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Cooperative Hyper-Scheduling based improving Energy Aware Life Time Maximization in Wireless Body Sensor Network Using Topology Driven Clustering Approach

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Abstract—The Wireless Body Sensor Network (WBSN) is an incredible developing data transmission network for modern day communication especially in Biosensor device networks. Due to energy consumption in biomedical data transfer have impacts of sink nodes get loss information on each duty cycle because of Traffic interruptions. The reason behind the popularity of WBSN characteristics contains number of sensor nodes to transmit data in various dense regions. Due to increasing more traffic, delay, bandwidth consumption, the energy losses be occurred to reduce the lifetime of the WBSN transmission. So, the sensor nodes are having limited energy or power, by listening to the incoming signals, it loses certain amount of energy to make data losses because of improper route selection. To improve the energy aware lifetime maximization through Traffic Aware Routing (TAR) based on scheduling. Because the performance of scheduling is greatly depending on the energy of nodes and lifetime of the network. To resolve this problem, we propose a Cooperative Hyper-scheduling (CHS) based improving energy aware life time maximization (EALTM) in Wireless Body sensor network using Topology Driven Clustering Approach (TDCA).Initially the method maintains the traces of transmission performed by different Bio-sensor nodes in different duty cycle. The method considers the energy of different nodes and history of earlier transmission from the Route Table (RT) whether the transmission behind the Sink node. Based on the RT information route discovery was performed using Traffic Aware Neighbors Discovery (TAND) to estimate Data Transmission Support Measure (DTSM) on each Bio-sensor node which its covers sink node. These nodes are grouped into topology driven clustering approach for route optimization. Then the priority is allocated based on The Max-Min DTSM, the Cooperative Hyper-scheduling was implemented to schedule the transmission with support of DTSM to reduce the energy losses in WBSN. This improves the energy level to maximization the life time of data transmission in WBSN than other methods to produce best performance in throughput energy level.

Keywords- WBSN;scheduling; energy aware-routing; delay tolerance; topology driven clustering; Life time maximization;

I. INTRODUCTION

The Wireless Body Sensor Network (WBSN) is attentive nature of WSN for transmitting body sensor values n cooperative communication medium this become a great part for monitoring human health information to transfer data under WSN medium called Personal health records (PHR). The data transition in WBSNs have delay problems under irresponsible network senor nodes, relay, routing , such as mitigation or aging of the population, tension and a variety of rampant chronic illnesses such as increasing other health workers and facilities. Therefore, more people want to use technology as fast as possible WBSN. The monitoring information and communication in recent trends have consumes more energy, latency to increase the complexity of the nature which is an ongoing result WBSN. Due to more consumption, the network life time be reduced leads information losses because of energy loses under the dependencies of routing constraints in sensor nodes. The WBSN are identified as dominant in modern day computing world by on time

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communication on carrying energy aware information in sensor nodes. The reason behind the popularity of WSN is its characteristics. Any network is intended to provide services to their users. Figure 1 shows the WBSN communication process

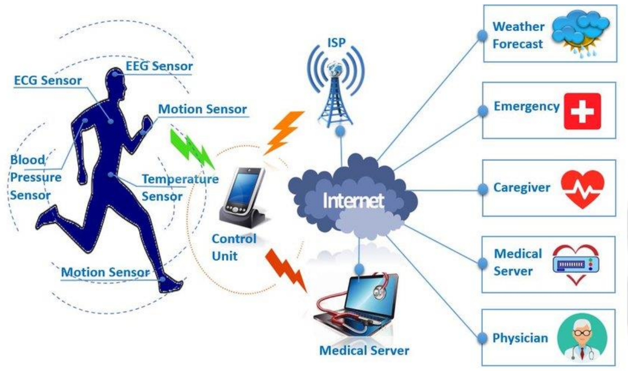

Figure 1. WBSN communication process

The wireless sensor network has been used in several situations by the organizations. The organizations setup the WSN for number of purposes, like to maintain their data, provide access to the data and provide services to their customers in accessing any data. Similarly, the WSN has been used in many areas like war filed and educational institutions. However, the services available in the network cannot be accessed directly by any sensor due to the restrictions of physical characteristics.

At WBSNs, all devices, including sensors, personal digital assistants and smartphones, are connected to each other via a wireless connection. All these devices, energy / electricity to keep connected and services have been restricted. These ultra-small sensors to reduce energy and power are important reasons for the dangerous impact of minimal heat on the human body

The WBSN is comprised with number of sensor nodes where each sensor has a radio device with the specific configuration as per transmission range which limits the sensor node in communicating with the other sensor nodes are permuted at transition under relay mode be in communication medium. Similarly, WBSN senor node comes with a battery to store power to be used in data transmission. This also restricts the sensor node in restricting the number of data transmission to be performed. According to this, the process of data collection enforced in Warfield which collects data from different sensors located geographically. However, the data collection process faces energy loss problems. The data transmission considered as cooperative medium hold the energy information which required to reach the data sensors are less compare to the number of nodes. The data sensors are geographically distributed in the network, and to reach the data sensors there exist number of routes. Among the available routes, only a specific route will be used for the process. Such selection of route to be performed to improve the performance and the nodes of the route should be scheduled.

The scheduling is the process of selecting energy aware routing contained sensor from cooperative communication medium and assign their state between wakeup and sleep mode. When all the sensor nodes which are not participate in any transmissions in specific duty cycle are active or wakeup mode. This introduces energy depletion in relay nodes under the sensor nodes by listening to the incoming signals, it loses certain amount of energy. This affects the lifetime of the entire wireless sensor network which must be considered. This research is about the maximization of lifetime in WSN by designing optimal scheduling strategy.

In general there are number of scheduling strategies available which involves in the route selection first based on various parameters like hop count, energy, traffic and so on. But the most approaches suffer to achieve higher scheduling performance due to the lack of considering the maximum parameters. On the other side, the lifetime of the entire network is depending on the performance of scheduling. Further, the route selection has higher impact in the quality of service of the network. This research is about improving the scheduling performance in such a way to maximize the lifetime of the entire WSN

A. Problem identification factors

- The existing method does not consider the lifetime maximization support of any route which introduces poor lifetime of Bio-sensor network.
- The traffic based scheduling approaches schedule the nodes only the traffic time which leads to energy lose in many nodes which affect the lifetime of the network.
- Most of the scheduling in WBSN, data transmission are non-dependant in topology driven sensor nodes according to the energy of nodes which leads to the energy drain in frequently scheduled specific small set of nodes in short span.
- The scheduling of Bio-sensor nodes performed according to the energy schedules unwanted sensors to wakeup mode which are not participate in any data transmission and they lose energy in listening for the incoming packets. This introduces higher energy loss and affect the lifetime of the network.

B. Objectives and considerations

- To design efficient scheduling scheme which consider many factors like energy, traffic, number of transmission, number of neighbours and so on.
- The scheduling scheme should consider the previous cycle condition of any node in scheduling to wakeup node.
- To design efficient scheduling scheme which consider the transmission support of any route and lifetime support also.
- The method should consider the topology constraints in scheduling and identifying the routes and finding the most required nodes to be scheduled for any cycle

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Further, the research on scheduling and lifetime maximization in WSN can be carried forward by adapting Neighbour condition based self-scheduling which can be restricted in minimum hop level. By monitoring the Neighbour nodes and its condition, the sensor can schedule itself to provide a route to support data transmission.

II. RELATED WORK

Numbers of approaches are discussed in literature towards scheduling in lifetime maximization in WBSN. This section details set of methods related to the problem

An information-centric networking-based framework via WBSN as a key enabler of e-health applications. Wireless body sensor network (WBSN) users face many issues when using IP networks, including packet loss and security [1]. Therefore, an Information-Centric Network (ICN) has been proposed to solve such problems by utilizing many advantages such as efficient resource management. Scalability, reduced traffic and security. ICN routers have a caching function that caches content.

Sensor nodes in these applications receive control information from the mobile station to adjust the operating mode, requiring the mobile station to transmit information data. However, unlike easily rechargeable mobile stations, body sensor nodes suffer from a lack of energy that affects the life of the node [2]. To solve this problem, Design a new Medium Access Control (MAC) layer protocol to increase energy efficiency and extend the life of WBSNs body sensor nodes Physiological data is collected by the biosensor nodes and transferred to the BNC via intermediate nodes or forwarders. Forwarder nodes are selected based on a cost function. The cost function depends on the residual energy of the node and the path loss between the sensor node and the Body Node Coordinator BNC [3]. In each round of execution, the body sensor node with the maximum value of the cost function is selected as the forwarder.

The purpose of WBSN is to physiologically monitor vital signs of the patient, route-related data to the base station as a result. Because the environment of such networks is mainly human, it is necessary to modify the data routing mechanisms used in traditional wireless networks (WSN, WANET, etc.) and adapt them to the challenges of WBSN routing, need to address even more limitations [4]. Intra-body WBSN routing protocols have limitations and limitations compared to protocols specific to intra-body WBSNs, and are expected to be efficient and robust.

This report has focused on the development and implementation of wireless body sensor network technology (WBSN) in the health care system [5]. Body area network (BAN) technology establishes a system for monitoring the health of the patient using a small wireless sensor device which is arranged inside or around the human body. However, because this technology must maintain system-critical security and data and maintain high confidentiality, power failure, sensor validation and system compatibility, data integrity, and costs, Face unique design and implementation challenges, such as privacy concerns.

With the Heat-Warning System, the firefighter can permanently monitor the body's core temperature in order to protect it from collapse [6]. Moreover, by placing multiple temperature sensors around the thorax in certain conditions, the relative location of the dangerous heat sources can be estimated. Regarding the location of the sensor nodes, an empirical channel model coupled with a cubic body model was used to estimate individual transmission path losses by taking into account the influence of the human body.

Many wireless communication technologies, Magnetic Induction (MI) is a novel signal transmission technique is promising, its inside, have been proposed for WBSNs [7][8]. Based wireless communication system - It combined the resonance frequency of the source power to consider the application of impedance matching networks in order to increase the efficiency of routing. Equivalent circuit model of MI coils are used to calculate the parameters of the matching circuit.

To save energy in a wireless body sensor networks, a framework of adaptive compressed classified for action recognition have been proposed [9]. Mechanism estimates the minimum activity-specific compression ratio subject predetermined recognition accuracy, based on feedback from the results of the adaptive behaviour recognition, to adjust the number of samples taken by the sensor node.

The human body sensors, sensing the physiological signs via a wireless media using radio waves, calculation, and communication [10]. This process generates heat inside and around human tissue. The reason is the energy use by an electronic circuit of the electromagnetic energy and the sensor nodes sensor antenna to be used [11]. This is to influence the human tissue; it is important to reduce the designing a routing protocol in order to ensure the service quality of the thermal stability.

An important event such as maintaining energy efficiency is designing a computing power program, which is a difficult task due to the network topology force algorithm, strict constraints, and power supply [12]. As an integral part of the design, WBANs gathered Routing Protocol, which is a key part of any communication stack, plays a significant impact on network performance.

WBSNs, wireless transmission, active and passive protection from attacks, have been exposed in various ways. As a result, WBSNs collected from the protection of personal information is very important [13]. The main challenge in designing the application and WBSNs primarily concentrated. Wireless sensor, the health condition of the patient is monitored 24 hours,

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or to avoid any of the emergency states, it is possible to take the appropriate steps in the case of such a situation [14]. The main design is, in these applications, is seeking an appropriate solution, such as security, privacy, accuracy, and to challenge as energy consumption.

Wearable sensors can be connected to form a wireless body sensor network(WBSN) for use in physiological monitoring and continuous medical However, the wireless connection between devices, the body is vulnerable to the current common energy inefficient and eavesdropping attacks, it is achieved by emitting a signal to the surrounding space[15]. That is, stored as a WBSN records for the domain name specified only IoT device data based on routing in DNS protocol and asymmetric encryption user is allowed to query, after being encoded by the data transfer, the IoT data encryption, however, the decoded [16]. All virtual nodes are automatically registered in the DNS, prototype system exceeding a name-bound virtual networks (NBVNs) name is bound to the network traffic is restricted in each NBVN. Through the preliminary evaluation, confirmed the validity of the secure communications and privacy stored in IoT remote monitoring in the mechanism

Energy efficiency (EE) WBAN consisting of sensor nodes with energy harvesting capability to communicate with an aggregator sensor nodes (SNs). In order to provide a low computational complexity quasi-optimal solution, using the structure of the optimization problem, it derives an upper limit and a lower limit formula of the source rate of SN [17]. The simulation results, energy, optimal allocation of source rate to the importance of SN was revealed that improve system performance of WBAN in terms of EE in different daily activities

A vehicle makes its way into the ad-hoc network had the sensor data transmission, which has become a major concern for the security researcher. Encryption-based solutions, trust-based solutions, an affirmative approach, two-trust characteristics of acceptability and a confidence level of the first study were considered to create a new confidence-inference model that was chosen in comparison to measuring subjective belief-based confidence, the specific vehicle of confidence [18].The reliability of the probability Trust-based Probabilistic Broadcast (TPB) based on the reliance on the overhead reduction caused by a malicious node, particularly the rebroadcast probability, is determined. In order to gain the trust of the terminal, the lightweight trust management model is designed based on direct and recommended trust evidence. Depending on the fidelity of the terminal, the rebroadcast order of the packets is calculated to give way to the delay of the re broad cast. The new approach, called "Protocol for Optimize.

Optimized Light Weight Secure (OLWS)", improves overhead reduction and security. In OLWS, the hash keyword dynamic is calculated based on the complexity of the generated node complexity decreases. Like the attack, the protocol lead to the initial detection of the attack, only the leader of the enemy node cluster is identified. Rich Simulation NS2 performs very well, performing its OLWS based on good results showing results, energy consumption, security level increases and many times [19].

Wireless Sensor Network (WSN) Improvement With the new routing protocol, many wireless sensor networks have been developed. Wireless sensor routines protocols over networks. Network energy constraints directly intent a protocol to rule directly and the inspectors have access to its properties [20, 21]. Wireless sensor network, sensor node, various security issues, i.e., in the case of vulnerability and malicious attacks. Network security for the control of a limited number of sources such as bandwidth demands [22], memory, computation cost and minimum energy consumption of the sensor terminal becomes impossible [23].

III. MATERIALS AND METHODS

First, The Wireless Body Sensor Network (WBSN) is an incredible developing data transmission network for modern day communication especially in Biosensor device networks.

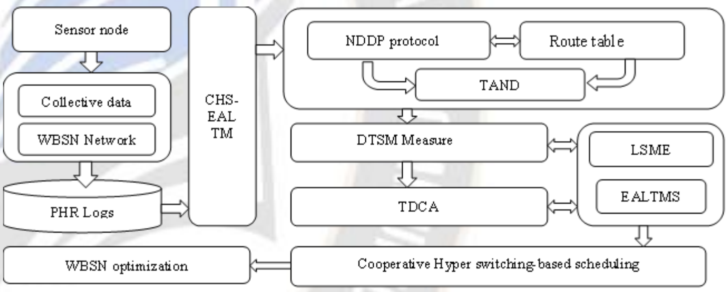

Figure 1. Example Architecture For proposed system CHS- EALTM

Due to energy consumption in biomedical data transfer have impacts of sink nodes get loss information on each duty cycle because of Traffic interruptions. The reason behind the popularity of WBSN characteristics contains number of sensor nodes to transmit data in various dense regions. Due to increasing more traffic, delay, bandwidth consumption, the energy losses be occurred to reduce the lifetime of the WBSN transmission. So the sensor nodes are having limited energy or power, by listening to the incoming signals, it loses certain amount of energy to make data losses because of improper route selection. To improve the energy aware lifetime maximization through Traffic Aware Routing (TAR) based on scheduling. Because the performance of scheduling is greatly depending on the energy of nodes and lifetime of the network. To resolve this problem we propose a Cooperative Hyper-scheduling (CHS) based improving energy aware life time maximization (EALTM) in Wireless Body sensor network using Topology Driven Clustering Approach (TDCA).

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Initially the method maintains the traces of transmission performed by different Bio-sensor nodes in different duty cycle. The method considers the energy of different nodes and history of earlier transmission from the Route Table (RT) whether the transmission behind the Sink node. Figure 2 shows the Architecture For proposed system CHS- EALTM. Based on the RT information route discovery was performed using Traffic Aware Neighbour Discovery (TAND) to estimate Data Transmission Support Measure (DTSM) on each Bio-sensor node which its covers sink node. This nodes are grouped into topology driven clustering approach for route optimization. Then the priority is allocated based on the Max-Min DTSM, the Cooperative Hyper-scheduling was implemented to schedule the transmission with support of DTSM to reduce the energy losses in WBSN. This improve the energy level to maximization the life time of data transmission in WBSN than other methods to produce best performance in throughput energy level.

A. Network Route Discovery

The cooperative communication needs traffic less data transformation based on the route information processed from route table. This stage discovers the data transmission rate from bio-sensor observation to transfer the data by identifying shortest distance route (SDR) based on the neighbour distance discovery protocol (NDDP).

By each time stamp, the duty cycles update the data transmission rate depends on the packets transmission arrived on route in distribution level. This methods identifies the least energy consumption from list of sensor nodes response by identifying target level form source node to destination node.by selecting the best route on energy consumption level alternatives to transmission by selecting targeted scheduling to make cooperative communication

The WBSN collective sensors be targeted by the transmission nodes from the cooperative communication medium

Service adaptive targeted List (SList) = $\int_{i=1,j=1}^{size(Network)} \sum Sensor \in Network(i,j)$

Each duty cycle considers the transmission rate to the service level dependencies are monitored from each time stamp during node response. DcT $= \sum_{k=0}^{n} \binom{D}{s} x^k i^{n-k}$, where s is the source node and D is the destination node in single duty cycle at ‘x’ nodes containing data at k-transmissions.

By considering the service list from sensor nodes in network of network controllers NoTc, from source transmission ‘s’ be identified by each shortest node be calculated as,

NoT = $\int_{i=1}^{size(NeT)} \sum NeT(i).sensor == s$

The WBSN response rate are varying from the detecting feature limits by generating transmission packets during different time windows. Also the different sensor nodes have different transmission rate, by ensuring mean depth transmission rate before choosing the node on transmission rate. Based on this consideration the routes are identifies on different window from the location of service response nodes. The list of sensor node at transmission rate is identify from neighbour list is calculated as,

Neighbour list nl = $\int_{i=1}^{size(Slist)} \sum Slist(i).location < s.location \,\&\, s.transmission\ range >$

The NDD distance is observed by Euclidian distance measure from list obtained from

Route List Rl = $\int_{i=1}^{size(nl)} \sum Routes(nl(i), Destination) \in Network$

Depending the selected route list the scheduling strategy was performed in the cooperative communication.

B. Data Transmission Support Measure (DTSM)

The Transmission rate is estimated by number packets transmitted between the source nodes to destination by the average mean rate of time delay, node response rate, traffic consumption, energy losses in the cooperated communication medium. This feature dependencies are formalized in the route propagation by transfer from sensor route. Using the DTSM a single route is selected from each time window from the cooperative communication. When data transmission is performed it is necessary to identify set of routes available. In this approach, the route discovery is performed according to the location details available in the network topology. From the transmission history, the method collects the location details of different nodes in the network. Based on the response rate in communication medium each sensor is observed by DTSM rate belongs to the route to identify the list of routes based on the Location. Using this transmission support further be processed with scheduling

Algorithm: Data Transmission Support Measure (DTSM)
Given: Network N, Network Trace NeT
Obtain: Route List Rl
Begin
Read network topology.
Find the Sensor List Slist = $\int_{i=1,j=1}^{size(Network)} \sum Sensor \in Network(i,j)$

Compute No of Transmissions NoT = $\int_{i=1}^{size(NeT)} \sum NeT(i).sensor == s$

For each sensor s
Find the neighbours.

Nl = $\int_{i=1}^{size(Slist)} \sum Slist(i).location < s.location \,\&\, s.transmission\ range >$

For each Neighbour
Identify the routes through each Neighbour.

Route List Rl = $\int_{i=1}^{size(nl)} \sum Routes(nl(i), Destination) \in Network$
End
End
Stop

The neighbour sensor nodes depends on the relay transmission in transmission medium to utilize the route discovery along with path to identify the least distance. From the each distance covers the route contains neighbour nodes make the multiple shortest route. The above algorithm defines the list of sensor nodes on WBSN construction to identify the shortest path for scheduling.

C. *Topology Driven Clustering Approach (TDCA)*

In this stage the route are clustered into cooperative communication state and the sensor are grouped into relay clusters with formalised cluster head transmission support in route. Discovering proof of cluster head is performed which present more successive traffic with the assistance of exchanging the data between nodes of any network. For any packet being gotten through the network, the highlights are being removed and the separated highlights have Neighbour addresses through which the packet being navigated. From the historical backdrop of prior packets being gotten and with the present element vector an arrangement of extraordinary traversal way being recognized.

Algorithm:
Start
Initialize no of nodes In N.
Identify the All Features, compute access feature (CAF).
If CAF $\ni$ Node details →Traffic, node response, packet transfer speed, node active.
Then
Compute all the node details in network, neighbour nodes (ND)
End

ND= $\int \frac{Nodes\ (\sum CAF)}{Densityofnetwork}$

Compute Neighbor node details (NnD)
NnD= $\int Ni(Nna) * ND$
If NnD>Network Density Then
If Node(size)> no of packets
then
Choose the node and produce the login history and access history.
Node =$\sum \frac{Size(node)}{Densityofnetwork}$
End
Else
Allow the packet.
End.
Stop

The above-discussed algorithm identifies the cluster head in the network and products log in the contact history. From the unique arrangement of routing, a set of nodes are recognized which happened all the more much of the time and regular nodes through which the packets being crossed. Additionally, with the support of network topology, the set of an accessible route is distinguished to achieve the service point. By utilizing both the accessible route and one of a kind traversal route and current host succession, the node is being identified as a cluster head or not

D. *Lifetime Support Measure Estimation (LSME)*

The scheduling in this approach is performed according to the lifetime support measure of any route. There will be number of routes can be identified between the source and destination. For each route being identified, the lifetime support measure has been identified. In order to get selected, the route r considered should have higher lifetime support measure. It has been measured based on the transmissions performed by all the sensors of the route and their energy depletion. The route given is measured for the lifetime support measure (LSM) which shows the fitness of the route in achieving the maximum lifetime in WSN. The value of LSM is measured according to the number of transmission each sensor of the route involved, their depletion in energy. Using these two values, the method computes the lifetime support measure (LSM) for the route. The value of LSM is used to choose a single route to perform data transmission and scheduling.

Consider the route identified is R, then the hop list of the route is identified as follows:

Hlist =$\sum$ Hops $\in$ R

Where, Hope list (Hlist), Transmission List (Tlist), energy depletion (Edr)

For each hop H, the list of transmission performed is measured as follows:

$$\text{Tlist} = \int_{i=1}^{\text{size(NT)}} \sum \text{NT(i)}.\text{R} \in \text{H}$$

Similarly, the energy depletion of the Hop H is measured as follows:

$$\text{Edr} = \text{size(Tlist)}\times\mu$$

Using these two values of Tlist and Edr, the method computes the value of LSM.

$$\text{LSM} = \frac{\sum_{i=1}^{size(Hlist)} size(Tlist)}{size(Hlist)} \times \frac{\sum_{i=1}^{size(Hlist)} Hlist(i).Edr}{size(Hlist)}$$

Computed value of LSM is used to perform route selection and scheduling

The list of routes between the source and destination are presented. Similarly, the LMS measure computed on each route has been presented Routing Table. According to the measures estimated, the method performs route selection and scheduling.

E. Energy aware life time Max- scheduling (EALTMS)

The scheduling of sensor nodes is performed according to the scheduling weight. For any route available in the network it is necessary to consider the transmission support and lifetime support of different routes. In order to achieve higher quality of service parameters, the above mentioned factors should be considered. Also by choosing the route among the set of routes available, based on the scheduling weight the performance of the network can be improved. To perform this, the method computes the value of scheduling weight based on the transmission support and lifetime support values. The value of transmission support (TS) is measured according to the average value of energy and average number of transmission performed with the hop count. Similarly, the value of lifetime support measure (LSM) is measured according to the energy of all the nodes of the route considered. Using both of them the method computes the value of scheduling weight.

By estimating the Energy aware life time Max- scheduling, initially the get the Cluster preference depends on Topology Driven Clustering Approach (TDCA) And Lifetime Support Measure Estimation (LSME). Behind the Maximum weight be estimated by ‘x’ at ‘n’ number of nodes relates ‘R’ is the route which the data handles on the transmission medium.

Let as ‘x’ be the sensor nodes on the transmission route R be computed as average mean handles the packet at regular interval time ‘T’ as follows.

$$\text{Transmission Support Ts} = \frac{\sum_{i=1}^{size(R)} R(i).Energy}{size(R)} \times \frac{\sum_{i=1}^{size(R)} R(i).NoT}{size(R)} \times size(R)$$

By the transmission level the computing weight be averaged by TS, at the node handles less energy with time consuming to transfer packet.

$$\text{LMS} = \frac{\sum_{i=1}^{size(R)} R(i).Energy > Th}{size(R).TS}$$

By consuming the maximum energy contains the multiple of nodes have the same dependences on scheduling weight.

$$\text{SW} = \text{TS}\times\text{LMS}$$

Estimating the scheduling principles, the energy level nodes are carried out the Max scheduled constraints depending on the time contrarians from transmission state and required route levels. Each routing data on transmission nodes have the relay attention from scheduled weight which is updated from route Table (RT)

Algorithm: EALTMS estimation
Input: Ts, LMS, SW, Route R
Output: SW-Route
Step 1: Initialise the WBSN Network node Construction
Compute transmission rate from RT.
Attain transmission support by getting RT observation on each transaction Ts = $\frac{\sum_{i=1}^{size(R)} R(i).Energy}{size(R)} \times \frac{\sum_{i=1}^{size(R)} R(i).NoT}{size(R)} \times size(R) \in RT$ in max route relay support.

Estimate the LMS by attain the each node response from the relay node $\frac{\sum_{i=1}^{size(R)} R(i).Energy>Th}{size(R).TS} size(R) \in RT$ in max response rate.

Estimate the scheduling rate $size(R) \in RT$ in TS×LMS by the, multiple of both TS and LMS successive rate

The life time support based on the energy constraints which presents the transmission support to create the cooperate links on high supported node response rate belongs to the relay node. Each transmission and relay node assigns the continual link in transmission to estimate the mean depth value.

F. Cooperative Hyper switching based scheduling

The hyper switching scheduling computes the average delay transmission rate from different sensor nodes from the list of biosensor nodes from the optimum region. The scheduling margin rate (SMW) is estimated by max-precedence and Min precedence weight from the response of hyper switching transmission from sensor nodes. Based on the Maximum priority max-precedence supporting the route discovery obtained from the route table at each time window. This contains the transmission rate on list of routes containing sensor nodes on cyclic updating route. Based on list of routes Min weight propagated at lowest precedence on traffic priority assigns to relay to make cooperative communication medium. according to the priority the route is selected from the cyclic period to attain min route to schedule the transmission in active state then other supported precedence route are queuing for alter scheduling.

Algorithm:
Input: Route table , Sensor List Sl, SW,TS, LMS, Network Trace NT,

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Output: Optimized switching
Initialize the simulate Network from NT
Compute TS, LMS from Sensor List Sl
Computing sensor transmission from RT at Each response rate
For Each Node Sl← s1, s2, s3, to compute Max Threshold MT
If $\int_{i=1}^{size(Sl)} Sl(i).Max\ responce\ rate\ MrT$Then
For each constraint RT rate from Ts
Select the MAX transmission rate MrT←Sl(i)at each sensor rate) handles packet
Select the RT at Min rate →MrT(Ts) to assign Max rate SW
End if
End For
Estimate the energy constrains for each route handle Packet rate to switch SwT
Selecting each route TMS for each schedule route R at Max rate packet P
If P at Max state constraint Hyper state another cooperative route
Select Sw = $\int_{j=1}^{size(RL)} SWat\ Min(Rl(i)) \rightarrow p$
Else switch another route
For each Route get cooperative Loop index
Get P at Max packet P→TMS at max(R).SW
Else
Reroute switch state Min packet
End for
Return optimized route R from sensor Network to relay transmission
End if
End

The hyper scheduling working principle execute the energy efficient routing depends on the estimated weight. The WBSN constraints are energy dependencies based scheduled routing to choose the route to transmit the data. The above algorithm defines the energy efficient scheduling principle in sensor based relay transmission to control the routes to improve the lifetime maximization.

IV. Results and Discussion

The proposed methods of scheduling towards Cooperative Hyper-Scheduling based improving Energy Aware Life Time Maximization in Wireless Body Sensor Network Using Topology Driven Clustering Approach be tested with have been implemented using network simulator NS2. The methods are evaluated for their performance under different conditions. The methods are evaluated for their performance under various parameters. Obtained results are presented in detail in this section and compared with the results of other methods.

Table 1: Experimental Data

Key	Value
Simulator	NS2
Total Nodes	200
Energy	100 joules
Battery Voltage	5 volts
Control Packet Size	10 Bytes
Transmission range	100 meters
Simulation area	1000 meters

The experimental data considered for the evaluation of proposed approaches are presented in Table 1. The simulation is performed by varying number of nodes in then network and at each test case, the performance of the methods are measured in different parameters and presented in this section

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The scheduling performance is analysed by varying the number of nodes in the network and at each case, the performance provided by different methods are presented. The proposed LLTP-QOS and CHS- EALTM algorithm have achieved security performance in the ratio up to 97 % and 98% which is higher than other PA-KFI, HSDC and LLTP-QOS approaches.

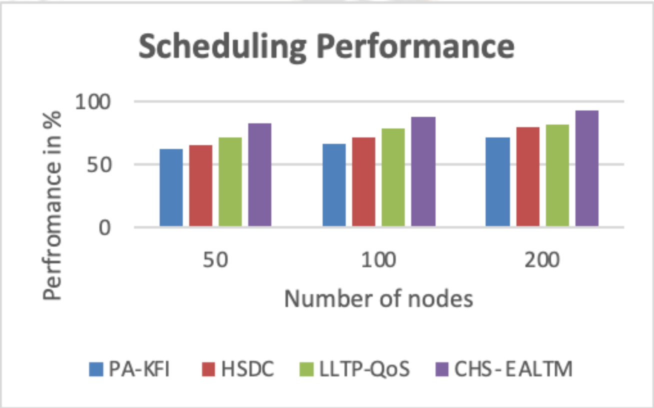

Figure 2. Performance in Scheduling

Table 2: Performance in Scheduling

Scheduling Performance in %				
No of nodes/methods	*PA-KFI*	*HSDC*	*LLTP-QoS*	*CHS-EALTM*
50	62.1	65.2	71.3	82.7
100	66.2	72.1	79.3	88.4
200	71.3	79.5	81.6	93.2

The above table 2 shows the scheduling performance compared with different methods. The proposed method CHS-EALTM produce higher resultant in scheduling rate than other methods.

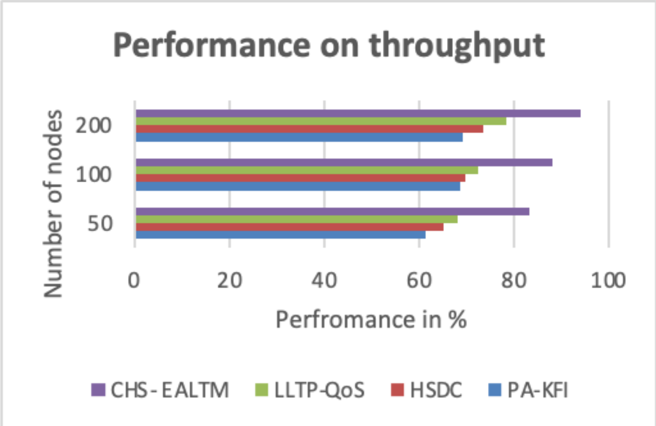

Figure 3. Performance on throughput

The throughput performance introduced by different approaches are measured and presented in Figure 4. By changing the number of nodes in each simulation the performance of the methods in throughput are measured and compared in Figure 8 . In all the conditions, the proposed LLTP-QOS and CHS- EALTM methods have achieved higher throughput performance than other methods.

TABLE 3: PERFORMANCE PERFORMANCE ON THROUGHPUT

Performance on throughput %				
No of nodes/methods	*PA-KFI*	*HSDC*	*LLTP-QoS*	*CHS- EALTM*
50	61.5	65.3	68.1	83.4
100	68.8	69.7	72.5	88.1
200	69.3	73.6	78.4	94.2

The ratio of throughput introduced by different approaches in different simulation time is presented in Table 3. The CHS-EALTM approach has produced higher throughput performance at all the simulation period than other methods

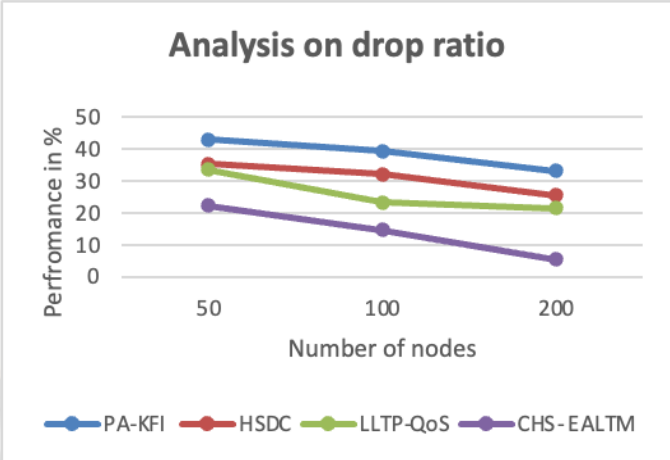

Figure 4. Analysis on drop ratio

The ratio of packet drop introduced by different methods are measured and presented in Figure 5. The proposed CHS-EALTM approaches have produced less drop ratio in all the test cases considered in evaluation.

TABLE 4: ANALYSIS ON DROP RATIO

Packet drop ratio %				
No of nodes/methods	*PA-KFI*	*HSDC*	*LLTP-QoS*	*CHS- EALTM*
50	43.1	35.3	33.6	22.4
100	39.4	32.1	23.4	14.6
200	33.1	25.6	21.5	5.4

The result on packet delivery ratio has been measured and compared in Table 4. The result confirms that CHS- EALTM algorithm has achieved higher than other methods.

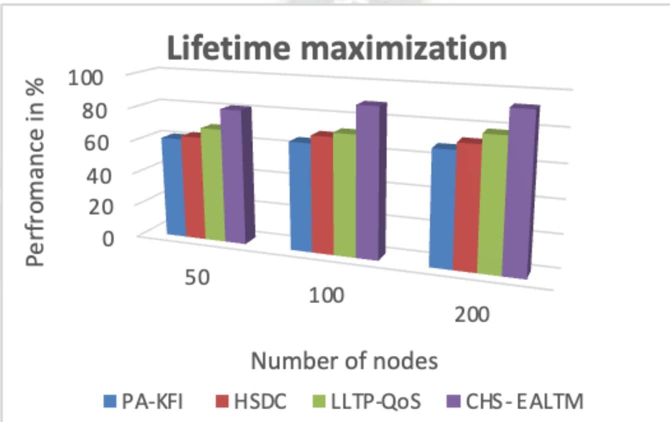

Figure 5. Performance on lifetime maximization

The performances in lifetime maximization introduced by different approaches are measured by varying the number of nodes in simulation. In each test case their performance is measured and compared in Figure 6. The proposed CHS-

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EALTM approaches have produced higher lifetime maximization performance than other methods

TABLE 5: PERFORMANCE ON LIFETIME MAXIMIZATION

Lifetime maximization in %				
No of nodes/methods	*PA-KFI*	*HSDC*	*LLTP-QoS*	*CHS- EALTM*
50	61.3	63.2	69.1	81.4
100	65.3	69.9	72.4	89.1
200	68.2	72.4	78.2	92.7

The Lifetime maximization performance is measured by various technologies and compared with the results of other methods as shown in Table 5. Comparison indicates that CHS-EALTM algorithm achieves higher rate than previous methods

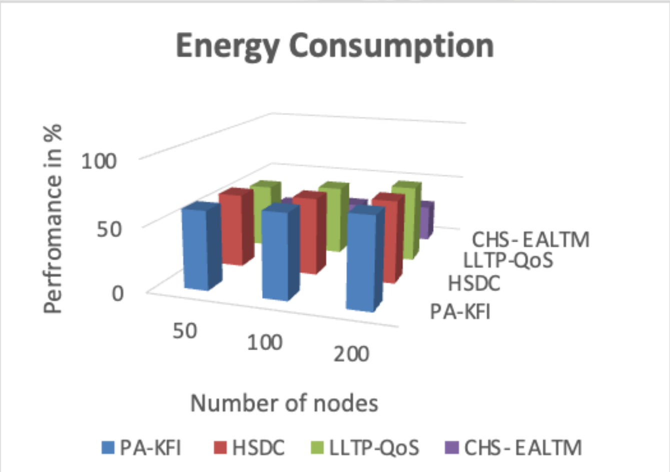

Figure 6. Performance on Energy Consumption

The ratio of packets transmitted by different methods is measured based on the energy taken by the node processed. Figure 7 shows the Performance on Energy Consumption. The performance of the energy level was measured and the results of other methods were compared.

TABLE 6: PERFORMANCE ON ENERGY CONSUMPTION

Energy Consumption in %				
No of nodes/methods	*PA-KFI*	*HSDC*	*LLTP-QoS*	*CHS- EALTM*
50	61.2	58.3	51.4	21.3
100	65.4	60.8	55.1	26.1
200	69.4	64.3	60.5	29.3

The energy consumed by different nodes in data transmission are measured for different approaches. Watt = 1 Joule per second (1W = 1 J/s) which means that 1 kW = 1000 J/s. Such analysis is performed by varying number of nodes in simulation and performances of different methods are measured. The proposed LLTP-QOS and CHS- EALTM algorithm have produced less energy consumption than existing PA-KFI, HSDC and LLTP-QOS algorithms.

V. CONCLUSION

To conclude that this proposed Cooperative Hyper-Scheduling based improving Energy Aware Life Time Maximization in Wireless Body Sensor Network Using Topology Driven Clustering Approach produce best performance. Towards the development, there are number of approaches discussed by various researchers. Some of the methods uses only the energy as the key and performs scheduling which affect not only lifetime performance but also the throughput performance gets affected. On the other side, the traffic-based approaches considered the traffic parameter in scheduling, which suffered with poor lifetime. Similarly, there are many techniques has been populated by various researchers but they still suffer to achieve the expected performance ratio 94.2 % in life time maximization. Also, for each route the method computes the value of transmission support and lifetime maximization support values. This method computes the value of scheduling weight. Based on the value of scheduling weight, the method selects a single route to perform data transmission with low redundant packet loss rate up to 5.4%. The nodes of the selected route are scheduled than other methods be in working mode where the rest of the nodes will be scheduled. The method improves the performance in scheduling and throughput performance.

REFERENCES

[1] Ali Hassan Sodhro[1, 2], Li Chen[3], Aicha Sekhari[2], Yacine Ouzrout[2], Wanqing Wu[4, 5]Energy efficiency comparison between data rate control and transmission power control algorithms for wireless body sensor networks, International Journal of Distributed Sensor Networks, First Published January 31, 2018.

[2] Rae Hyun Kim and Jeong Gon Kim, "Improved scheduling for MAC protocol in WBAN based monitoring environment," 2016 Eighth International Conference on Ubiquitous and Future Networks (ICUFN), 2016, pp. 706-709, doi: 10.1109/ICUFN.2016.7537128.

[3] Hisham Alshaheen, Haifa TakruriRizk, Improving the energy efficiency for the WBSN bottleneck zone based on random linear network coding, Special Issue: Body Sensor Networks, 01 February 2018

[4] B. Khadem, A. M. Suteh, M. Ahmad, A. Alkhayyat, M. S. Farash and H. S. Khalifa, "An Improved WBSN Key-Agreement Protocol Based on Static Parameters and Hash Functions," in IEEE Access, vol. 9, pp. 78463-78473, 2021, doi: 10.1109/ACCESS.2021.

[5] Samanta, Y. Li and S. Chen, "QoS-Aware Heuristic Scheduling with Delay-Constraint for WBSNs," 2018 IEEE International Conference on Communications (ICC), 2018, pp. 1-7, doi: 10.1109/ICC.2018.8422180.

[6] D. Bortolotti, M. Mangia, A. Bartolini, R. Rovatti, G. Setti and L. Benini, "Energy-Aware Bio-Signal Compressed Sensing Reconstruction on the WBSN-Gateway," in IEEE Transactions on Emerging Topics in Computing, vol. 6, no. 3, pp. 370-381, 1 July-Sept. 2018, doi: 10.1109/TETC.2016.2564361.

[7] S. Motoyama, "Flexible polling-based scheduling with QoS capability for Wireless Body Sensor Network," 37th Annual IEEE Conference on Local Computer Networks - Workshops, 2012, pp. 745-752, doi: 10.1109/LCNW.2012.6424059.

[8] H. Alshaheen and H. Takruri-Rizk, "Energy Saving and Reliability for Wireless Body Sensor Networks (WBSN)," in IEEE Access, vol. 6, pp. 16678-16695, 2018, doi: 10.1109/ACCESS.2018.2817025.

[9] Anwar and S. Duraisamy, "A Predictive Routing Algorithm for WBSN Based on Kalman Filter Iterations," in IEEE Sensors Journal, vol. 18, no. 18, pp. 7741-7748, 15 Sept.15, 2018, doi: 10.1109/JSEN.2018.2847049.

[10] Song, "Massive-MIMO Enabled FDD Wireless Backhaul Small-Cell Relay Networks: AF Protocol Based Designs With Low Channel Estimation and Feedback Complexity," in IEEE Access, vol. 6, pp. 31050-31064, 2018,

[11] P. -C. Chen, S. -J. Ruan and Y. -W. Tu, "Power-Management Strategies in sEMG Wireless Body Sensor Networks Based on Computation Allocations: A Case Study for Fatigue Assessments," in IEEE Access, vol. 8, pp. 181366-181374, 2020, doi: 10.1109/ACCESS.2021.

[12] M. S. Farash and H. S. Khalifa, "An Improved WBSN Key-Agreement Protocol Based on Static Parameters and Hash Functions," in IEEE Access, vol. 9, pp. 78463-78473, 2021, doi: 10.1109/ACCESS.2021.3083708.

[13] R. Braojos, D. Bortolotti, A. Bartolini, G. Ansaloni, L. Benini and D. Atienza, "A Synchronization-Based Hybrid-Memory Multi-Core Architecture for Energy-Efficient Biomedical Signal Processing," in IEEE Transactions on Computers, vol. 66, no. 4, pp. 575-585, 1 April 2017, doi: 10.1109/TC.2016.2610426.

[14] F. T. Zuhra et al., "LLTP-QoS: Low Latency Traffic Prioritization and QoS-Aware Routing in Wireless Body Sensor Networks," in IEEE Access, vol. 7, pp. 152777-152787, 2019, doi: 10.1109/ACCESS.2019.2947337.

[15] H. Radie and A. A. Thabit, "Energy Harvesting based System: Toward Outage Probability Minimizing of WBSN," 2019 2nd International Conference on Engineering Technology and its Applications (IICETA), 2019, pp. 89-93, doi: 10.1109/IICETA47481.2019.9013009.

[16] T. Rashid, S. Kumar and A. Kumar, "Effect of Body Node Coordinator (BNC) positions on the performance of intra-body sensor network (Intra-WBSN)," 2017 4th International Conference on Power, Control & Embedded Systems (ICPCES), 2017, pp. 1-6, doi: 10.1109/ICPCES.2017.8117613.

[17] H. Alshaheen and H. T. Rizk, "Improving the energy efficiency for biosensor nodes in the WBSN bottleneck zone based on a random linear network coding," 2017 11th International Symposium on Medical Information and Communication Technology (ISMICT), 2017, pp. 59-63, doi: 10.1109/ISMICT.2017.7891767.

[18] H. Alshaheen and H. T. Rizk, "Improving the energy efficiency for a WBSN based on a coordinate duty cycle and network coding," 2017 13th International Wireless Communications and Mobile Computing Conference (IWCMC), 2017, pp. 1215-1220, doi: 10.1109/IWCMC.2017.7986458.

[19] T. Wu, P. Yang, Y. Yan, P. Li and X. Rao, "Near Optimal Route Association With Shannon Model in Multi-Drone WSNs," in IEEE Access, vol. 6, pp. 60869-60880, 2018, doi: 10.1109/ACCESS.2018.2874661.

[20] F. T. Zuhra, K. B. A. Bakar, A. A. Arain, U. A. Khan and A. R. Bhangwar, "MIQoS-RP: Multi-Constraint Intra-BAN, QoS-Aware Routing Protocol for Wireless Body Sensor Networks," in IEEE Access, vol. 8, pp. 99880-99888, 2020, doi: 10.1109/ACCESS.2020.

[21] G. Xie and F. Pan, "Cluster-Based Routing for the Mobile Sink in Wireless Sensor Networks With Obstacles," in IEEE Access, vol. 4, pp. 2019-2028, 2016, doi: 10.1109/ACCESS.2016.2558196.

[22] P. Singh, R. S. Raw, S. A. Khan, M. A. Mohammed, A. A. Aly and D. -N. Le, "W-GeoR: Weighted Geographical Routing for VANET's Health Monitoring Applications in Urban Traffic Networks," in IEEE Access, doi: 10.1109/ACCESS.2021.3092426.

[23] N. Morozs, P. D. Mitchell and Y. Zakharov, "Dual-Hop TDA-MAC and Routing for Underwater Acoustic Sensor Networks," in IEEE Journal of Oceanic Engineering, vol. 44, no. 4, pp. 865-880, Oct. 2019, doi: 10.1109/JOE.2019.2933130.

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