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A Hybrid Approach for Energy Efficiency Routing Protocol over Wireless Sensor Network

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Abstract: *Routing plays an important role for the efficient network performance. Proposed methodology present a novel routing protocol for multipath energy efficient routing over wireless sensor network that encapsulate advantage of two different predefine method in order to overcome their limitation. Proposed protocol tries to provide supplement support to lower energy node at heavy traffic by higher energy node from lower traffic of network. In this work outlier detection and the Linear Regression approach has been use as a hybrid approach to find the high energy node. This approach helps to enhance the network survival. The simulation results also provide the batter results as compare to previous approach. The technique has been simulated for different number of nodes. For all the scenarios, the proposed technique demonstrates an efficient performance as compare to existing methodology.*

Keywords: *WSN, Routing, AODV, LEACH, DSR, Energy efficient Routing, linear regression.*

1. INTRODUCTION

Wireless network (WSN) is a network which consists of group of dispersed sensors which are responsible for data collection such as monitoring any area and recording the physical conditions of the environment of that area and organize the collected data to send it to the central location. WSNs is used for many applications like measure environmental conditions like checking temperature in snowy areas, to find the areas for non military exercises, to check fire existence in forest, to check humidity, to check wind speed, to detect temperature in nuclear reactor etc. Initially WSNs were designed to help government organization like Army to check various non military exercise in the area where human intervention is impossible but later they are used for many other activities also related to business. A Wireless Sensor Node consists of sensor nodes which may vary from few numbers to many.

In the present days, there is a large application of wireless sensor networks (WSNs) in many areas such as environmental monitoring, medical treatment, and control of the movement and track the target, etc. However, the energy from the battery is limited and cannot be compensated from each sensor node hindered the development of wireless sensor networks . Take advantage of the energy from one node to extend the life of sensor networks is the primary objective in the design of sensors for wireless network routing protocol. Because of energy conservation and expansion so [1], it has caused a routing protocol based on mass considerable attention. Includes sensor equipment the receiving node transfer of radio that is capable of both receiving antenna with the transfer, the controller, which controls the sensor activities of electronic circuits, and power source, usually a battery they are not rechargeable.

This paper has five sections including this one. First is introduction of the paper. Second section gives the brief history of previous work related to energy efficient routing over Sensor Network. Now the third section enlightens on proposed work. And fourth section includes implementation detail and performance measure. Finally the paper has concluded in section five.

2. RELATED WORK

Delaney has been suggested, D., Russell Higgs, and G. O'Hare way in 2014 [1] based on heuristics neighborhood (NHS). Structural orientation tree in wireless sensor networks provides SNS approach, using this approach, data routing and search for the place, which is a comprehensive manner. The best place to find out the sensor is through a combination of measures decade sensors used today and the metric of its neighboring nodes.

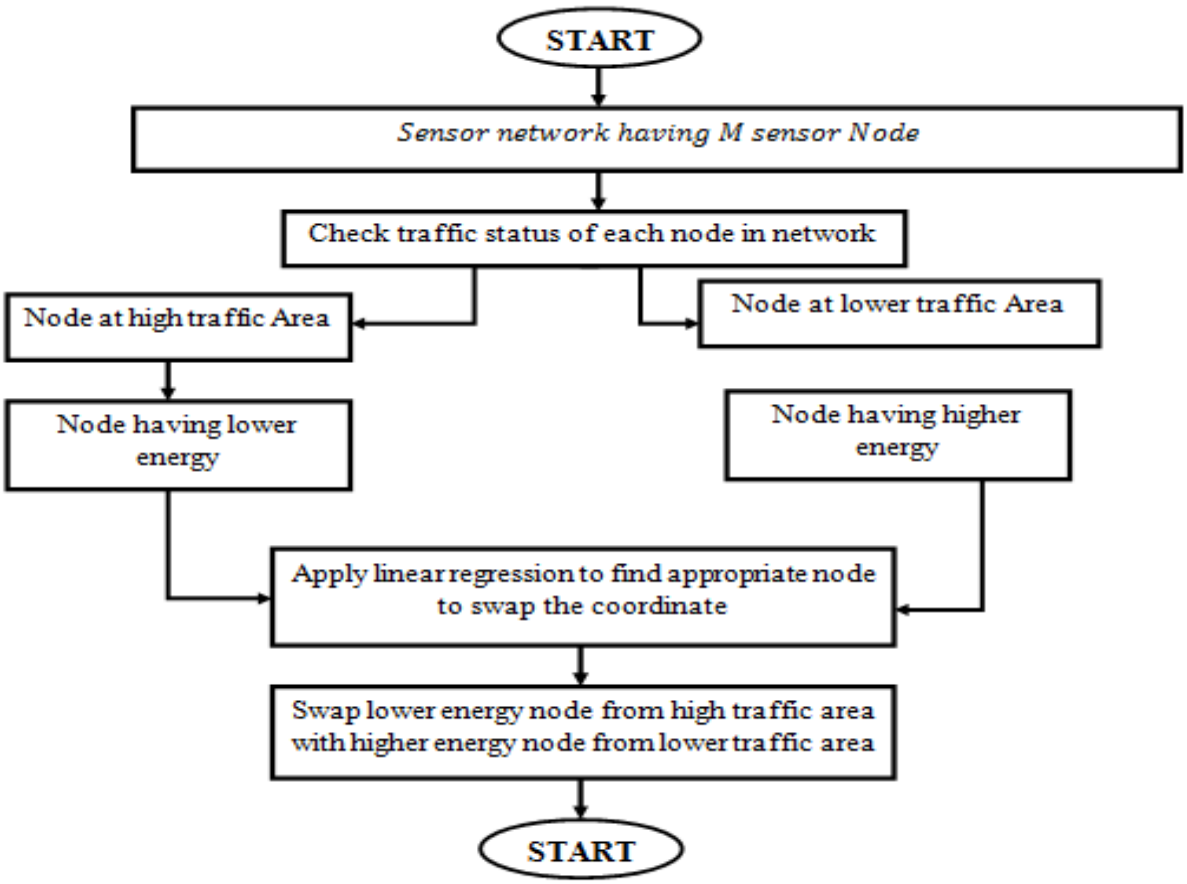

Figure 1: Proposed Methodologies for Sensor Network Life Saving Routing Protocol

The destination node is considered as the central node where all data is collected, the sensor nodes when transmit the data select the best node having good quality alternative routes so that at the time of failure of any sensor node neighbor sensor node route can be followed to transmit the data.

2014 Ghadimi, Euhanna et. al. [2] have proposed Opportunistic Routing in Low Duty-Cycled WSNs. With the regular approach data is transmitted in two steps: in first step routing protocol select next sensor node and in second step protocol MAC wait for terminus sensor node to get up to receive the data as WSNs are considered as standalone networks in which nodes get slept when they are not used to increase the life span of the network. So in the paper the authors have introduced ORW, for WSNs. In a Duty cycled setting data packets are forwarded to each neighbor sensor node and sensor node which wakes up first receives the data. This method increases the strength of the WSNs.

2014 Sahin, Dilan et. al. [3] has worked upon a technique applied for the communication system of smart grid. WSNs place an important role to cope up with the problem which is faced by power grid with its low cost deployment characteristics. During bad environmental condition when power grid stops working due to occurrence of fault WSNs are used as they are deployed prior to check the weather condition. In it clusters form as WSNs are deployed to large areas. Each cluster has cluster head sensor nodes under particular cluster has sent data to it, data collected at cluster head is further send to the BS. WSNs are also deployed in power grid to check the fault occur during bad environmental condition. In this regard, this helps in developing of routing protocols for environments of smart grid.

The author says that the wireless sensor network technology has been used in the different routing protocols and topologies in order to move data from source to destination. A technique based on the routing topology based on the tree, while the use of the relationship between parents and children on the packet forwarding. The move also must be considered an important safety issue. And the movement of a package from the source to the destination must be achieved in a specific period of time in advance. Should apply some security mechanism must be added to some of the parameters to each data packet to be sent.

2012 Kwon, Kiwoong et. al. [5] IP WSN is an essential thing for IoT (Internet of Things). There are various routing protocols which are proposed for IP WSNs but they have some issues like point to point traffic in which many processing resources are required to address the problem in P2P traffic stateless P2P routing protocol (SPR) is used in it data packet is delivered to the node having small streamlining hop count instead of delivering data from parent to child tree route. SPR also provide stateless routing in which it determines the route through hierarchical address and one neighbor information without storing the global route.

2014 Tunca, Can, Sinan Isik, M. Donmez, and Cem Ersoy [6] as we know in tree based routing the knob nearer to the terminus knob lose their batteries faster as compare to other knob and cause the destruction of the network to solve this problem they have proposed a survey upon distributed mobile sink routing method for WSN. In mobile sink routing method Mobile sinks provide load balancing and uniform consumption of the energy in sensor knobs. Mobile sink means that terminus knob is not fixed the location of terminus node in WSN changes as per the energy of its neighboring nodes, but it introduces overheads in measures of packet delivery delay or energy consumption.

It is seen that most of the previous approaches for chose alternate path directly when any node shout down that dropped performance and have relative higher complexity. As the mobile nodes operate on the limited power of battery therefore it becomes very necessary to develop techniques which can successfully maintaining lesser complexity. The objective of this dissertation is to develop a new approach which can successfully maintain the rout with lesser battery power in order to long survival of Sensor network. The large number of work has done in order to find another path when node will discharge in the network. Due to this break down the overall performance of network will also decrease with respect to complexity of routing protocol. The objective of this Paper is to develop a methodology in order to enhance the network survive as long as Possible.

3. PROPOSED ROUTING PROCEDURE

The proposed solution is going to provide supplement support the high junction lower energy node with lower junction high energy node. Proposed method used liner regression for deciding which high energy node provides supplement support to high junction node without break its own connectivity. In proposed methodology as show in figure 1 uses to select node from low traffic area having middle resident energy limit to provide supplement support low energy node at high traffic zone.

The proposed algorithm initially assume power limit knot low-energy environment and a resident residing knots. If a node in the network degrades the minimum energy for low power node, and residents knot broadcast replace its own package. If a node neighbors have more energy than the average resident and reduce reside in low traffic area traffic select to provide additional support.

The proposed solution will work for all the nodes exist in the network. Here traffic of network will check at the time duration. For the M sensor node algorithm has been trying to find the lower energy node. Here we get the high energy node. Now the linear regression approach has been apply in order to swap the nodes. The swapping has been take place between lower energy node and higher energy node.

4. PROPOSED ALGORITHM

Assumption

1. $Sensor_{network} =$ *Sensor network having M sensor Node*;
2. $Node = Sensor\ Node;$
3. $SN_{HT} = Sensor\ Node\ at\ high\ traffic;$
4. $SN_{LT} = Sensor\ Node\ at\ Low\ traffic$;
5. $S_T = Simulation\ Time$;

Algo( )
For (i=1 to i<=M)
{
Check traffic status of each node M (i) in network

If (Node M(i) is in Node HT)
Then
Node M (i) include in S nht

Else
Node M (i) include in S nlt

}

For (i=1 to i<=number of node in Snht)
{
If(energy (Snht(i) < Lower limit))
{

1. *Apply linear regression over Snlt and search node for swap*
2. *Swap the node from Snht to Snlt*

}

5. SIMULATION DETAIL & PERFORMANCE MEASURE

To implement the concept, the aodv.cc file has been modified. When the simulation starts function named "command" is invoked. All the modification related to the wormhole is done in this function. Functionality to create wormhole nodes by reading the node ID from the file is added in this function. The Tcl script calls this function to create wormhole in the simulation.

Table 1: SIMULATION DETAIL

Parameters	**Values**	
Number of Nodes	Vary from 40 to 100	
Area	40	600*300
	50	600*300
	100	1000*800
Traffic	CBR	
Simulation Duration	100 Mili Seconds	
Packet Transmission Rate	1024 kbps	
Carrier sense threshold Used In Normal Nodes	200 Meter	

The performance metrics which are used to analyze the performances of routing protocols in heterogeneous ad hoc networks are discussed in the following:

Performance Parameter

Packet Delivery Ratio: Packet delivery ratio of total number of packets successfully delivered during data transmission to total number of packet send. For any ideal routing protocol it is required that it has higher Packet delivery ratio, whereas existing approach by using PF-MHR(Potential Field based mini-mum hops routing) Based On Potential Field have lower packet delivery ratio as compare to proposed methodology by using LR(Linear regression)- Based On Potential Field

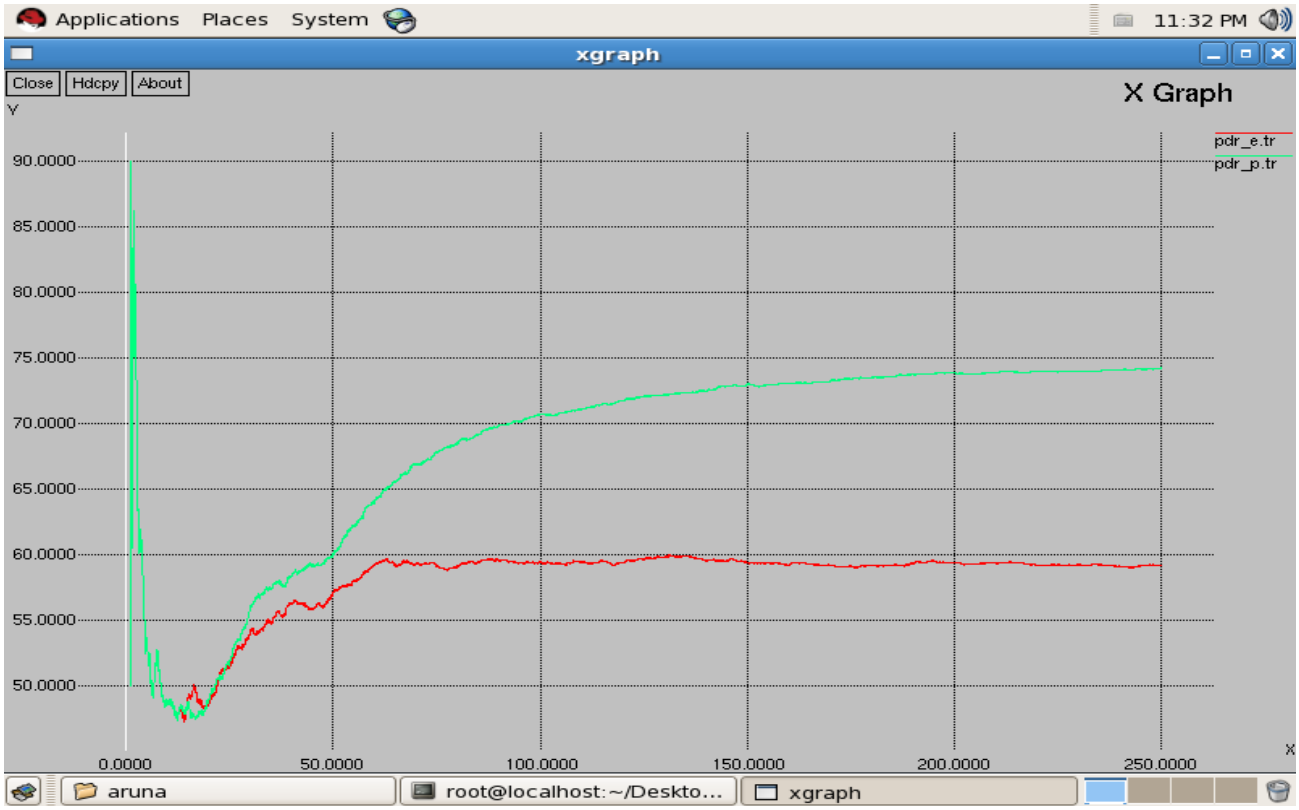

Figure 2: Comparative Analyses of packet delivery ratio of Proposed and Existing Approach

Routing Load: - Routing load is the overhead required to search route from source to destination and establish an end to end connection from source to destination. For any ideal routing protocol it is required that it has lower routing load, whereas existing approach by using PF-MHR Based On Potential Field have required higher control packet as compare to proposed methodology by using LR- Based On Potential Field.

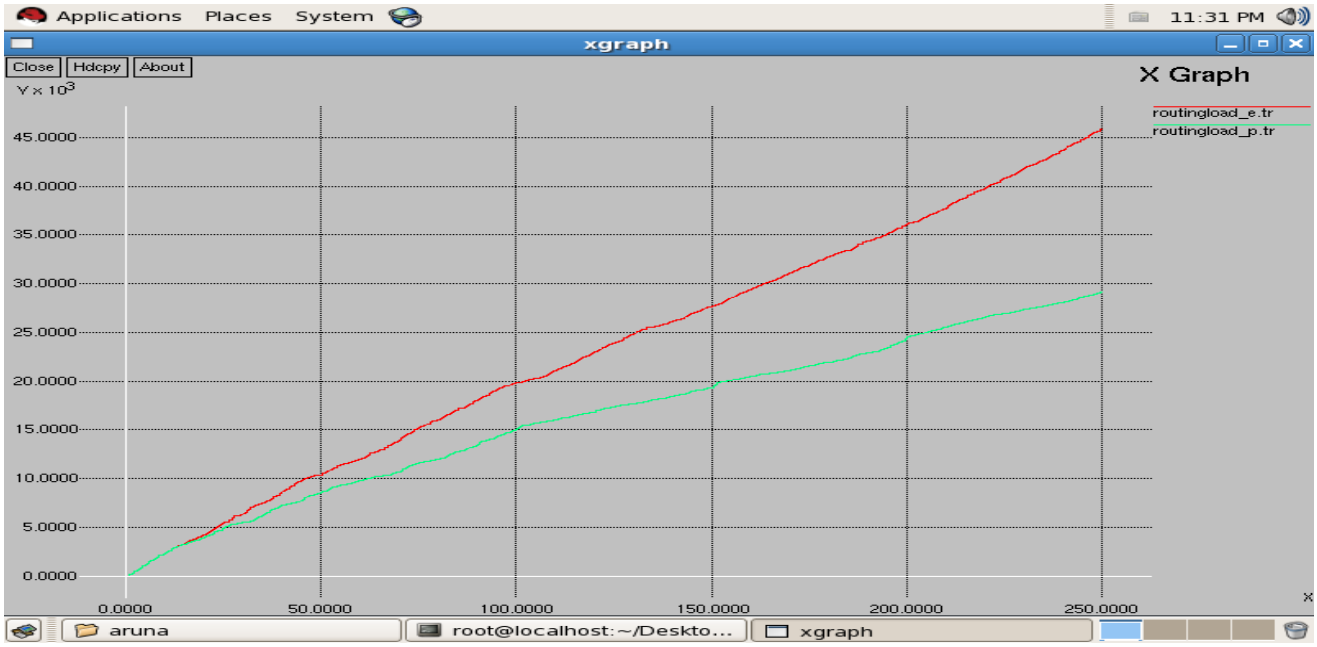

Figure 3: Comparative Analysis of Routing Load of Proposed and Existing Approach

Energy Consumption by Node: - Energy consumption means battery power used by any node for successful transmission. Higher energy consumption degrades the survival of network. And lower energy consumption maintains longer survival of network. For any ideal conduction network need longer survival. Using this protocol the retransmission will be reduced where existing methods are only able to minimized redundant path. Existing approach by using PF-MHR Based On Potential Field have required higher battery power consumption as compare to proposed methodology by using LR- Based On Potential Field.

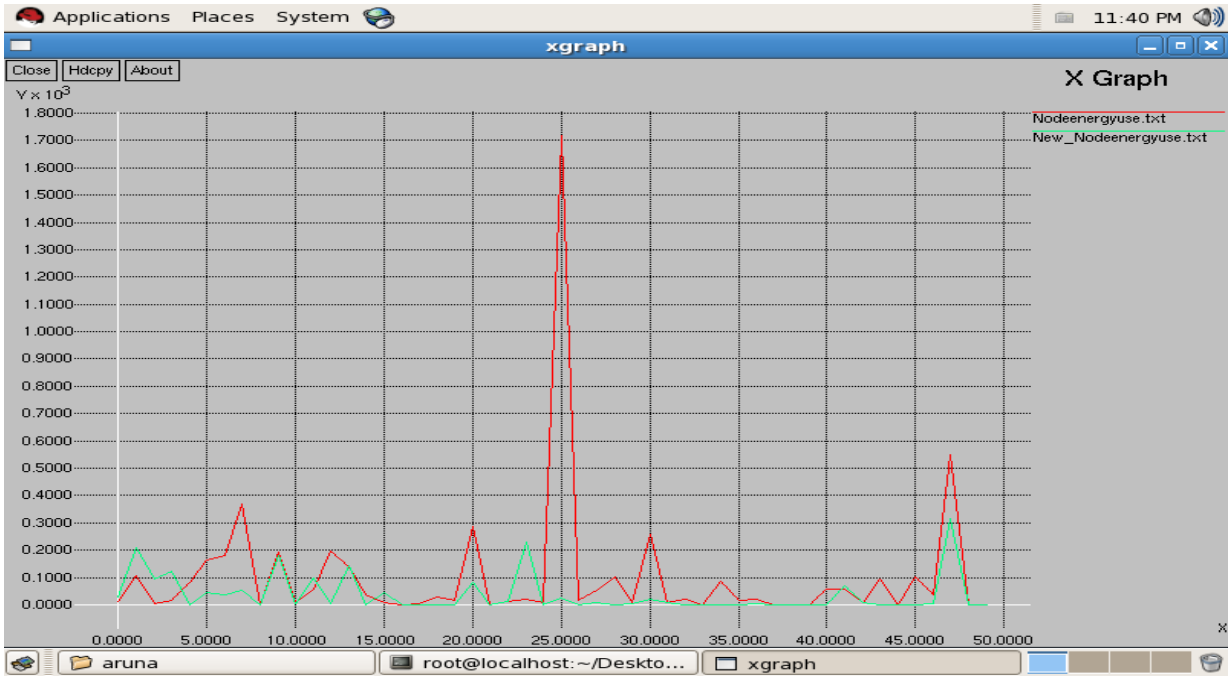

Figure 4: Comparative Analysis Of Node Energy Consumption Of Proposed And Existing Approach

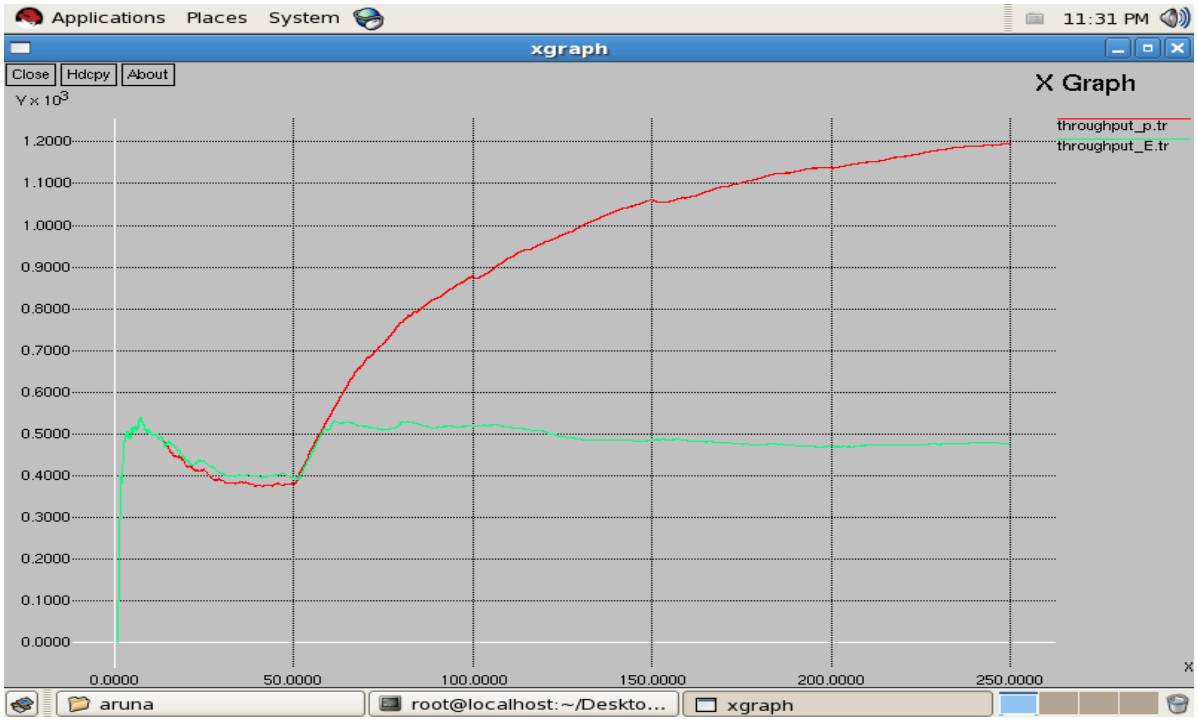

Figure 5: Comparative Analysis of throughput network of Proposed and Existing Approach

Throughput:- In any sensor network it is required to have higher throughput ie need to increase rate of successful packet transmission.

6. CONCLUSION

In the previous study, multiple disjoint paths are discovered among source and destination. Among the discovered routes, the optimal paths are selected based on bandwidth constraints, delay constraints and path stability. When any flow request is received, it is initially categorized as real time and non-real time flows where real time flows are given higher priority. This paper a novel secure location added data transfer protocol for multipath energy efficient routing over sensor network is presented. This method encapsulate advantage of two different predefine method in order to overcome their limitation. First swam intelligence and second one is bi partite graph. Proposed protocol tries to provide supplement support to lower energy node at heavy traffic by higher energy node from lower traffic of network.

In order To enhance the reliability using redundant paths in the network, it is suggested to have a maximum number of paths between the source and the destination. It is necessary to have a minimum number of nodes in each redundant path. Network reliability is increased in networks multipath disjoint nodes, where each node disjoint path has a maximum number of redundant paths and the minimum number of nodes in each redundant path. In the multi-path network node disjoint, the reliability is very high the performance of proposed technique is depending upon network density and network traffic.

The proposed work has been tested for large density of nodes having grate combination of different types nodes. The high density networks shall cause the a lot of probabilities of getting higher quantity of traffic and a lot of probabilities of malicious nodes within the network thence the operating of the planned work shall be checked upto nice extent.

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