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To Propose an Improvement in Relay Based Routing to Reduce Fault in WBAN

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ABSRACT

In order to sense the body conditions, the wireless body area network is designed which has within it the seven sensors that can sense the functionality of bodies. These sensors sense the conditions and pass information to the transmitter. The transmitter receives the sensed information and performs required actions according to human body conditions. The main problem which occurred in the wireless body area network is FAULT. The fault may occur due to failure of sensors and due to battery degradation of the sensors. To recover fault scheme for relay nodes which extra nodes deployed with the sensor nodes is used. It helps to improve network performance in terms of energy and packet loss.

1. INTRODUCTION

Body Area Network is a latest technology in wireless field which is uses in number of application for monitoring of health and fitness, device control and emergency response [1]. In this network there are some low profiles, low power devices that are interconnected in this way so that it creates sensor nodes consist of one and more sensor device known as microcontroller unit (MCU) and one radio transceiver that get rid of wire to make connection with coordinator nodes to transfer data from one node to other. The coordinator node functions in two ways either as a gateway to transfer data to an external health care monitoring system and as a local monitoring and self control hub. In these days wireless MCU has been introduced [2].
Nowadays single chip of hardware is introduced in which MCU and radio transceiver in a single package according to the external components. Basically sensors devices operate at access low level interface by loading MCU interfaces as a return it obtain data from actual sensor devices. It contains all the necessary instructions fetch from actual sensor devices. It also converts raw data into information which can be interpreted using logical information by using radio chip. These wireless nodes are worn and wrapped around human body [3].

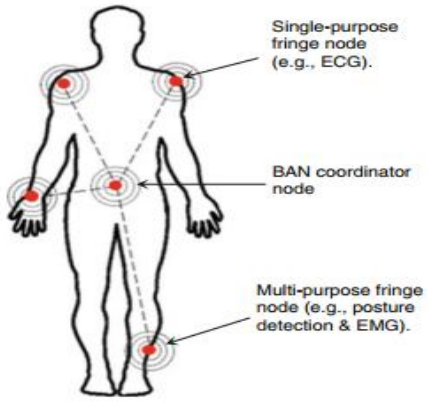

Fig.1.1 Body Area Network

There are various parts of the WBAN which help in providing proper monitoring of the body actions. It consists of portable, miniaturised and independent sensor nodes within it. There is no affect of the monitoring procedure on the normal lives of people and the day to day activities are analyzed on regular basis. The medical applications mainly involve this kind of system [4].

A WBAN consist of two parts one is in-body and other is on-body to monitor patient information regularly for diagnosis and perception. Within the multimedia and games related applications, the on-body sensors are applied. There are two categories of WBAN which are on-demand emergency and normal traffic [5].

On-demand traffic is triggered by the doctor and coordinator to fetch information especially for diagnosis purposes. It can be continuous and discontinuous type.
When the nodes exceed the predefined threshold the emergency traffic initiates. It should take less than a second to access this traffic [6]. There are no predictions made on this on daily basis and is very different from predictions made.

The traffic that does not involve any time limitations and on-demand events in it is known to be normal traffic [7]. There are daily checkups of patients and treatments of various serious diseases which are done through the applications of such techniques. With the help of the central controller or coordinator, the normal data present

within the applications is gathered and processed for analysis [8].

2. Review of Literature

Khan et.al (2013**)** [9] presented in this paper the study on IEEE802.15.4/Zigbee MAC based wireless body area network. This application runs on various daily monitoring systems which record the daily conditions of patients. An OPNET based simulation model is utilized here within these systems. The results provided show a proper analysis on the patient's health and determine all the related issues. As per the simulation results it is seen that from remote locations, the patients can be monitored with the help of WBAN without any making any delay and compromising their health.

Rassan et.al (2014) [10] examined that the potential limitation of PV's is short keys generation, which can be easily brute forced and high computational cost whereas in Pre-loading the keys are not random and require enough keys storage. In this paper they will merge PV's and pre-loading techniques by using electrocardiography (EKG/ECG) values of PVs and pre-loading based schemes to strengthen the security. The applied technique will enhance the security as well as reduce storage and power consumption.

Xu et.al (2014) [11] proposed in this paper an energy-efficient routing method for WBAN. This proposed method utilizes the genetic ant colony algorithm within it which involves the two different algorithms that are the genetic algorithm as well as the ant colony optimization. There is an enhancement of both time and quality with the combination of these methods. Energy is balanced amongst all the nodes that are present within source to base station along the path followed with the help of the distance-based energy aware routing algorithm presented in this paper.

Pan et.al (2015) [12] explained that sensor node and body worn coordinator is harmful and poor to conditions of channel. This happens due to variations of sensing condition between sensor nodes and coordinators. In this paper two hop relay mechanism is proposed in IEEE 802.15.6 standard and divide it into relay node election, channel assessment, data relaying process. Experimental result shows that predefined relaying process improves 50% of packet delivery rate. Moreover network lifetime is also extended to 8%. In future to improve packet delivery rate more, dynamic scheduling algorithm can be used.

Arya et.al (2014) [13] reveal that the wireless body area networks are of three types on the basis of the clothes, body and skin of the humans. The newly proposed methods of WBAN and the various MAC protocols are presented in this paper. The health of the human is to be monitored to provide proper health and care related solutions for them. These systems are developed with the help of this technology. The sensors help in this process and the movement of the patients is not a factor to be affecting their conditions.

In the section 3, various routing protocols of wireless body area network is discussed. In the section 4, proposed technique is elaborated for fault recovery in the network. The section 5 described that performance analysis of proposed and existing scheme in the form of graphs

3. Protocols for Wireless Body Area Networks

There are various WBAN Routing protocols. These protocols are [14]:

a. M-ATTEMPT: Mobility-supporting Adaptive Threshold-based Thermal-aware Energy-efficient Multi-hop protocol (M-ATTEMPT) for WBANS

In M-ATTEMPT, high data rate nodes are placed near the human sink. Nodes are placed away from the sink when they have low data rates. The protocol operation applied on the different phases. Hello messages are broadcast in initialization phase [15]. This contains information neighbour and from sink in terms of hop count. In the routing phase, routes with minimum hops are selected for data transmission from nodes to the sink. If routes are available with minimum hop counts is selected. The low data rate nodes send their data to the nearest high data rate nodes which send the aggregated data to the sink. In M-ATTEMPT, single hop and multi-hop communication to enhance network lifetime. TDMA slots are assigned to the nodes after route selection. But in M-ATTEMPT nodes are characterized into three phases according to their data rates [16]:

1. Parent nodes
2. First level child nodes
3. Second level child nodes

During the movement of human body if any child node moves away from its parent node, then it get associated with other another nearest parent node to save energy. Hot-spot condition occurs due to excessive heat up of nodes.

b. SIMPLE (Stable Increased Throughput Multi-hop protocol for Link Efficiency in WBAN): In SIMPLE eight nodes are placed at different location of the body and having sink at the waist. SIMPLE protocol is divided into different phases. In the initial phases sink broadcasts information packet of short length to the other nodes to inform its position on the human body. Every node contains a node ID, residual energy value and its location. In the next phase, a forwarder node is selected which route the data of other nodes with saving energy. The forwarder is selected based upon its distance from sink and its residual energy. The node having minimum distance from sink and having maximum residual energy value is selected as a forwarder. All the corresponding nodes send data to the forwarder node which aggregates the received data and routes it to the sink. For the child nodes TDMA slots are used [17].

c. FEEL (Forwarding Data Energy Efficiently with Load Balancing in WBAN): It is a protocol to improve stability period and throughput. Total eight numbers of nodes are deployed on the human body. Node 8 is for ECG and node 7 for glucose level sensor. Mostly two types of

topologies have been used for sink deployment. First of all sink is deployed on the chest and in second case it is deployed on the wrist. HELLO messages are broadcast for initialization in the first phase. It contains three types of information:
1. Location of sink
2. Location of neighbour
3. Information about the possible routes to the sink.
The node receives HELLO message and update the routing table [18].

4. Proposed Methodology

The wireless body area network is type of network which is used to sense the body conditions. The sensors are deployed in such a manner so that efficiently sensed data can be transmitted to transmitter. The communication in the wireless body area network is multi-hop communication. In this type of communication source node establish shortest path to destination. When source node is transmitting data to destination in between some sensor nodes get faulty or battery of the sensor nodes degraded due which fault may arise in the network. The relay based technique used relay nodes for fault recovery in the network. In this work, further improvement will be proposed in relay based network to reduce network complexity. The proposed enhancement will be based on dynamic routing. In this routing, multiple paths will be established from the source to destination. When battery of any sensor node reduced to threshold value, new path will be automatically chosen for data transmission. This technique may leads to reduce in network complexity, reduce network delay, reduce energy consumption and increase network throughput.

There are number of nodes deployed in the network. Sink is also available in the network. Nodes transfer data through intermediate node to the sink. Node which wants to communicate with sink, data is transferred through intermediate node. During data transmission or forwarding data faults may be occurred at intermediate node in the network. Due to fault, network performance degrades in terms of throughput, packet loss, delay and energy. Transmission of data also affected due to fault occurrence.
In the proposed algorithm technique of MCDM is applied for the selection of relay node to forward data to base station. In the technique of MCDM, comparison is made between various relay nodes in terms of energy and buffer size and node which has best resources is selected as best relay for path recovery.

Algorithm

```
Set M Sensor  Node's
Set S sender and R receiver
Node Routing = AODV
Set Route
{ If (route from S to R found)
      { Check number of route;
            If (route => 1)
              {
                    Find (energy of each route && energy > 20)
          Select only 3 routes as a best route //shortest path
             Send route acknowledge through all exist path
      }
}
Else {route unreachable} }
 {
   Source send( Ping message, adjacent nodes)
   {
      Adjacent nodes revert back to source which can recover path
      Check( Node which has higher energy is path recover node)
          {
             Increment-Q;
             Store incoming   data;
             }
   Receiver receives data from I node;
   Send ACK to sender S;
    }
}
```

5. Experimental Results

The proposed and existing scenarios are implemented in NS2. The NS2 is the event based simulator which provides both type of animation and text based simulations. In the performance analysis it analyzed that proposed technique perform well in terms of energy, throughput, pdr, network lifetime and routing overhead.

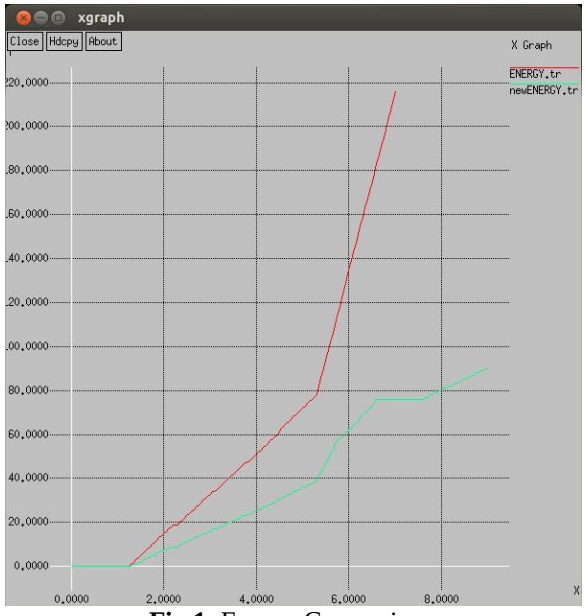

Fig 1: Energy Comparison

As illustrated in figure 1, the energy comparison is made between existing and proposed schemes. In the existing scheme due fault in the network, packetloss is increased at steady rate due to energy consumption of the network increased. The proposed technique will recover the network fault and it leads to reduction in energy consumption of the network.

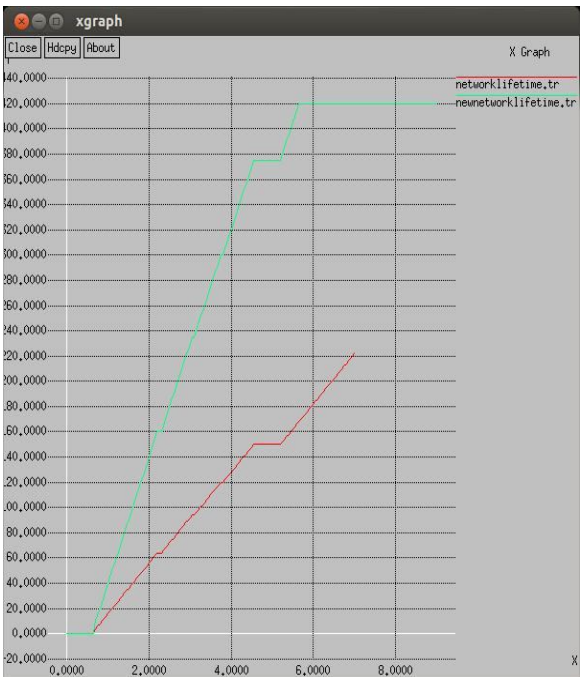

Fig 2: Network Lifetime Comparison

As shown in figure 2, comparison of proposed and existing scheme is done in terms of network lifetime. The red line represents the network lifetime of existing scheme and green line represents network lifetime of proposed scheme. The network lifetime is increased due to fault recovery in the network

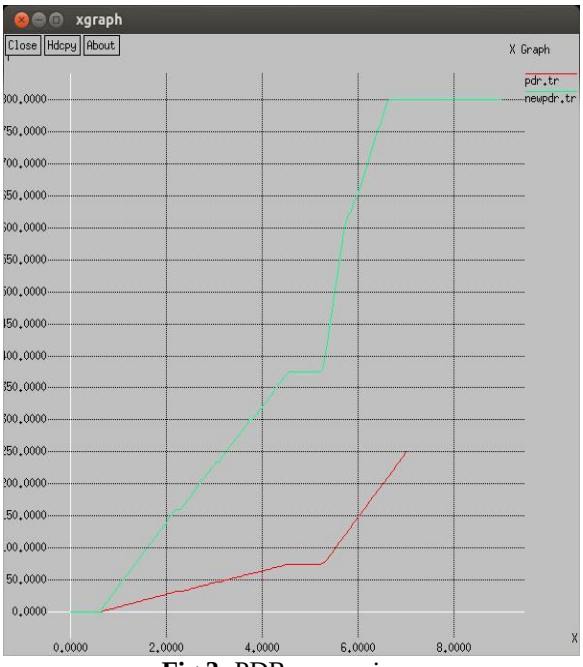

Fig 3: PDR comparison

As shown in figure 3, comparison is made between the proposed and existing scheme in terms of PDR. The PDR stands for packet delivery ratio. When fault occurred in the network packetloss occur in the network due to which pdr reduced in the network. When fault is recovered pdr is increased in the network

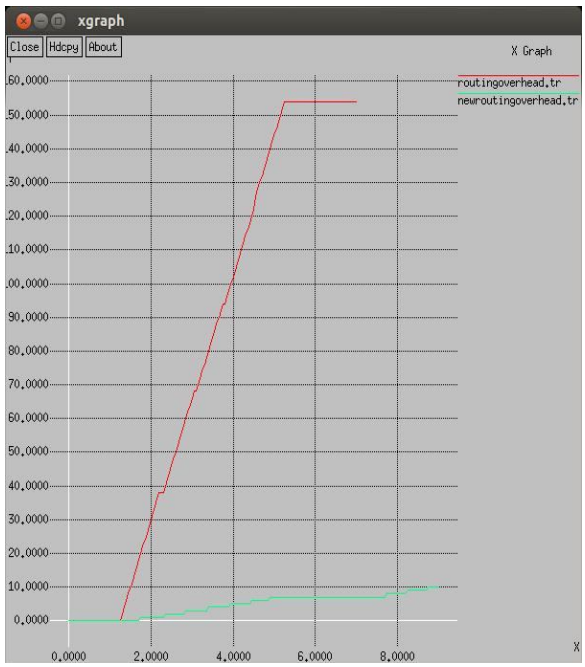

Fig 4: Routing overhead

As shown in the figure 4, routing overhead of the proposed and existing scenario is shown and when fault is recovered in the network source node need not to send packets again and again which reduce routing overhead

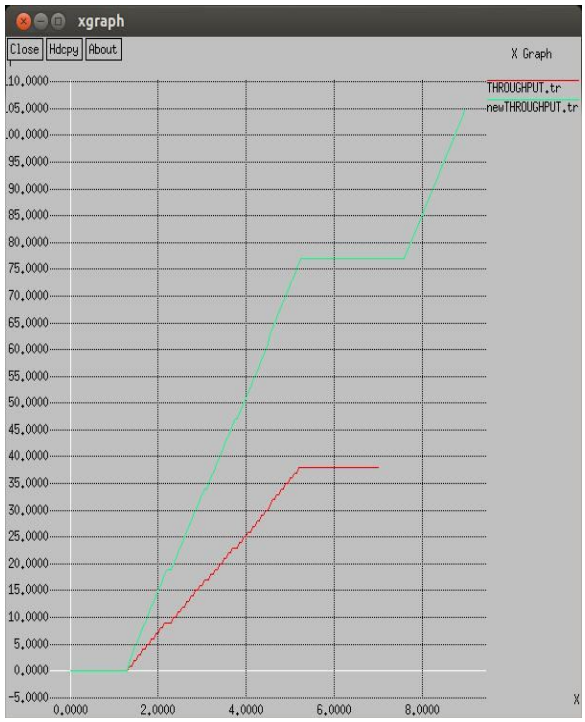

Fig 5: Throughput compression

As illustrated in figure 5, throughput comparison is made between proposed and existing scenario and due to fault recovery in the network throughput increase at steady rate as compared to existing scenario.

4. Conclusion

In order to sense the surrounding conditions, the wireless sensor network is designed which helps in gathering the conditions such as temperature and pressure from the area around it. for sensing the conditions of a body, the wireless body area networks are proposed which help in monitoring the various conditions of body through certain parameters such as the temperature and pressure of the body. It consists of seven different sensors within it. These sensors sense the conditions and pass information to transmit. The transmitter receives sensed information and performs required actions according to human body conditions. The main problem which occurs in the wireless body area network is of fault. The fault may occur due to failure of sensors and due to battery degradation of the sensors. In the proposed technique, a fault recovery technique in wireless body area network has been discussed. To recover fault author proposed scheme for relay nodes which extra nodes deployed with the sensor nodes. It helps to improve network performance in terms of energy and packet loss.

References

[1] Jang, L., Jing, L., Ming, L., Bin, Y.,and Wenlong, L., (2015) "A Novel Energy Efficient MAC Protocol for Wireless Body Area Network", China Communications

[2] Arya, A., and Bilandi, N., (2014) "A Review: Wireless Body Area Networks for Health Care", International Journal of Innovative Research in Computer and Communication Engineering", Vol. 2, Issue 4

[3] Bangash, J. I., Abdullah, A. H., Anisi, M. H., and Khan, A. W., (2014), "A Survey of Routing Protocols in Wireless Body Sensor Networks", Sensors 14, 1322-1357

[4] Sanchez, P. P., Tapiador, J. E., Lopez, P. P., and Tangil, G. S., (2014), "Secure Publish-Subscribe Protocols for Heterogeneous Medical Wireless Body Area Networks", Sensors 21, pp. 345-376

[5] Murtaza, S., Masud, R. A., (2013), "Study and Analysis of Scientific Scopes, Issues and Challenges towards Developing a Righteous Wireless Body Area Network", International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-3, Issue-2

[6] Movassaghi, S., Abolhasan, M.,and Lipman, J., (2013), "A Review of Routing Protocols in Wireless Body Area Networks", Journal of Networks, Vol 8, No 3, 559-575

[7] Khan, P., Hussain, M. A.,and Kwak, K. S., (2009), "Medical Applications of Wireless Body Area Networks", International Journal of Digital Content Technology and its Applications Volume 3, Number 3

[8] Rahim, A., Javaid, N., Aslam, M., Rahman, Z., Qasim, U.,and Khan, Z. A., (2011), "A Comprehensive Survey of MAC Protocols for Wireless Body Area Networks", Science direct, pp. 37-119

[9] Khan, J. Y., Yuce, M. R., and Karami, F., (2013), "Performance Evaluation of a Wireless Body Area Sensor Network for Remote Patient Monitoring", Semantic scolars, vol 3, issue 7

[10] RASSAN, I. A. A.,AND KHAN, N., (2011), "SECURE & ENERGY EFFICIENT KEY MANAGEMENT SCHEME FOR WBAN – A HYBRID APPROACH", IJCSNS INTERNATIONAL JOURNAL OF COMPUTER SCIENCE AND NETWORK SECURITY, VOL.11 NO.6

[11] Xu, G., and Wang, M., (2014), "An Energy-Efficient Routing Mechanism Based On Genetic Ant Colony Algorithm for Wireless Body Area Networks", JOURNAL OF NETWORKS, Vol. 9, No. 12

[12] Pan, R., Chua, D., Pathmasuntharam, J. S., and Xu, Y. P., (2015) "An Opportunistic Relay Protocol with Dynamic Scheduling in Wireless Body Area Sensor Network", IEEE Sensors Journal

[13] Arya, A., and Bilandi, N., (2014), "A Review: Wireless Body Area Networks for Health Care", International Journal of Innovative Research in Computer and Communication Engineering, Vol. 2, Issue 4

[14] Wang, W., and Li, C., (2009) "Integrated Application of WBAN and WSN", NCM, Proceedings of the 2009 Fifth International Joint Conference on INC, IMS and IDC

[15] Yuce, M. R., Ng, P. C., Lee, C. K., Khan J. Y., and Liu, W., (2007) "A wireless medical monitoring over a heterogeneous sensor network", 29th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Conference Proceedings, Lyon, France

[16] Soomro, A.,and Cavalcanti, D., (2007), "Opportunities & Challenges using WPAN and WLAN Technologies in Medical Environments", IEEE Communications Magazine, vol. 45, no. 2, page 114-122

[17] Poon, C. C. Y., and Zhang, Y-T., (2006), "A Novel Biometrics to Secure Wireless Body Area Sensor Networks for Telemedicine and MHealth", IEEE Communications Magazine, vol. 44, no. 4, pp. 73-81

[18] Golmie, N., Cypher, D., and Rebala, O., (2005) "Performance analysis of low rate wireless technologies for medical applications", Computer Communications, 28, Elsevier, pp. 1266-1275