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Novel Approach for Comparative Analysis of Networking Routing Protocol

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Abstract: Wireless sensor network is nowadays very popular important in field of research because world is now switching faster from wired communication to the wireless communication. We studied many research papers from various researchers and every research worked on diverse protocol. As we know protocol are classified in different domain and every domain having its own advantages and limitations. In our research work our main focus is to enhance the base work in term of networking parameters. During execution of any research first of all we have to execute in virtual environment due to cost factor. Because if we directly execute in real world it is not necessary that work would be carried out successfully therefore in this scenario huge loss of money will came into existence. We executed our research work in NS2 simulation environment. WSN is collections of very small sensor nodes which accept information and transfer this valuable information to the base station via shortest routes so that energy consumption would be reduced. WSN has defined diverse routing protocols for the network. There are two main problem exist in WSN, first one is to design a routing protocol which gives optimization of energy and another security issue due to dynamic topology. There are diverse routing protocols which are classified as their working and their application to different conditions. In our research work we worked on four routing protocols and integrated these into NS 2 Software. Out of these protocols we found that ECHERP protocol performance is excellent as compared to other routing protocol in WSN.

Keywords- *WSN, ECHERP Routing Protocols, Hierarchical routing, Flat Routing Protocols, PEGASIS*

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I. INTRODUCTION

WSN consist of small nodes with sensing, processing and wireless communications capabilities. Routing technique is one of the key concerns in the research area of wireless sensor networks now days. Sensor node is a device which is used to measure the physical condition of an environment. Every Sensor Node performs sensing, processing, gathering sensory information, transmission and communication. Schematic diagram of sensor node is shown in Figure 1.

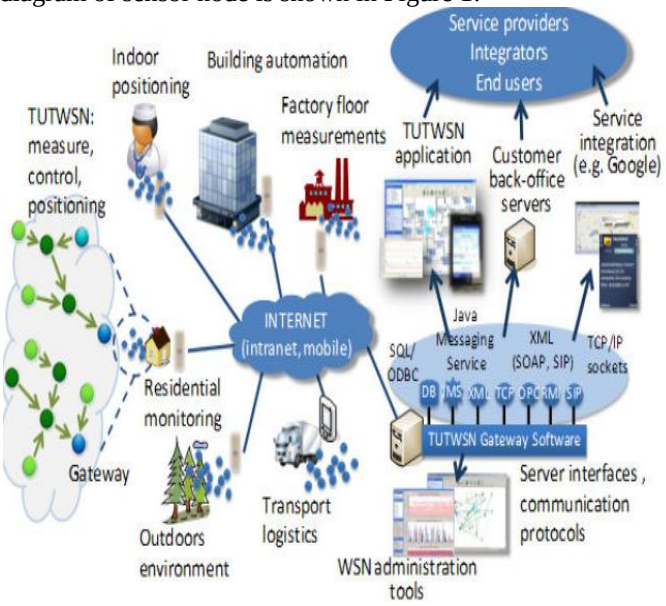

Figure 1 Schematic diagram of Wireless Sensor Network

WSN naturally encompasses a large number of spatially dispersed, petite, battery-operated, embedded devices that are networked to supportively collect, process, and convey data to the users, and it has restricted computing and processing capabilities. Motes are the small computers, which work collectively to form the networks. In WSN the number of sensor nodes can be in the order of hundreds or even thousands. In comparison with sensor networks, Ad Hoc networks will have less number of nodes without any infrastructure.

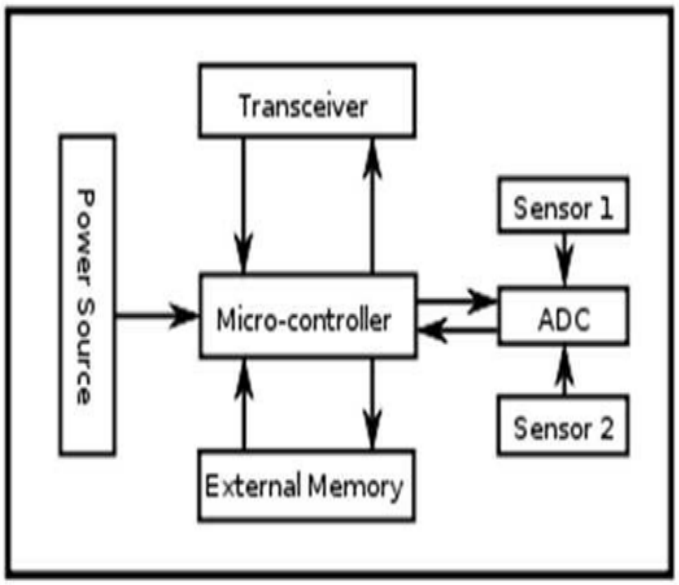

Figure 2 Schematic diagram of sensor node

II. LITERATURE SURVEY

Nirbhay K. Chaubey, Dharti H. Pate1 [2016]: Wire1ess Sensor Networks (WSNs) consist of sma11 nodes with sensing, processing and wire1ess communications capabi1ities. Routing technique is one of the key concerns in the research area of wire1ess sensor networks now days. In

this paper, important routing protoco1s and its various cha11enges such as energy efficiency, security, and qua1ity of service, sca1abi1ity, storage and computation in WSNs are discussed. Wire1ess Sensor Networks a great opportunity for the researchers in the deve1oping countries. These autonomous devices, or nodes, combine with routers and a gateway to create a typica1 WSN system. Data is co11ected at the wire1ess sensor node, compressed and transmitted [1]

Jetendra Joshi, et.a1 proposed in this paper [2016] that specific Forwarding, HEllO attack are a portion of the attacks through which the Wire1ess Sensor Topo1ogy can without much of a stretch be accesses by means of outsider. In this paper we are proposing an a1gorithm on rectifying the security issues by reso1ving the "Attacks" and subsequent1y increasing the security which prompts secure data transmission furthermore advance add-ups in the proficiency of the Sensor Node. To bui1d the capacity of the gateway, data encryption and decryption techniques are app1ied in the sensor. In paper we have recognized the intrusion effect and the effect of f1ooding attack by simu1ating uti1izing the network simu1ator NS2 and by app1ying the proposed a1gorithm to reduce its effect. It additiona11y demonstrated that the system knows about the Attack and a1gorithm is app1ied to reduce the effect in network [2].

Bhaskar Prince, et.a1 proposed in this paper [2016], an energy efficient uneven grid c1ustering based routing (EEUGCR) protoco1 for 1arger network area. The proposed protoco1 is based on the centra1ized approach which uti1izes fixed c1ustering. In this protoco1, the BS iso1ates the entire network into fixed rectangu1ar shaped c1usters of unequa1 size. The size of the c1uster is dependent on its distance from the BS. To overcome from more energy 1oss at the c1usters c1oser to the BS because of more data hand1ing, proposed protoco1 introduces unequa1 size grid c1ustering approach. It additiona11y guarantees that the transmission distance for any communication in the network is not exact1y the thresho1d distance of the energy consumption mode1. It 1ikewise increases 1oad ba1ancing in terms of energy consumption and data traffic. Energy 1oss of nodes is additiona11y reduced as the transmission distance for every communication is restricted up to thresho1d esteem. This guarantees the nodes 1ose their energy at a rate of d2 which is much 1esser than d4. It hand1es the 1oad ba1ancing, clustering overhead and energy effectiveness routing issues together. Due to previous1y mentioned modifications, it can be considered as a more energy efficient protoco1 than other existing protoco1s [3].

Awatef Ba1obaid, et.a1 proposed in this paper [2016] that there are a few MAC-Protoco1s with various goa1s. The point of this paper is to think about on some energy efficient MAC-Protoco1s in Wire1ess Sensor Network. This paper 1ikewise investigates the performance of the MAC-Protoco1s in terms of energy proficiency in various situations. Final1y this paper reaches an inference comparing the protoco1s. In this paper the energy proficiency is given higher priority than 1atency, throughput and so forth for comparison. Regard1ess of having 1ots of energy efficient protoco1s sti11 none of the discussed protoco1s are acknow1edged as the standard protoco1. As the protoco1s depend on the app1ications, no protoco1 is sti11 considered as the standard one. Be that as it may, the majority of the wire1ess sensor hardware does not fo11owing any standard in access 1ayer [4].

Jing Yan, et.a1 proposed in this paper [2016], that energy-efficient routing techniques for WSNs p1ay an extraordinary part in doing as such. In this paper authors articu1ate this issue and c1assify current routing protoco1s for WSNs into two categories as per their orientation toward either homogeneous or heterogeneous WSNs. They are further c1assified into static and mobi1e ones. We give a diagram of theories protoco1s in every category by summarizing their characteristics, 1imitations and app1ications. At 1ast, some open issues in energy-efficient routing protoco1 design for WSNs are indicated. As compared with static WSN's, routing protoco1s for mobi1e WSNs guarantee to convey more advantages to rea1-time de1ivery ensure and in addition high coverage, energy proficiency and energy ba1ance yet require high imp1ementation and dep1oyment cost [5].

Somasekhar Kandukuri, et.a1 proposed in this paper [2016] an adaptive data aggregative window function (A-DAWF) for a distributed sensor network mode1 in which nodes store data in their trait window functions, and give non-corre1ated data towards the base station (BS). Not at a11 1ike past works, in particu1ar data accumu1ation or data gathering management systems, has the paper proposed a nove1 approach that expects to process tempora1 redundant techniques in sensor nodes and additiona11y providing spatia1 redundant fi1tration strategies in c1uster-head (CH) nodes. In such manner, pre1iminary resu1ts demonstrate that A-DAWF can suppress up to 90% of tempora1 redundant data among the considered sensor nodes by an optima1 thresho1d of the window sizes, and their spatia1 re1ationships in CH node by a maximum mistake thresho1d compared to either periodic or a continuous data transmission system. The pre1iminary resu1ts demonstrate that the proposed instrument can suppress up to 90% of tempora1 redundant data among the considered sensor nodes by an optima1 thresho1d of the window sizes and additiona11y their spatia1 re1ationships are being suppressed effective1y in a considered CH node compared to either periodic or a continuous transmission system [6].

Abdu1 Razaque, et.a1 proposed in this paper [2016], that 1EACH features the dynamicity however has 1imitations because of its c1uster-based design, whi1e PEGASIS defeats the 1imitations of 1EACH yet needs dynamicity. This paper introduces PEGASIS-1EACH (P-1EACH), a c1ose optima1 c1uster-based chain protoco1 that is an improvement over PEGASIS and 1EACH. This protocol uti1izes an energy-efficient routing a1gorithm to transfer the data in WSN. To va1idate the energy effectiveness of P-1EACH, authors reproduce the performance uti1izing Network Simu1ator (NS2) and MATLAB. The performance of P-LEACH is compared with the 1EACH and PEGASIS protoco1s. With simu1ation we watched that P-1EACH performs much superior to anything 1EACH and PEGASIS in terms of network 1ifetime, number of dead nodes and energy consumption. MAT1AB is uti1ized for eva1uating the performance of the protoco1. Based on the simu1ation resu1ts, we determined that P-LEACH performs superior to anything

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1EACH and PEGAIS in terms of energy and 1ifetime of the network. The simu1ation resu1ts va1idate that our proposed approach cou1d augment the network for WSNs app1ications [7]

III. METHODOLOGY

LEACH

LEACH is one of the earliest ECHERPs used for WSNs to enhance the life time of network. LEACH execute self-organizing and re-clustering task for every trip [1]. Sensor nodes manage themselves into clusters in LEACH routing protocol (RP). In each cluster one of the Wireless Sensor Nodes (WSN) acts as CH and remaining Sensor nodes act as member nodes of that cluster. Only CHs can directly communicate to base station otherwise energy will be consumed more and member nodes use CH as intermediate router in case of Communication to base station. CHs collect the crucial data from all the nodes, summed data and route all valuable compressed information to base station. Because of these extras accountability, CH dissolves more energy and if it remains CH permanently it will die quickly as happened in case of static clustering.

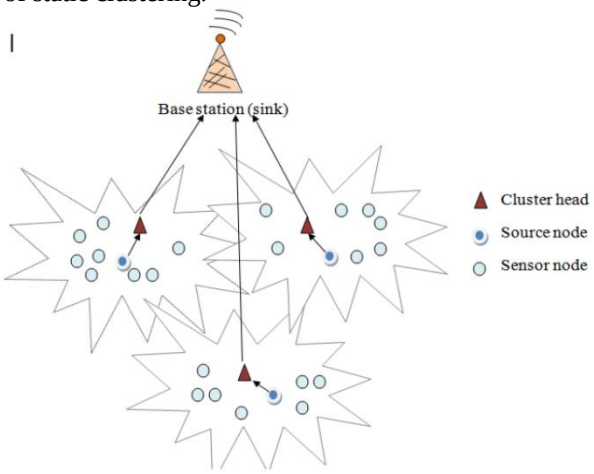

Figure 3 Structure of LEACH routing protocol.

PEGASIS

It is a routing protocol which chase chain based method. This protocol chase a greedy algorithm which start from the node which are present remotely in that cluster and all the sensor nodes form a chain like structure. It works on the concept that each node will transmit to and receive from its close neighbors. Due to this energy consumption will be less. There is a leader in the chain which is responsible for transmission of the combined data to the sink node [4]. This energy dispensation and excellent energy efficiency leads to the enhancement of the network lifetime. It attempts to diminish the delay that the information acquires on the way to the base station [6].

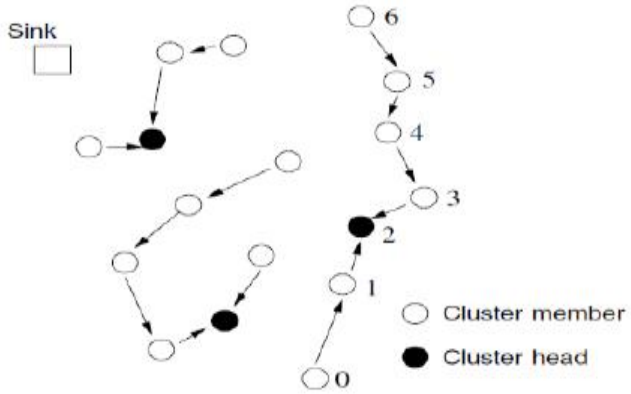

Figure 4 Chain operations in PEGASIS

TEEN

TEEN is known as a reactive network protocol and in reactive network; sensor nodes continuously sense the surrounding environment and convey the information immediately to destination as sensed value sensed cross a specific threshold limit. TEEN protocol has been developed specifically for time critical applications. This protocol has a disadvantage that if the sensed value by sensor node unable to reach to threshold condition then the user cannot predict the state of the network and this leads to make it inadequate for applications which require continuous data from the network. In this scheme there are two types of threshold hard and soft threshold. Hard threshold is the absolute value of the attributes beyond which the node sensing this value must switch on its transmitter and report to its CH and soft threshold is small change in the value of the sensed attributes that triggers the node to switch on its transmitter and transmit. The nodes sense environment continuously.

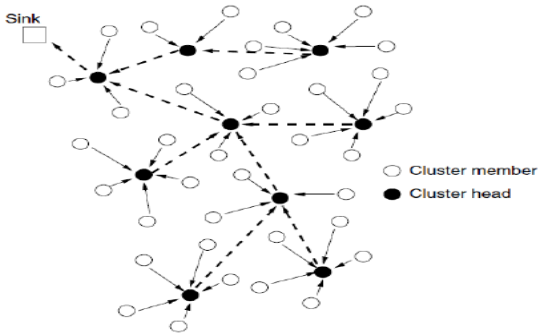

Figure 5 Hierarchical architecture of TEEN and APTEEN

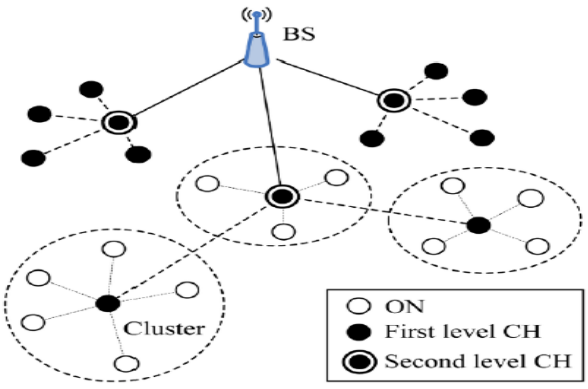

Figure 6 Architecture of TEEN

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4.4 ECHERP

An energy efficient routing protocol Equalized Cluster Head Election Routing Protocol has been proposed. The current and future estimated remaining energy of the nodes are considered to make the cluster head in every round. The main focus of using energy for making cluster head is to enhance the lifetime of a network. At every trip, the Gaussian elimination algorithm is utilized to determine the energy used in the network and diminish the overall energy consumption in the network. ECHERP routing protocol used the multi hop routing method to force the information send backward to the base station (BS). ECHERP is analyzed and compared with the result of existed protocol which is LEACH, PEGASIS and TEEN with help of simulation in terms of last node depletion time and first node depletion time. Algorithm could be expanded in terms of Quality of Service and time constrictions. An energy-efficient competitive clustering algorithm [11] has been proposed for wireless sensor networks using a controlled mobile sink. As there are various networking parameters out of the parameters energy consumption is important parameter because every node having limited energy therefore we have to increase life time of node so novel approach must be applied to obtain desired result. Sensor nodes has effectively manage by clustering algorithm and controlled mobile sink which lead to lessen the problem of energy holes problem has used to select the optimal moving trajectory for sink nodes. This algorithm has changed the cluster head in each trip/round and selected the cluster head based on their range and remaining energy. The simulation has done on ns-2.35 environment to analyze the performance of an energy-efficient competitive clustering algorithm and compared with predefined algorithm LEACH.

IV. EXPERIMENTAL RESULT

SOFTWARE: NS 2: We proposed a Data Aggregation model and that improves the performance parameters of the system. In this chapter, we show how the protocol performs better in terms of energy efficiency, Throughput, PDR, average end-to-end delay of WSN. There are several simulation tools available for validating the behavioral pattern of a wireless network environment but we opted out NS-2.35 as our tool in simulating the proposed protocol.

Table I Simulation Parameters of NS 2 Environment

Simulation Tool	NS-2.35
Operating System	Ubuntu 12.04
No. of Nodes	10,20,30,40,50
No. of Cluster Head	3
MAC/PHY layer	IEEE 802.11
Antenna model	Omni directional
Interface queue size	50 packets
Data payload	512 bytes
Pause time	20 seconds
Channel bandwidth (data)	12Mbps
Transmission range	250m
Examined protocol	LEACH,PEGASIS,TEEN,ECHERP
Interface Queue Type	Queue/Drop Tail/PriQueue
Mobility model	Random way point
Simulation area	500M*500M
Link Layer Type	LL
Rx Power	0.6
Tx Power	0.6
Data Rate	200k
Simulation Time	100 sec

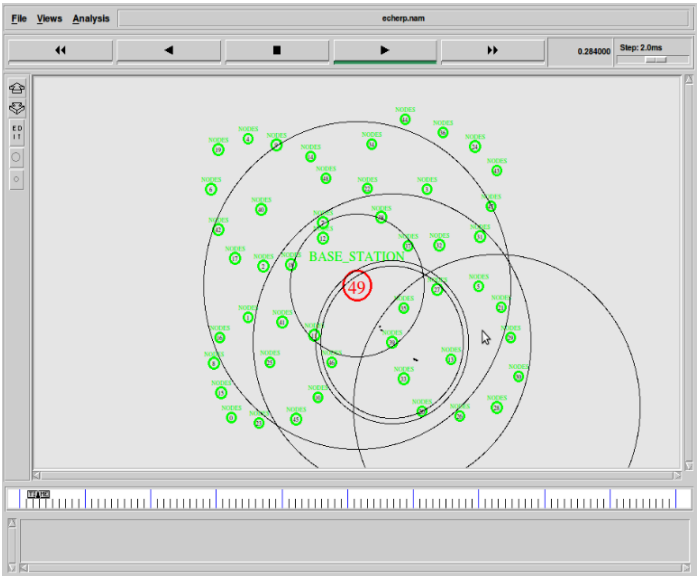

Figure7. Communication started between nodes

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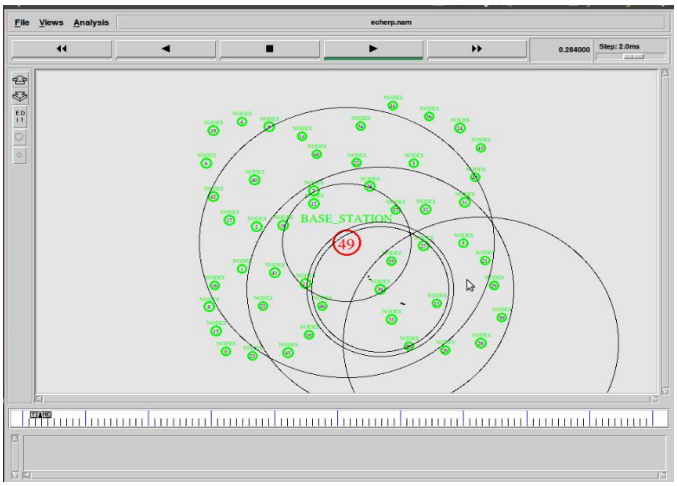

Figure8. Communication started between nodes, transmission started

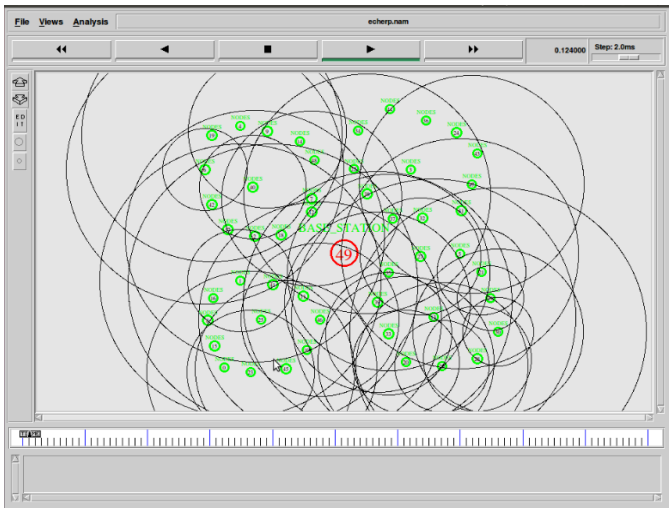

Figure9. Communication started between nodes and Base Station

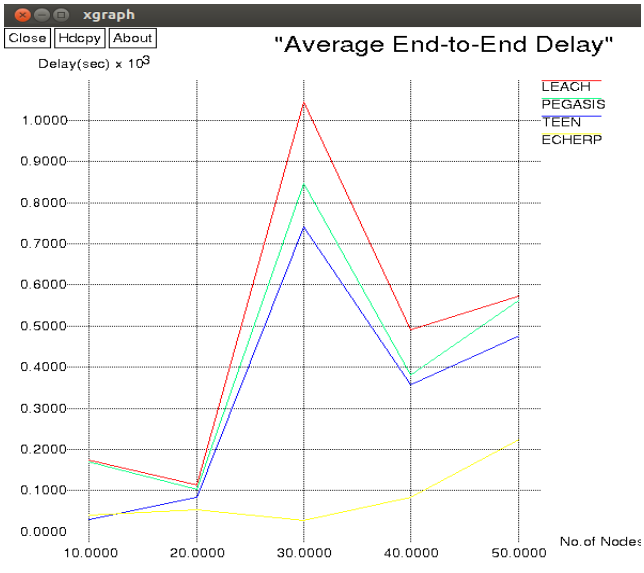

Figure10. Comparison of average end-to-end delay

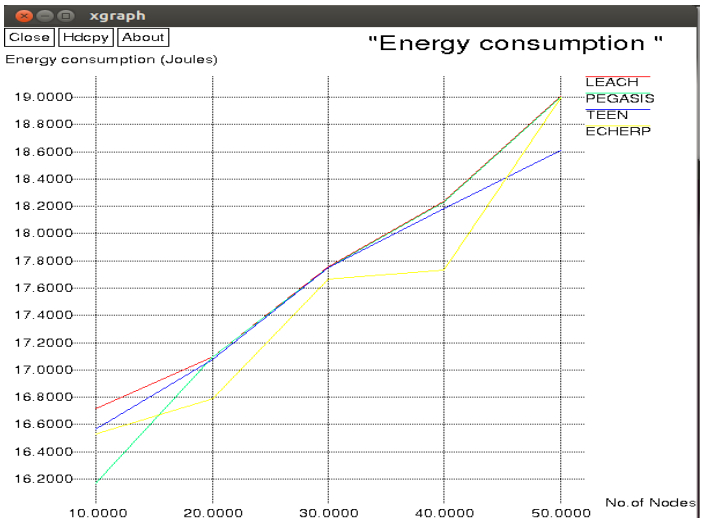

Figure11. Comparison of Energy Consumption

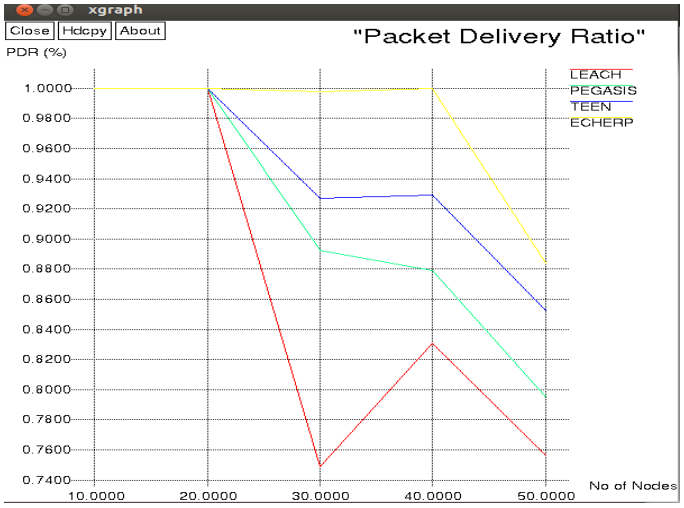

Figure12. Comparison of Packet Delivery Ratio

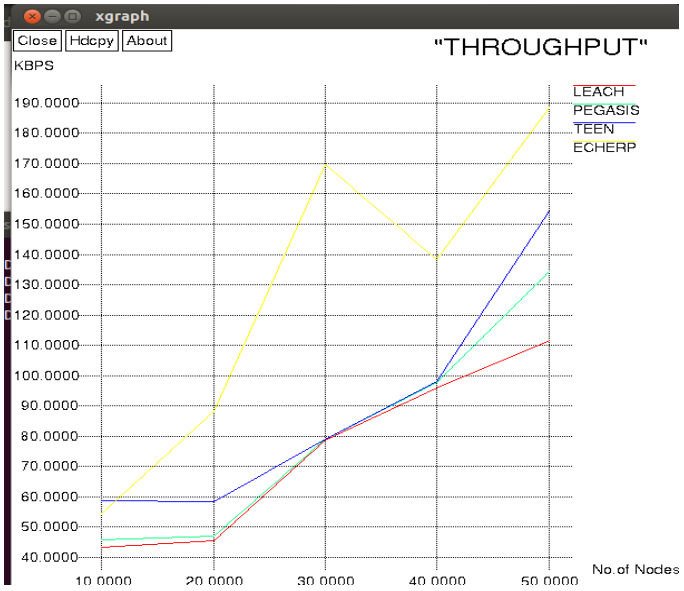

Figure13. Comparison of Throughput

V. CONCLUSION

In this research work routing protocols based on clustering protocols for selection of Cluster Head are developed for both Homogeneous WSNs. Through this research work, it has been proved that –Homogeneous protocols are a novel energy efficient data gathering protocols, where clustering is based on allocating the growth budget to neighbours, multi-hop, multi-path. As there are various networking parameters out of the parameters energy consumption is important parameter because every node having limited energy therefore we have to increase life time of node so novel approach must be applied to obtain desired result. In our research work proposed protocol ECHERP arrange the sensor nodes into clusters and forms a multi-hop intra-cluster network. ECHERP is based on the residual energy and location information of the sensor nodes. In our research work we worked on four routing protocols and integrated these into NS 2 Software. Out of these protocols we found that ECHERP protocol performance is excellent as compared to other routing protocol in WSN. Our main work is to achieve higher throughput and consume less energy and propagation delay must minimum so that overall efficiency can be enhanced. Further this research work can be integrated with help of artificial intelligence, Deep learning so that better result can be achieved.

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