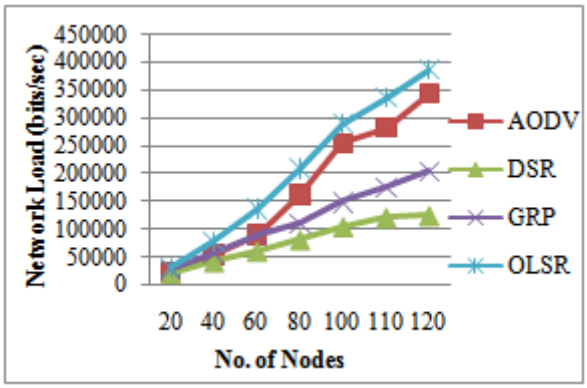


**Figure8:** Network Load under HTTP

Finally, we evaluated and compared packet delivery ratio of different routing protocols as a function of node density under FTP and HTTP applications is shown below in figures9 and 10, respectively [15]. From the graph shown in figure9, it clearly depicts that AODV has slightly high packet delivery ratio than OLSR, followed by GRP and DSR protocol under FTP application. Similarly, from the graph shown in figure10 depicts that OLSR and DSR perform slightly better than GRP and AODV under HTTP application. Thus, we concluded that in terms of packet delivery ratio OLSR performs better followed by AODV, GRP and DSR under both FTP and HTTP applications.

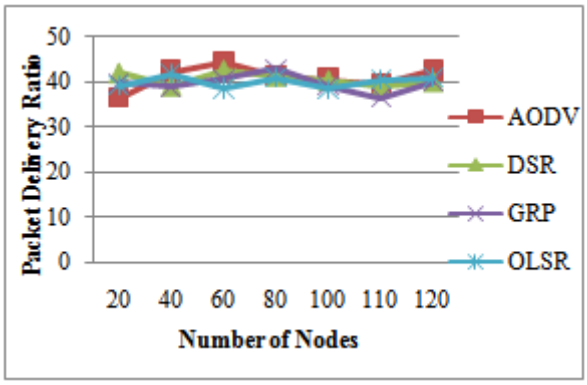


**Figure9:** PDR under FTP

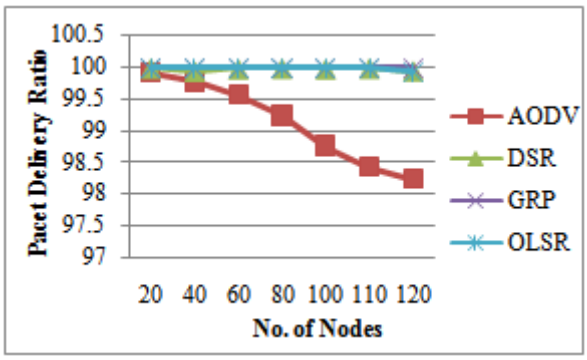


**Figure10:** PDR under HTTP

## V. Conclusion

Routing protocols plays a significant role in ad-hoc networks to forward packets from one host to another wirelessly. In this paper, we have evaluated and compared different routing protocols to choose the best routing protocol for FTP and HTTP applications. From the simulation results, we concluded that OLSR performs better in terms of throughput followed by AODV and GRP under both FTP and HTTP applications. OLSR protocol has least delay followed by GRP for both FTP and HTTP applications. While-as AODV has highest delay under HTTP and DSR has highest delay under FTP applications. Packet delivery ratio is almost same for all routing protocols under HTTP. Whereas, packet delivery ratio of AODV is slightly greater than OLSR, GRP and DSR protocols under FTP application. Thus, from the simulation results we concluded that OLSR performs better in terms of throughput and delay followed by AODV and GRP while as GRP performs better in terms of network load followed by AODV and DSR. The future work of MANET is expected to

become a significant part of pervasive technology such as smart grid, smart house. Ad-hoc networks can be deployed in remote and far- flung areas for education purpose to make them aware about advanced technology. It can be implemented to provide communication facility during emergency and rescue operations.

## References


[1]. M. K. Jeya Kumar and R. S. Rajesh; "Performance Analysis of MANET Routing Protocols in Different Mobility Models"; IJCSNS International Journal of Computer Science and Network 22 Security, VOL.9 No.2, February 2009

[2]. A. Vasudha and K. C. Rama; "Performance Evaluation of Routing Protocols for MANET under Different Traffic Conditions", 2nd International Conference on Computer Engineering and Technology IEEE 2010, V6-80

[3]. Adam N., M.Y.Ismail, and J. Abdullah; "Effect of Node density on Performance of Three Routing Protocols", International Conference on Electronic devices, Systems and Applications (ICESDSA2010), IEEE 2010

[4]. [4] Fan Ya-qin, Fan Wen-Yong, and WANG Lin-zhu; "OPNET-based network of MANET routing protocols DSR Computer Simulation", 2010 WASE International Conference on Information Engineering; IEEE 2010

[5]. Vishal Sharma, H.Singh, M.Kaur, V. Banga; "Performance evaluation of reactive routing protocols in MANET networks using GSM based voice traffic applications" ; Optik-International Journal for Light and Electron Optics, volume124, Issue 15, August 2013, Pages 2013–2016

[6]. H.S. Mewara, and Saurabh Porwal; "Node Density and Traffic based Modelling and Analysis of Routing Protocols for MANETs", IEEE 2013 Paper id 76

[7]. An Ran, Qu Jinxin, and Sha Xuejun; "MANET Routing Protocols Comparison for Composite Traffic Network", 2013 Third International Conference on Instrumentation, Measurement, Computer, Communication and Control, IEEE 2013

[8]. Abu Hasnat Md. Riadul Alam, Md. Atiqur Rahaman Khan, and Jia Uddin; "Network Design and Performance Analysis of Geographical Routing Protocol in Mobile Ad-Hoc Networks"; IEEE 2013

[9]. Mazhar H Malik, Qasim Awais, Mohsin Jamil , Arun Dhyani; "Performance Analysis of Proactive and Reactive Protocols in Mobile Ad-hoc Networking: A Simulation based Analysis"; 2014 International Conference on Robotics and Emerging Allied Technologies in Engineering (iCREATE) Islamabad, Pakistan, April 22-24, 2014

[10]. Dimitra Kampitaki, and Anastasios A. Economides; "Simulation study of MANET routing protocols under FTP traffic"; Conference on Electronics, Telecommunications and Computers – CETC 2013, Procedia Technology 17 ( 2014 ) 231 – 238

[11]. Harsukhpreet Singh, Harminder Kaur, Anurag Sharma, and Rahul Malhotra; "Performance Investigation of Reactive AODV and Hybrid GRP Routing Protocols under Influence of IEEE 802.11n MANET" 2015 Fifth International Conference on Advanced Computing & Communication Technologies; 2015 IEEE

[12]. Mazin Alshamrani, Haitham Cruickshank, Zhili Sun, Basil Elmasri, and Vahid Fami; "Evaluation of SIP Signalling and QoS for VoIP Over OLSR MANET Routing Protocol"; 2013 UKSim 15th International Conference on Computer Modelling and Simulation

[13]. J. Hoebeke, I. Moerman, B. Dhoedt, P. Demeester, "An Overview of Mobile Ad Hoc Networks: Applications and Challenges"; Department of Information Technology (INTEC), Ghent University – IMEC vzw, Sint Pietersnieuwstraat 41, B-9000 Ghent, Belgium

[14]. OPNET, Modelling Concepts References Manual, Modeller / Release 11.0