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Intelligent Adaptive Energy Efficiency & Effective Signal Buffer Management Algorithm for VoIP (QoS) over Manet

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Abstract

Energy Efficient in the VoIP transmission is the major criteria and issues to be maintained the packet and data while processing VoIP (QoS) over Manet environment. Mobile Adhoc network (MANETs) presents a good platform for the fast deployment of VoIP services in many application scenarios. The energy efficiency mechanism for the data packet of voice in the queuing system have not been concentrated which actually consumes the more power while in the queue buffer management. Manet provide a considerable complexity that makes the transmission of real-time applications like VoIP a great challenge due to insufficient energy for packet transmission. In this research a new algorithm is proposed which enhance the performance of energy in manet carrying VoIP traffic. Through a simulation and mathematical expression we analyze and evaluate QoS indicators such as Distance, power, Bandwidth. Several voice codec are studied to determine their effect of insufficient energy. In the existing methods queuing energy have been used depend on number of nodes in certain environment which is drawbacks with mobile nodes. Hence a QoS based Intelligent Adaptive Energy Efficiency & Effective signal buffer management algorithm for voip(QoS) over Manet. The main objective of this paper is to segregate the energy altitude as per detachment the bandwidth is assign by using our IAE^3 signal barrier algorithm in manet environment. In great and dynamic networks, central algorithms are not suitable due to the lack of responsiveness. The bandwidth allocation is done by IAE^3 signal buffer algorithm.

***Keywords**: VoIP, QoS, IAE3*

1. Introduction

A movable ad hoc network (MANET) is a gathering of wireless mobile hosts which cautiously form a scheme. It is continually, self-configuring, infrastructure-less system of mobile devices connected without wires.[1] ,VoIP (Voice over Internet Protocol) has become an industry preferred technology over Public Switching Telephone Networks (PSTN) for voice communication because of its cheap cost. One of the critical issues in such applications is represent by the limited availability of power within the system and hence consumption power is vital Several technique have been introduced for saving power, such as the use of power efficient routing and switching between sleep/active modes for sensors generate a large quantity of data in which has to be aggregate at various levels. The well-organized node-energy utilization in mobile ad-hoc networks is a necessary role. The aim of this algorithm is to decrease the energy consumption of the mobile nodes in the system QOS (Quality of Services) presentation in a VoIP Context in sense of energy analysis. Network Simulator 2 (ns2) is used to run several simulations, we have proven for excising algorithm method there is some drawback due to overcome those drawback we have future a new energy algorithm is called Intelligent Adaptive Energy Efficiency & Effective signal buffer organization algorithm for VoIP (QoS) over

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Manet. For this research we are using NS2 to put into practice our VoIP network in Queue buffer management. [5]

2. Related Work

There are more than a few researches that have been done for energy efficient in Mobile Ad hoc network environment particularly for Transmit and receive energy. But our researcher urbanized a new algorithm which named as Intelligent Adaptive Energy Efficiency & Effective signal buffer management algorithm for VoIP(QoS) over Manet which is derived from the AODV protocol and queue mechanism the our algorithm is based on the energy status of each node in certain distance to allocate a certain bandwidth.[14]

The researchers proposed algorithm which combines incoming energy metrics and integrates these metrics into queue buffer management in an efficient way so that Ad hoc network has a greater lifetime and the energy consumption across the node is reduced.

The creator suggested an energy efficient algorithm for mobile ad hoc network called IAE^3signal buffer management algorithm for VoIP (QoS) over manet. The main idea of the algorithm is to assign the bandwidth from the distance of node residual energy. Once a distance is calculated the bandwidth as per energy is used for VoIP (QoS) over manet.

It can balance person node's energy consumption and hence the entire network's lifetime.

2.1 MANET

MANET(Mobile Ad-hoc network)are independent networks consisting of two or more mobile nodes ready with wireless message and hence are self-configuring infrastructure less networks.The infrastructure, suppleness and low cost are the main kind of MANETs.A prerequisite of MANETs is that these network should allow for multi-hop communication, while in the traditional wireless concept more often than not single-hop communication is used (from the base station to the user and vice versa).MANETs allow communication not only between a base station and its users, but also directly flanked by individual users. Hence, within a restricted region multiple transmissions might take place at the same time as.

2.2 AODV

AODV is a steering protocol for MANETs and additional wireless adhoc networks. In AODV Routing Protocol a way is recognized simply when it is necessary by a basis node for transmitting data packets. AODV build routes using a route ask for and route reply instrument. When a source node needs a route to a purpose it broadcasts a route demand (RREQ) packet crossways the system. Nodes in receipt of this packet inform their in order for the source node. The RREQ contain the most recent series figure, basis node's IP address, and development number and broadcast ID. If the node that receives is either a destination or if it has route to destination with equivalent sequence number it sends a route reply RREP. In this folder, it unicasts a RREP rear to the basis; or else, it rebroadcasts the RREQ. If nodes obtain a RREQ which is already processed, the node discards the RREQ. As the RREP propagate back to the basis nodes set up onward pointer to the destination. After in receipt of the RREP the source node may begin to advance data packets to the purpose. [11]

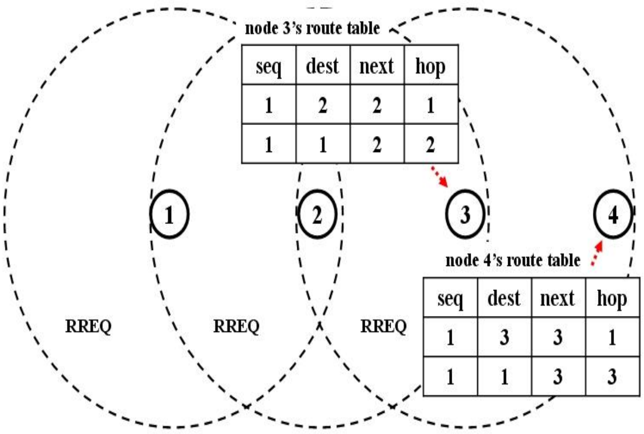


Figure 1.

2.3 Medium Access to Shared Medium (100)

The main goal of MAC is to organize the direct access among multiple nodes to achieve high channel utilization. In other expressions, the organization of channel right of entry must reduce or remove the incidence of collision and make the most of spatial use again at the similar time [10]

2.3.1 Adaptive Collisions

Adaptive Collisions approach from two aspects in MANETs. They may happen owing to simultaneous transmission by two or more nodes in a sure range anywhere their signal crash and get in the way with every other. Obviously, the extra the lively nodes in the range of a transmitter receiver couple, the more ruthless the collisions experiential

3. Real Time QUALITY OF SERVICES (Qos)

3.1 Performance Calculations

Throughput

Throughput is the normal rate of doing well data pass over a communication channel. In the outline file, "r" represents "take delivery of" in standard and wireless event, which can be used to tack throughput. The method is shown as following:

Immediate throughput=bytes (received in designation node) over one second

The immediate throughput will generate a graph showing the amount of in order received by the destination lump in excess of each next. This is useful for evaluating the immediate effects of the backdrop traffic on the pre-existing VoIP traffic.

The average throughput will produce a single value showing the standard throughput for the entire period of the simulation. The method is as following:

=Total figure of bytes received in designation node [14]

3.2 Reconfigure Voip Codes

VoIP utilize the IP network (Internet or intranets) for telephone conversation.

Codec is used to convert an analog voice signal to digitally prearranged account. Codec's vary in the noise excellence, the bandwidth required, the computational supplies

[11]. Each service, program, phone, entry, characteristically supports more than a few dissimilar codec.

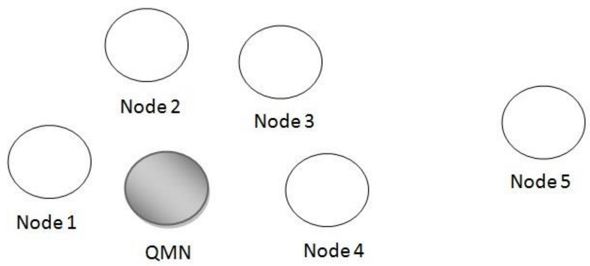
3.2.1 Voip:

Link capacity increasing the most excellent way to enlarge bandwidth is to increase the link capability to contain all application and users, with some extra bandwidth. Even though this explanation sounds simple, increasing link ability is expensive and needs time to be implement. Providentially, various QoS mechanisms can be used to successfully increase available bandwidth for priority application.

Queue Buffer Management

A buffer organization handle packet queue in Mobile Ad hoc Networks (MANETs) for set and mobile nodes. In this scheme try to achieve energy resourceful queuing in the buffer by assigning dynamic buffer space to all neighboring nodes and controlling packet drop probabilities [14].

When dissimilar services are the part of some network, it is essential to provide main concern to the packet of delay sensitive armed forces such as Voice over IP (VoIP) and video streaming applications. This is more often than not referred as Quality of repair (QoS) completion in a network. When packets are process according to their assign priority, more packets of the same or other services also reach your purpose usually at QoS processing hops [18].



MANET Scenario

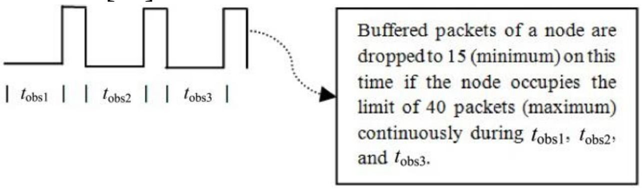
Active Queue Management (AQM) was introduced which is now prevailing in the network world. The AQM is mainly used in wired networks these days where IPv4 packets are marked for their priorities in Type of Service (ToS) byte of the packet header.

New scheme of buffer mgt for packet queue to save energy called as QMN (Queue management node).

Algorithm for Every Node Future in Queue Buffer Authority Level for Voip

Step 1. Compute an immediate buffer opportunity busy.
Step 2. Decide size flanked by assign limit and buffer space unavailable by each node.
Step 3. Position the packet values in ascending order with matching nodes.
Step 4. Obtain distance between total node space and total buffer space occupied, i.e., Distance node space “dns”
Step 5. Calculate (dns / Sum) * nn and add it to buffer space occupied by the node with the least distance available through Step 3...
Step 6. Calculate (dns / Sum) * (nn-1) and add it to buffer space occupied by the node with the size more and closer than the least available distance Step 3.
Step 7. Repeat Step 7 for all remaining neighbors with decreasing value of “nn” by “1” each time and selecting nodes with respect to increasing values of energy available through node.

Step 8. Assign calculated bandwidth allocation to corresponding nodes as new buffer space allocations [23].



Queue Buffer Management

4. Existing Algorithm

4.1 Leach

Low Energy Adaptive Clustering Hierarchy (LEACH) protocol It is one of the most popular hierarchical energy routing algorithms for sensor networks. The idea is to form energy of sensor node based on the received signal strength and use as router to the sink. This reduces energy consumption since the transmissions will only be done by such energy heads rather than all sensor nodes. Minimum number of energy is estimated to be 5% of the total number of nodes.

LEACH is divided into two phases Set up Phase and steady state phase. Each round starts with a set-up phase, where energy are formed, followed by a steady-state (transmission)phase in which data packets are transferred from normal nodes to classify.

4.2 Mathematical Model

Many of the research protocols have used the first order radio model as described in [5]. Energy is dissipated while transmitting and receiving the data and energy consumption for the short distance is d2 when propagation is in line of sight and d4 for the long distance due to multipath fading propagation.

Transmission energy and receiving energy are calculated as follows

l Elect + lEfsd2 , d < do

E Tx (l, d) =

l Elect + lEmpd4 , d > do

Where d is a difference between transmitter and receiver. And L is a the length of the message in bits,

$$d0 = Efs/Emp$$

Table 1. Simulation Parameters

Parameters	Value
Sink	At(50,130)
Radius	25m
Eelect(Energy consumed in the electronics circuit to transmit or receive the Signal)	50 nJ/bit
Efs (Energy consumed by the amplifier to transmit at a short distance)	10 pJ/bit/m2
Emp (Energy consumed by the amplifier to transmit at a longer distance)	0.0013 pJ/bit/m4
EDA (Data Aggregation Energy)	5 nJ/bit/signal
Message Size	4000 bits
E0, Initial Energy	0.5 J

The network of N nodes is considered from which m percent of nodes are high energetic nodes and remaining nodes are normal nodes, Therefore the high energetic nodes would be m*N and normal nodes would be (1-m)*N. For example if we consider the network of 50 nodes N= 50 and 12% of high energetic nodes m=0.12 then normal nodes would be (1-0.12)*50=44 and high energetic nodes would be 0.12*50=6 [2].

4.2.1 Transmission Power Control

When a node receives a packet from a neighbor, the channel attenuation is computed as the difference of the transmitted power $Power_{txmax}$ and the received power $Power_{rx}$. The ideal transmission power can be calculated as follows:

$$Power_{tx} = Power_{txmax} – Power_{rx} + S_r + Sec_{th}$$

Where S_r is the minimal power level required for correct packet reception and Sec_{th} is the power included to overcome the problem of unstable links due to channel fluctuations [9].In order to find the optimal path, the value P can be defined as follows:

$$P = max_j\ min_i\ (RE/Power_{tx})\ [8]$$

The optimum route is determined by using the value of P described above. Among all feasible paths, we choose the path with the maximum value P as the optimal route for transmitting data packets. Here RE is the residual energy on the route and $Power_{tx}$ is the transmission power.

4.2.2 Queuing Energy Calculation:

The queue buffer energy is the remaining energy at every node which is the energy left after the packet transmission. The buffer energy RE can be calculated by using the following formula

$$RE = E_I – E_C(t)$$

Where $E_I$is the initial energy of a node and $E_C(t)$ is energy consumed by a node after time *t*. Total energy consumption of all nodes is defined as the following equation.

$$TE_C = N * Initial\ Energy – RE$$

Here N is denoted as the number of nodes used in the network.

4.2.3queuing Energy Consumption Analytical Model:

For our analytical model, we use following notations:
λ: mean arrival rate per cluster head
μ: mean service rate in cluster head
ρ: utilization of the cluster head
p0: probability that the cluster head is in idle state
ETX: energy consumption for sending one data packet
EIdle: energy consumption in idle state
N: mean number of packets in cluster head per unit time
PW: average energy consumption of a cluster head per unit time
N: number of nodes
QM: total energy consumption of N nodes per unit time.
The steady state balance equations obtained for the analytical model according to the M/M/1 queuing model which are given by equations (1) to (6)
Based on M/M/1 queuing model the mean number of packets in the cluster head (N) is determined as:
= / 1−
Where
= /
And the probability that the queue in idle state is determined as:
P0=1-ρ

Energy required for sending a data packet can be determined as:
$= h \times$
Now, the average energy consumption of a cluster head can be expressed as:
PW=N.ETX+P0.EIdle=NETX + (1-ρ) EIdle

4.2.4 Energy Consumption Model

The Energy Consumption Models Describe The Total Host Energy Spent In Following Modes

- TX mode
- RX mode
- Idle mode
- Overhearing mode

4.3 Tx Mode

When a node send packet to other nodes, it is in TX mode The energy required during transmit packet is called TX Energy of a node. TX Energy depends on packet size (in bits). TX energy can be described as follows.

$$TX = (Pkt\text{-}size \times 330) / 2 \times 10^6$$

And

$$P_{TX} = TX / T_{TX}$$

Where P_{TX} is transmitting power, TX is transmitting energy and TTX is time take during packet transmit and Pkt-size is the size of packet in bits.

4.4 Rx Mode

When a node receives packet from other nodes it is said to be in RX mode. The energy required during receiving packet is called RX energy . The RX energy can be formulated as

$$RX = (Pkt\text{-}size \times 230) / 2 \times 10^6$$

And

$$P_{RX} = RX / T_{RX}$$

Where PRX is receiving power, RX is receiving energy and TRX is time take during receiving a packet and Pkt-size is the size of packet in bits.

4.5 Idle/ Listening Mode

According to idle mode, the node does not send or receive any data packet. But in this mode energy consumed because the node continuously listening the wireless channel and ready to receive packet. When a packet is arrived and the node is converted from idle mode to RX mode. The power consumed in idle mode is as under.

$$P_{Idle} = P_{RX}$$

Where PRX is power consumed in receiving mode and PIdle is power consumed in idle mode.

4.6 Drop / Overhearing Mode

When a packet is receive by a node which is not design for this node it is called overhearing mode. The power consumed in overhearing mode is describe as under.

$$P_O = P_{RX}$$

Where PO is power consumed in overhearing mode and PRX is power consumed in receiving power.

5. Proposed Algorithm

The algorithm which is proposed here is follows:

Intelligent Adaptive Energy Efficiency & Effective Signal Buffer Management Algorithm for Voip (Qos) Over Manet (IAE3signal Buffer Mgt)

When the Bandwidth **g**, is unable to allocate the certain band get the data packets from a node **d** during the given time for in certain distance. At the time ,**g** informs the entry node **e**, by the giving the data packet <d,(Z_d,Z_d+1),Lo_g>; here d is the id of lost node, (Z_d,Z_d+1) are the band width allocation during distance is calculated as per energy level, Lo_g is the current energy level in VoIP over manet.

Begin

Step 1. e receives <d,(Z_d, Z_d+1), Lo_g> from g

Step 2. e sends a packet to d and asks for its distance after a fixed bandwidth of time till any further information then waits for <ackn> from d

Step 3. if e receives <d, Lo_d>update $(stat)_d$=high else $(stat)_d$=low
If (stat) d=high

Step 4. {e computes the distance dist between Lo_g and Lo_d and compare dist with the radio transmission ranges of d and g.

Step 5. if d is out of range then e signals g for slot reassessment and also signals d for not sending any packet to g, else signal g to wait for data in the further expected time range of d.} else

Step 6. if g computes the bandwidth of d & g as within the Radio transmission range of each other then signal g to assign time range for d and also signal d to send the packets towards g and not to send position to e End

Energy Consumption Analytical Model

Energy Consumption in Sensor Nodes

For sensor node the Queue buffer management

$$\mathbf{U_{CM} = \lambda_{CM} / \mu_{CM}}$$

Mean number of packets in the sensor node (N) is determined as:

$$\mathbf{N = U_{CM} / (1 - U_{CM})}$$

The amount of the energy required to send each packet as follows

$$E_{TX} = \text{Transmission Power} / \mu_{CM}$$

Where,

$$\mu_{Cm} = \text{Bandwidth/Packet size}$$

The final average energy consumption of sensor node in manet

$$PW_{CM} = N * E_{TX} + \pi_0 * E_{idle}$$

The transition from active state to idle state can reduce the energy consumption.

3. Energy Analysis and Distance Calculation

The steady state balance equation obtained for the analytical model according to M/M/1 queuing model which are given by equation:

Mean arrival rate per node entry can be expressed as:

$\lambda_{NODE} = (C-1)* \lambda_{CH}$

$U_{node} = \lambda_{node}/\mu_{node}$

Less energy is utilized in Transmit node side in short distance calculation is obtained the lesser bandwidth is allotted:

$N_2 = U_{node}/(1-U_{sink})$

The energy is calculated in this formula:

$$Pw_{node} = N_2*(E_{TX}+E_{RX}) + (\pi_{0\text{-}node}*E_{distance\text{-}node})$$

Node only receive the packet to forward to next node and send to base station to calculate a distance as per energy level to forward the packet.

Total energy: $E_T = E_{energy\text{-}distance}$+total nodes =Bandwidth

10 nodes,

$$\lambda=0.1, \mu = 0.5$$

Bandwidth = 10kbps: packet size =1600 bytes

Energy = 0.2 joules; Transmission power 0.4

$$U_{cm}= \lambda_{CM}/\mu_{CM}$$

= 0.1/0.5 = 0.2*100= 20 % of bandwidth is allotted.

Tabel 2. Model and Simulation Parameter

Parameter	**Value**
Mean arrival rate per sensor nodes	**0.0 1 to 0.1**
Mean service time	**0.5 sec**
Number of sensor nodes per each	**37**
Packet size	**1600 byte**
Band width	**10 Kbps**
Transmission Power (Tp)	**0.4 watt**
Idle Power	**0.1watt**
Receive Power (RP)	**0.2 watt**
Processing Power (PP)	**0.2 watt**
Time simulation	**1000 sec**

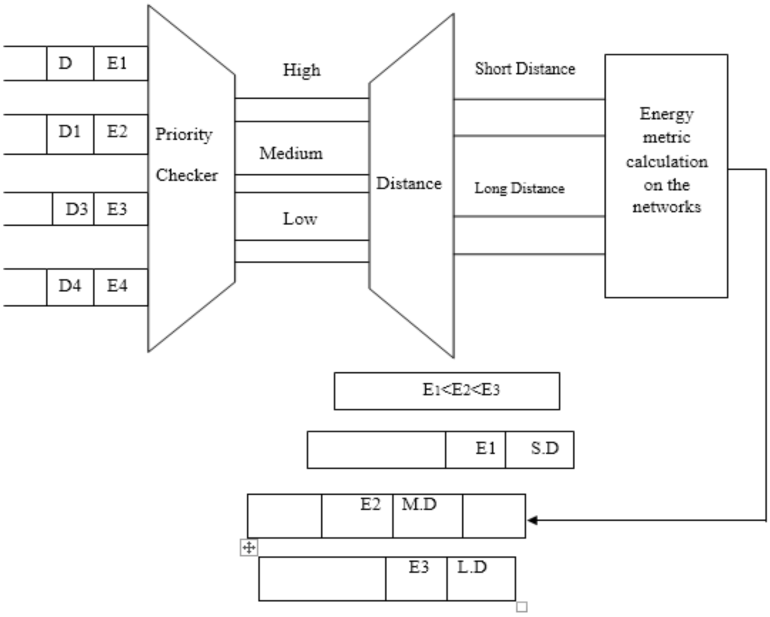
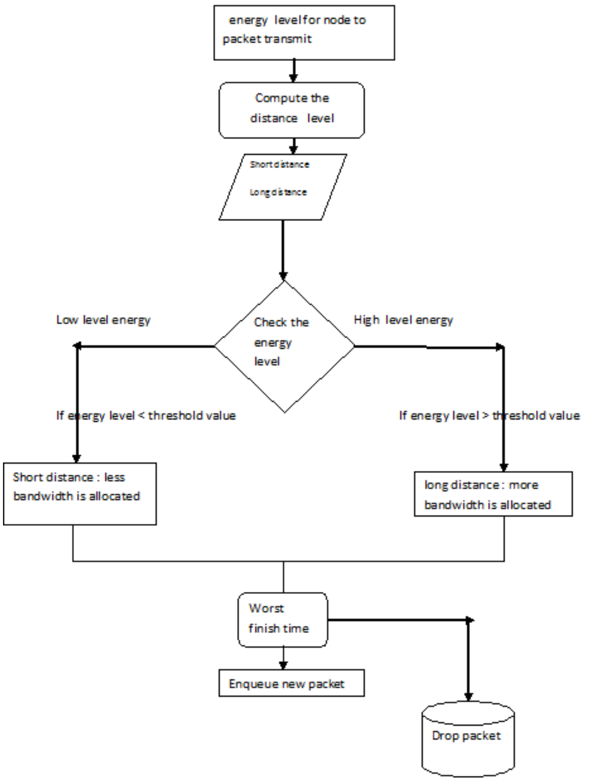


Figure 2.



Flow Chart 1.

Table 3. Simulation Mode

SIMULATOR	NETWORK SIMULATOR 2`
NUMBER OF NODES	RANDOM
TOPOLOGY	RANDOM
TOPOLOGY	RANDOM

INTERFACE TYPE	PHY/WIRELESSPHY
MAC TYPE	802.11
QUEUE TYPE	DROPTAIL/PRIORITY QUEUE
ANTENNA TYPE	OMNI
PROPAGATION TYPE	TWORAYGROUND
ROUTING PROTOCOL	AODV,
TRANSPORT AGENT	UDP
INITIAL ENERGY	APPLICATION AGENT CBR

6. Metrics Analyzed for Simulation

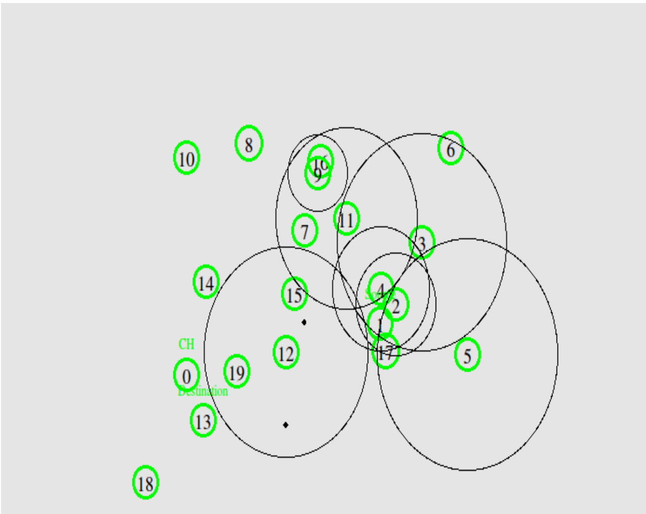
Consumed Energy the number of nodes in the network versus the total consumed energy is considered as a metric

Packet Delivery Ratio PDR is the proportion to the total amount of packets reached the receiver and amount of packet sent by source. If the amount of malicious node increases, PDR decreases. The higher mobility of nodes causes PDR to decrease.

$$PDR (\%) = \frac{\text{Number of packets successfully delivered}}{\text{Number of packets generated}}$$

Throughput The amount of data successfully received at the destination.

$$\text{Throughput (bits/s)} = \frac{\text{Total data}}{\text{Data Transmission duration}}$$



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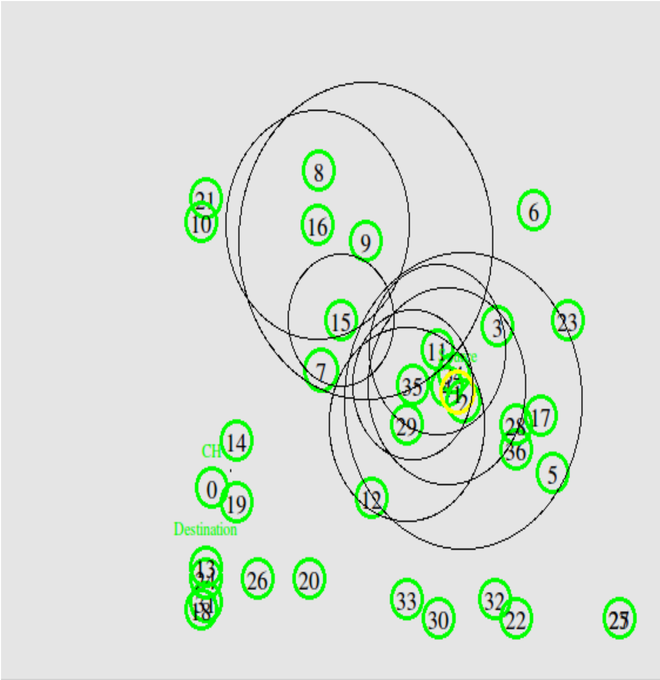

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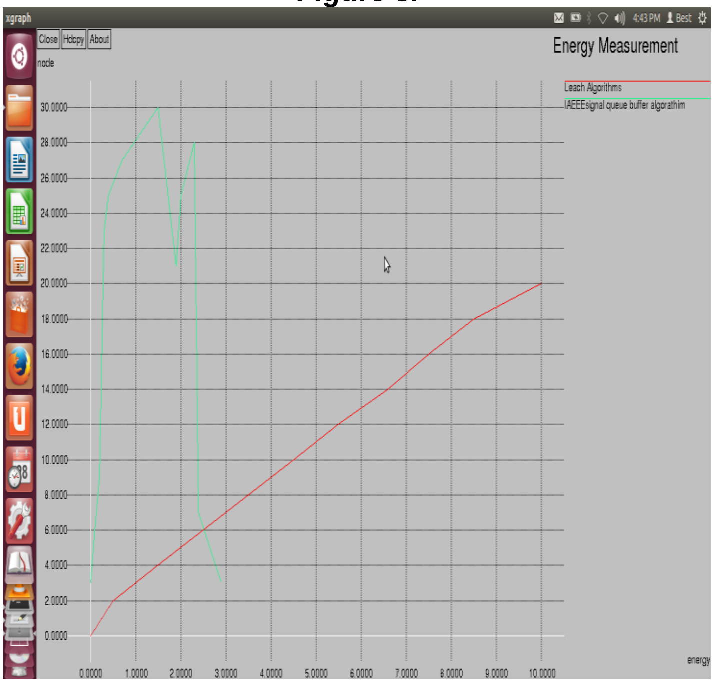

Figure 5.

7. Conclusion

In this research, we proposed a new analytical model to estimate the energy Intelligent Adaptive Energy Efficiency & Effective signal buffer management algorithm for VoIP (QoS) over Manet for energy consumption in queuing buffer management to allocate a bandwidth as per energy consumption we validate in this model using simulation transitions between distance and energy in VoIP over queue buffer in manet environment. The result of analytical model is suitable for energy consumption in our proposed model.

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