QoS Improvement in MANET using Self Organized Balanced Optimization

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ABSTRACT: The provision of quality of service (QoS) for routing in MANET (mobile ad hoc networks) is a major challenge due to the topology, bandwidth sharing and resource scarcity in wireless nodes. Another key aspect of distributing QoS is security, as malicious nodes pose all variety of threats to MANETs. Although a variety of MANET defense measures have been suggested, most solutions are only successful for a particular form of attack or provide security at the risk of sacrificing QoS. A trust-based, secure QoS routing scheme is proposed in this paper by incorporating trust between social and QoS. The key solution of the proposed scheme focuses on minimizing nodes that show different abuses of packet forwarding and finding the way that through the trust mechanism, safe communication is ensured. The performances are compared in in terms of QoS parameters, as channel quality, residual energy, link quality, etc.

Keywords : MANET, QoS Routing, Packet forwarding , Security

1.Introduction

The mobile ad hoc network (MANET) is of decentralized type. As it does not rely on pre-existing infrastructure, such as wired network routers or managed wireless network access points (infrastructure), the network is ad hoc. Rather, by forwarding data to other nodes, each node is involved in routing, so evaluating the nodes forward data is dynamically dependent on network connectivity and the routing algorithm. Wireless adhoc mobile networks are dynamic, self-configuring networks where nodes can travel freely around. By definition, a true MANET requires multicast routing and not just unicast or broadcast. Any device in a MANET is free to travel in either direction independently, and will therefore regularly change its ties to other devices. Each one must forward traffic that is not connected to its own use, and thus must be a router. The main challenge of building a MANET is to equip each device with the necessary data to properly route traffic continuously. MANET may be used as an independent fashion or as part of the wider internet. They form a highly dynamic, autonomous topology with the existence of one or more distinct transceivers between nodes.

Due to the growth of multimedia applications, Quality-of-Service (QoS) is becoming one of the most attractive features of mobile ad hoc networks (MANETs). Node mobility, restricted bandwidth, and the highly competitive existence of network topologies, however, make it difficult for QoS support in MANETs to deliver. The main purpose of the paper is to improve the MANET Qos, which introduces three algorithms for self organization, corruption rate and jitter level. Our approach to network configuration is, firstly, generate interesting QoS and security events. Secondly, Corruption rate is implemented to effectively detect undesired packet drop in MANET. Thirdly, jitter level is used for balancing of load in between creation of next path.

Venkatramana et.al [1] proposes the use of Dynamic Node Traversal Time (NTT) FBNTT DYMO with Fuzzy Logic instead of the usual NTT. By taking network size, the Fuzzy description is used, and inputs are flexible, and NTT output. In increasing QoS at MANETs, NTT plays a significant role. Sra et.al [2] introduces a goal of providing QoS is a novel heuristic protocol called Advanced-Optimized Link State Routing (A-OLSR). It works by increasing node connectivity and creating more reliable routes for best-effort routing than the traditional Optimized Link State Routing (OLSR) protocol. Sedrati et.al [3] designed to build QoS for real-time multimedia applications, two multi-path routing protocols have been tested. In medium mobility, these two protocols provide a slight jitter, regardless of node number, between reasonable and good quality. Laksmi et.al [4] proposed the Clustered QoS Routing Protocol is a new routing protocol known as (CQRP). This routing protocol generates a node-grouped cluster and assigns a cluster header. To avoid redundancy and communication loss problems, this cluster head is used to identify a connection accessible to the wireless node. Kalidoss et.al[5] introduced a new routing protocol, known as the Energy Efficient Routing Protocol, called Safe Quality of Service (QoS), is designed on the basis of confidence and energy modeling to enhance WSN protection and also to optimize energy use. Trust modelling uses a key-based security mechanism authentication technique to provide trust scores. To boost the QoS for MANET, Aware Adhoc On Demand Distance Vector (PA-AODV) Protocol is proposed as a priority, by Jayabaratan et.al[6]. Network parameters such as packet delivery ratio, throughput and end-to-end delay are calculated for the proposed PA-AODV protocol. Cander et.al [7] designed a Cross-layer Multicast Routing to boost QoS using a tree-based multicast routing protocol. Ramkumar et.al[8] proposes an ANINTECH Mathematical Model named as the DSA-QoS algorithm to reduce the average waiting time and which also increases the average real-time user throughput in the LTE network. The purpose of this paper is to minimize the average user waiting time during resource allocations in real-time. Collotta et.al[9] designed to provide better QoS and reduce energy consumption, a fuzzy-based data fusion solution in WSNs is used. Instead of processing the data in full, the proposed solution can only aggregate the true value. The implementation of a Fuzzy Logic Controller (FLC) inside nodes achieves this purpose. Alsamhi et.al[10] introduced a modificated Call Admission Control (CAC) technique. A novel CAC approach that uses two mechanisms, viz. "Reservation of bandwidth" and "degradation system" to achieve the required QoS. Celdran et.al[11] propose a new ICE++ architecture that is geared towards the Mobile Edge Computing Paradigm blends SDN and NFV techniques to manage MCPS components, taking into account their security, QoS and high availability. Chander et.al[12] introduced a Cross-layer Multicast Routing (CLMR) to boost QoS using a tree-based multicast routing protocol. To achieve QoS, tree operations and tree maintenance costs have been minimized. Yaacoub et.al[13] investigate Cooperative D2D communications at LTE-A uplink and downlink. The goal is to establish collaborative D2D groups for uplink (UL) and downlink (UL) data transmission / receipt in an energy-efficient manner (DL). The method proposed shows reduced delays and improved service quality (QoS). Gurumoorthy et.al [14] introduces Quality of service routing (QR) dependent Genetic Algorithm (GA). This routing implements a clustering algorithm based on choice designed to coexist under unchallenged limitations with GA-based QR. Then combine two different procedures for cluster header selection and QoS accomplishment, which are united by a particular restriction of selection. Alghamdi et.al[15] proposed a hybrid route optimization model, which improves service quality in a wireless sensor network with multi-hop operations. Some of the limitation in the existing work were identified after an exhaustive literature review of various research papers. The existing approaches do not provide efficient algorithms to enhance Qos.

Contribution of the research

The contributions are as follows in the research article.:

i. First, evaluate effectiveness of some of the best-known energy efficiency algorithms for WSNs.
ii. Depending upon the comparative analysis, this is figured out that our algorithms regular working mobile nodes and malicious nodes are listed very effectively within MANET.
iii. Detailed investigations were carried out to determine the effectiveness of the proposed technique.

The paper is structured in the following terms: The proposed topology is described in Section 2. Section 3 explains the technique which has been proposed. Section 4 describes the study of performance and the effects. Conclusion is stated in Section 5. Assess the efficacy of the proposed technique.

2. Proposed Topology

MANET a group of mobile wireless nodes, operating independently with no centralized infrastructure. Self Organizing Balanced Optimization algorithm enables very fast and seamless entry and attachment of nodes in any network. This is also valid for nodes leaving a network which leads to more complexity. Because of MANET's dynamic nature any unauthorized node (malicious node) can easily access, communicate, absorb all network traffic, and drop all packets into the network. When the packet is maliciously dropped through neighboring nodes, congestion at the forwarding node, collision at the destination and less residual node energy, a node can be considered as a malicious node. Consequently, Effectual packet dropping ratio variation method is implemented for MANET. Robust arrangement and Pre-Allocation algorithm is used for load balancing between next path creation. It allows flexible allocation of the new network node collects all information in the form of a trace file regarding packets and path creation.

An adversary model is used in this paper for packet dropping attacks. A malicious node continually records the field value of received and overheard control packets within this adversary model to keep track of the highest recorded value of the destination sequence number value. During the routing process, the malicious node reacts to a Route Request (RT) with the lowest hop count (which is 1) and the highest possible destination sequence number value. Even if the malicious node has no valid path, a genuine source node will immediately create a route through the opponent using Successful packet dropping ratio variation.

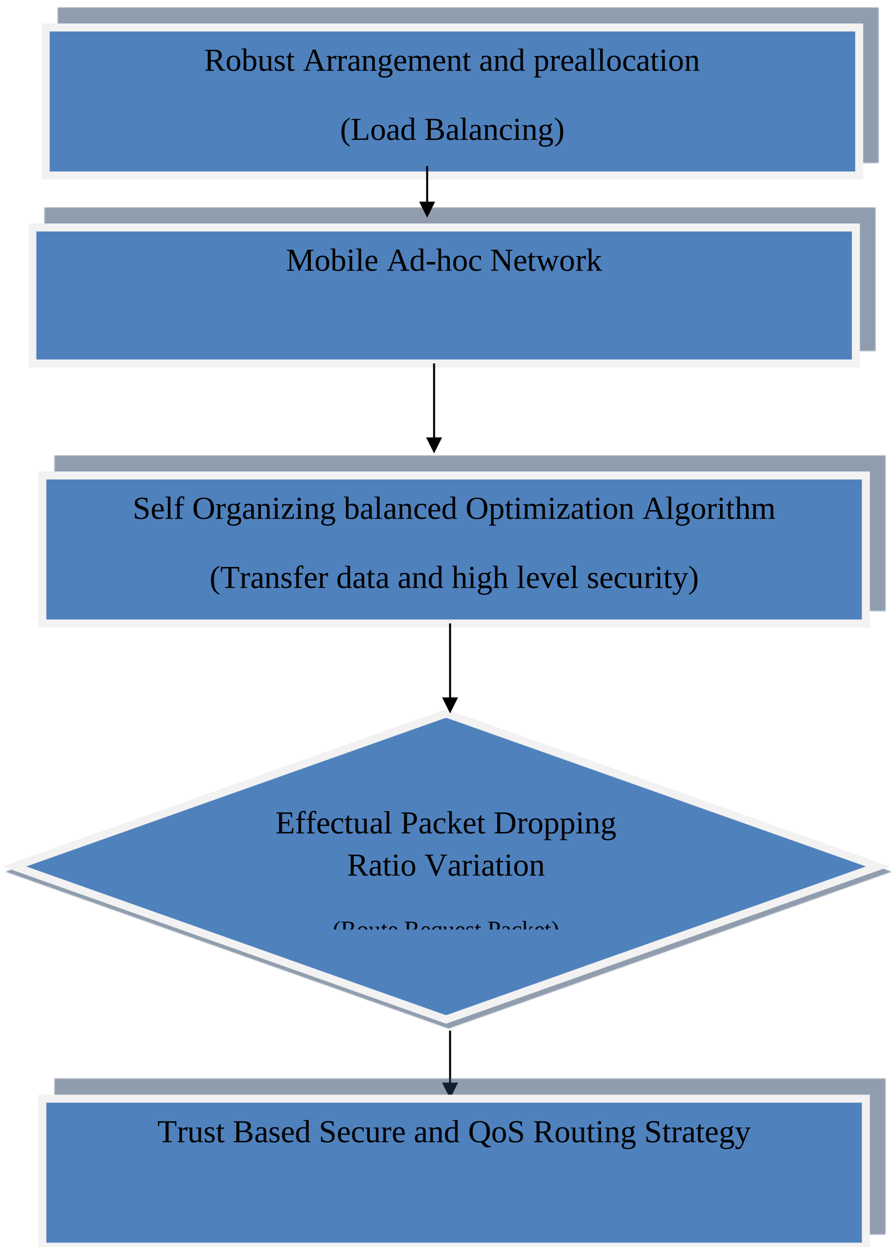

Fig 1.Architecture of proposed system

Procedure1 : Malicious node behavior after retrieving RT from the source node
If (RT isn't for me at all)**then**
Discard the RT obtained
// To add a random value between 1 and 10 to RA DesSeq
RA DesSeqn=RA DesSeqno +Random Num(1:10) and hop Count=1
Unicast the forgotten RA to the source on the reverse route
Else
Complete the RA packet with Sqno and hop Count=1
Discard the acquired RA
Unicast on the reverse direction of the real RA to the source
END If

Procedure 2: Malicious node acts following the receipt of data packets from the source node
If(the data packet is not received for the node)then
If(CurrentTime>time1&&Current Time<=time2)then/time2-time1=50% time period
The packet obtained will be dropped from the source
Else
Data packets will be forwarded if a valid route is open
ENDIf
Else
Receive the data packet for the node
EndIf

Fig 2. Adversary model of Route Request(RT)

2.1 Parameters of Qos

Based on Quality of channel, residual energy and link quality, the proposed routing scheme will select the next node to the destination node for packet forwarding.

2.1.2 Quality of channel

In our method, channel efficiency implies the availability of the canal during transmission. Intrusion measurement in a system can aid to ensure safe communication. The channel efficiency metric also assists in reducing end-to-end latency. Channel (H) capacity is stated as the rate at which data can be transmitted over the medium reliably and given by

$$H = G_t \times G_r \left(\frac{\lambda}{4\pi d}\right)^2 \quad (1)$$

Where transmitter gain is G_t, receiver gain is G_r, $\boldsymbol{\lambda}$ is the wavelength and the distance from the source to the destination is represented by d.

2.1.3 Quality of link

A new metric, i.e. the consistency of the connections, is introduced in this paper, a relation between two nodes persists (link residual life). To help mitigate route failure in a highly dynamic setting, we use the calculation value of the consistency of the links in our proposed method. Although the accurate representation of wireless connections in MANETs is a tedious process, it is relatively simple to measure the connection residual life based on the communication range between nodes and the relative velocity. It is possible to estimate the time between nodes during which a connection exists as follows. Next, the distance between nodes and their relative velocity needs to be found. With a link between nodes A and B in mind, let D be the distance between the nodes. If the coordinates of the nodes A and B are (x1, y1) and (x2, y2) respectively, the distance can be determined using the formulation as follows:

$$D = \sqrt{((x2 - X1)^2 + (y2 - y1)^2} \quad (2)$$

Let the communication range be R and the relative velocity be $\Delta V = V_A - V_B$, in the relative velocity, Then the residual existence of the relation T is $\frac{(R-D)}{\Delta V}$.

2.1.4 Energy Residuals

Energy is absorbed as a packet is received or sent, or when there is idle overhearing of traffic from adjacent nodes. The energy consumption of a node can be computed using the equation below:

$$E_c(n) = [P_t \times \frac{D_s}{D_r} - P_r \times \frac{D_s}{D_r}] + nP_o \quad (3)$$

In which, energy consumed by the node is represented by $E_c(n)$, P_t is the power consumption, D_s is the data packet size, D_r is the transmission rate, P_r is the reception power consumption, and P_o is the power consumption during the overhearing time of the neighboring node.

Energy residuals is available in a node, or remaining energy can be calculated as follows:

$$E_r(n) = E_i(n) - E_c(n) \quad (4)$$

Where $E_i(n)$ is the node 's initial energy, $E_c(n)$ and is the node's energy consumed.

2.2 **Effectual packet dropping Ratio and QoS Routing Scheme**

Within this section we explain within depth the proposed Effectual packet dropping ratio , stable routing framework for QoS (EPQRS) and its execution. Within EPQRS a trust model is used to enhance MANETs' cooperative routing and efficiency by testing the trustworthiness of the nodes on the network. A node listens promiscuously to its neighboring nodes in the trust model to determine the trust of those values. A node can monitor and estimate the resources of a neighboring node because of the broadcasting existence of MANETs. in a passive mode via their direct interactions. If it requires close observation, a node can provide a complete history of trustworthiness. Such a history should provide details about the node 's contact efficiency. In EPQRS, we make direct observations in our scheme to derive confidence values on adjacent nodes by using the social and QoS confidence parameters. In addition, with a fixed time period, trust is continuously assessed and trust value is determined by a node based on the quality of packet forwarding behavior. The methods used in our trust building scheme are as follows:

• Using the HELLO messages to accept recommendations.
• Confide in upgrading.
• Safe QoS routing strategy built on confidence

2.2.1 Using the HELLO messages to accept recommendations

Exchange of HELLO messages which are also used in the ad-hoc vector routing protocol (AODV) on demand distance to test link connectivity. If a node sending a hello message is a trustworthy node, it will calculate the relationship with the receiving node and save the result in a neighboring table to create an appropriate routing route. Intimacy is an accumulation of direct interaction experience that defines the interaction degree with a sending node.

2.2.2 Confide in upgrading

Our trust-based system takes network mobility into account. Any further updates or constant node-to - node connections, confidence values will decay over time. This involves instances such as breaking of node connections, allowing the current community to disconnect, Voluntary disconnection (in order to conserve power) or involuntary disconnection. The malicious activity of individual nodes is often assumed in resource-constrained MANETs. From the following equation, the general confidence value for the neighbor is derived:

$$Neighbor_{Trust} = \mathrm{w1} \times \mathrm{CFR} + \mathrm{w2} \times DFR + \mathrm{w3} \times Intimacy_{level} + w4 \times Residual_{Energy} + w5 \times Link_{Quality} + w6 \times Channel_{Quality} \quad (5)$$

In Equation (5), CFR is the ratio of the number of control packets correctly forwarded by a node to the total number of control packets intended for forwarding, and DFR is the ratio of the total number of data packets correctly forwarded by a node to the total number of data packets intended for forwarding. The weights of w1, w2, w3, w4, w5, w6 are 0 + w1, w2, w3, w4, w5, w6 + w1 + w3 + w4 + w6 = 1..

2.2.3 **Secured QoS Routing Strategy**

During the route discovery process, all nodes, including the source, the intermediates, and the destination cooperate. The source node finds the entry of the destination node in its routing table before data transmission begins. If such an entry occurs, via a trustworthy hop, the data is sent to the destination.

3.Result

The performance of the routing protocols are interpreted by using NS3 Simulator. Three metrics are used for their performance measurement**.** Distance vector ratio variation, Drouting Balanced, Network Density are used to determine their performance**.** These parameters and the values obtained are illustrated in a graphical way.

Distance Vector Ratio Variation

A protocol for distance-vector routing (DVR) allows a router to periodically notify its neighbors of topology changes.

Comparison of Distance vector ratio variation and number of nodes for Effectual packet dropping ratio variation and AODV is shown in figure 2.

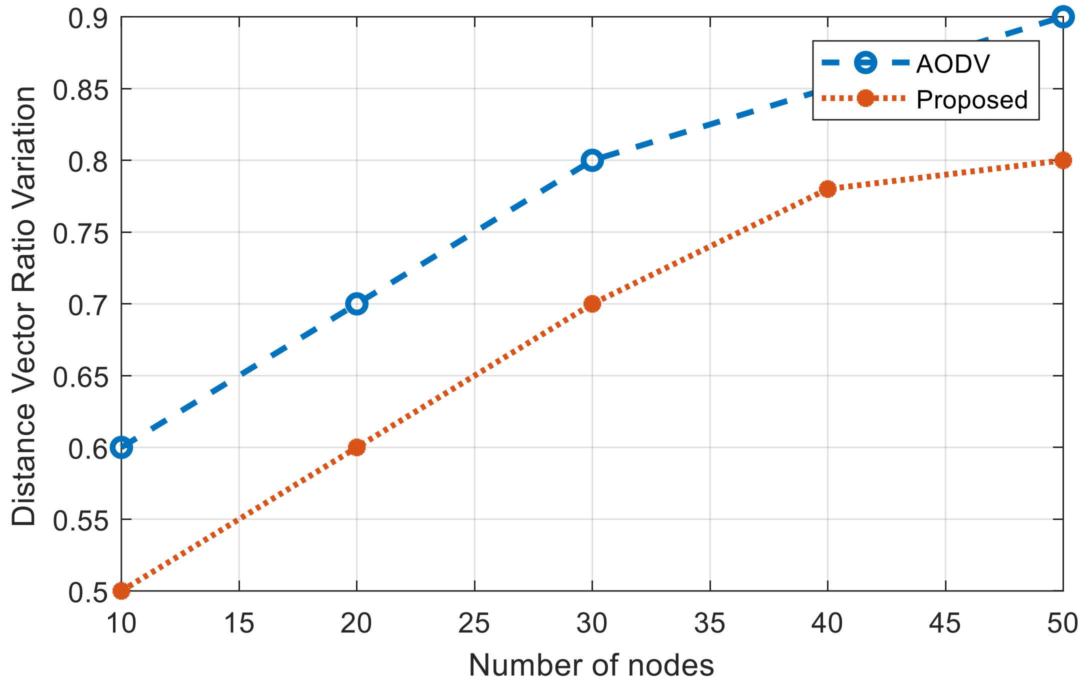

Figure 2. Distance vector ratio variation vs Number of nodes

From the graphical findings, AODV offers more variance in ratio than Effectual packet dropping ratio variation. With AODV and self-organized balanced optimization, the ratio variance values obtained are 0.9 & 0.8 . Effectual packet dropping ratio variance is higher, so its efficiency is low compared to AODV. With AODV and Effectual packet dropping ratio variation, the ratio variance values obtained are 0.9 & 0.8 . Effectual packet dropping ratio variance is higher, so its efficiency is low compared to AODV.

Table 1

Number of nodes	Ad hoc On Demand Distance Vector (AODV)	Effectual Packet Dropping Ratio Variation (Proposed)
10	0.6	0.5
20	0.7	0.6
30	0.8	0.7
40	0.85	0.78
50	0.9	0.8

DRouting

Adaptive routing, also referred to as dynamic routing, is a way of determining the best route through a network that a data packet will take to arrive at a given destination. Adaptive routing can be likened to a driver choosing a new route to operate after discovering that traffic is backed up on its usual course.

Comparison of DRouting balanced and Network Size for Self organized balanced optimization and AODV is shown in figure 3.

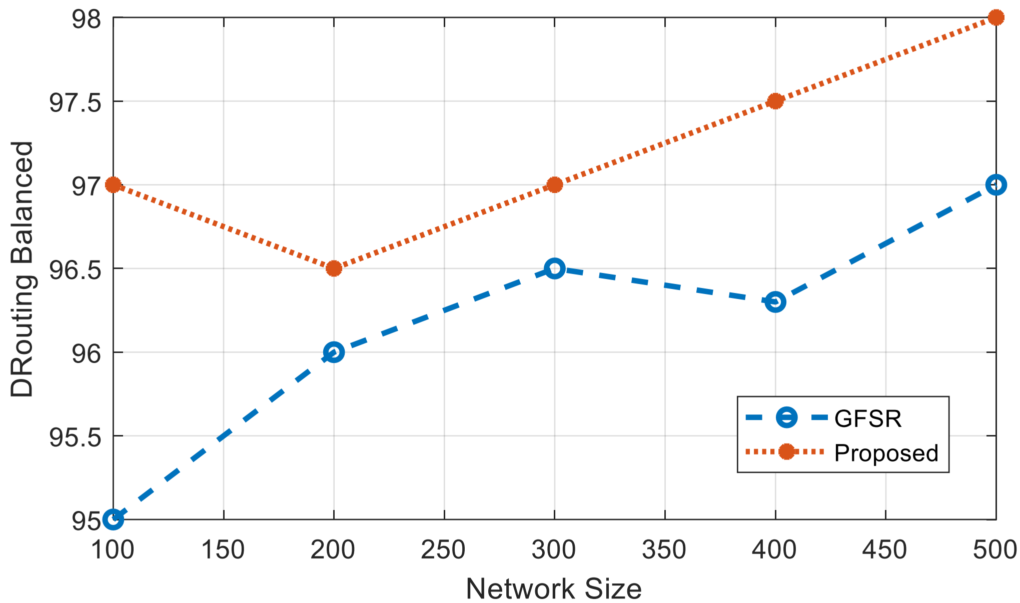

Figure 3. DRouting Balanced Vs Network size

From the graphical results, Drouting balanced for GFSR and Self Organized balanced optimization is 98 an 98.6 respectively. In Drouting balancing, Self Organized balanced optimization is better than GFSR.

Table 2

Network Size	Grid Fisheye State Routing(GFSR)	Self Organized balanced Optimization
10	93	94
20	94	95
30	96	97
40	98	98.6

Network Density

A network's density is the number of connections divided by the number of possible connections.

Network Density = $\frac{Actual\ Conentions}{Potential\ connection}$

Comparison of Routing and Network Density for Self organized balanced optimization and Effective routing is shown in figure 4.

Network Density for Efficient Routing and Self Structured Balanced Optimization is 98 and 98.7 from the graphical data. Self Ordered balanced optimization is better than Efficient routing by contrasting these algorithms.

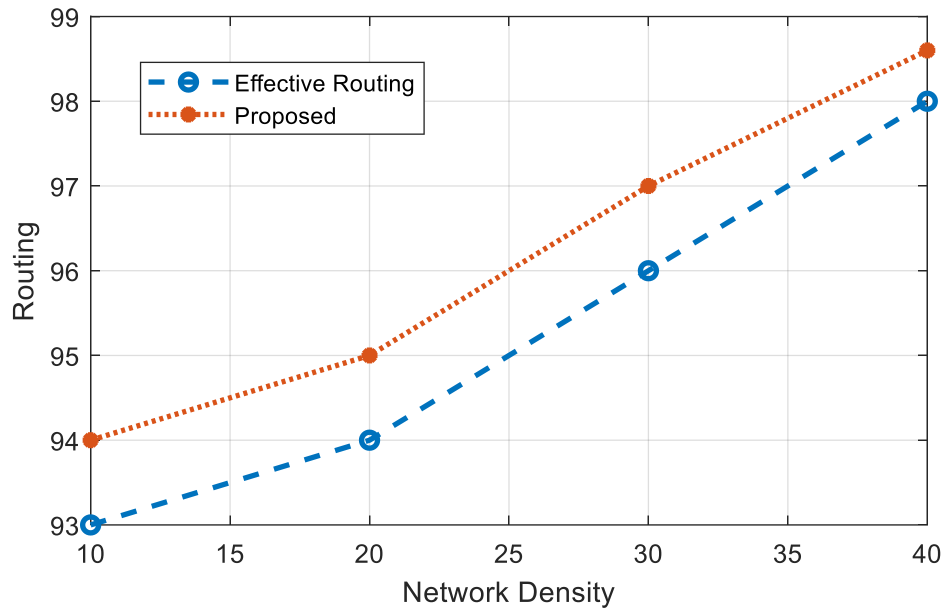

Figure 4. Routing Vs Network Density

Conclusion

As part of the literature survey, we found that combining QoS confidence can increase the effectiveness of MANET routing, as both quality and security are very important elements of such networks. The Performance assessment of wireless sensor network nodes is carried out on the basis of various parameters such as distance vector ratio variation, Drouting Balanced, Network Density. Compared to Efficient Routing , Where Self Organized balanced optimization shows impressive performance in terms of Network density. Effectual packet dropping ratio variation shows better results compared to existing routing protocols AODV and GFSR. Simulation results also demonstrate the efficacy of the Self Organized balanced optimization and Effectual packet dropping ratio variation. The overall routing variation is 0.8sec as well as network density is 98.7%.

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