



Wireless Body Area Network with Enhanced Object Identification, Optimal Storage and Security for Integrated Healthcare System

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ABSTRACT

CLOSA based IPv6 addressing scheme, Blowfish algorithm and Wireless Body Area Network (WBAN) these are the integrated core technologies, for dynamic addressing and object identification in the healthcare domain. In this methodology, when the object joins the WBAN, IPv6 address is normally generated and distributed it to every one of the object in WBAN network to verify its recognizable evidence. Energy efficient duty cycle MAC protocol is used to handle dynamic environment and enlighten the throughput and efficiency of the system. A detailed study is conducted; for successful data transmission, to avoid collision between Base Station (BS) and Low-Power Listening (LPL), Cluster Head (CH) technique is used along with Clear Channel Assessment (CCA); and for specific hardware low power consumption (LPC) methods are used and for low power network components are used, for supporting of MAC protocol with WBAN. It is basically focusing on faraway observing of aged people or constantly sick patients in suburban environment with dynamic object identification, secured storage just as optimal data transmission.

Key words: BBO, clear channel assessment, Cluster Head, MAC layer.

1. INTRODUCTION

Body Area Network (WBAN) is a sensor network with a special purpose of connecting various appliances and medical sensors, placed in both outside and inside of a human body [1]. To monitor critical body signs WBAN is fixed in the body, and it senses the critical body signs such as circulatory strain, heart rate, body temperature, glucose level etc. WBAN reduces both the expenses and the risk of a patient in health sector by monitoring these health parameters [2]. In WBAN the stimulation batteries are one of the central impediments. A productive supervisory common is appealing to conquer the dispute of energizing batteries [3].

Nowadays, the health promotion and disease preclusion strong and skilled ideas are completed. The latest creating developing technological advances in WBAN together with Information and Communications Technologies (ICTs) are premature discovery and inhibition of possible illness that happen afterwards in the life of the people [4]. It can be done by combining the ultra-low-power none-invasive sensor hubs into the system of WBAN in endless examining of health care in WSN innovation.

Based on the MAC frame structure we delineate a Time Division Multiple Access (TDMA), in terms of forwarding the design of mode in sleep, enhancing the effective of using the low power in the uplink and downlink sub frames which are adaptive and flexible [5]. In this approach for WBAN dependable, high throughput and stable directing sensors are used in it. Patient's ECG details and Glucose level, required low tightening, high unflinching quality and long life along these lines and so on., these practical data are have in this sensor and they send their data expressly to sink constantly.

Unmistakable sensors take after their defender center point and to sink through forwarder center it transmit their information. For quite a while this framework can be filled in just as the proficiency of centre points is kept up. Such a framework can be utilized to develop an adroit and modest medicinal services screen and that can be used as a noteworthy part of an analytic procedure. In future patients are most agreeable and loose in light of the fact that this framework will probably remotely screen more seasoned individuals and constantly sick patients in their own private surroundings, the costly hospitalization expenses are restricted and visit emergency clinic visits are diminished. Sensors and actuators are formed by grouping various devices the certain amount of the human body (externally/internally) is measured by using sensors. On the other hand data accumulate from the sensors based on the expect evaluation takes for actuators., a phone which goes about as a sink for information of the remote gadgets is a case for collaboration with the client or different people is commonly taken care of by an individual gadget [6, 7].

2. LITERATURE SURVEY

The healthcare mentoring system in low cost was discussed by Logambal & Thiagarasu [8]. A transitory review is distributed by one of the chief objectives of their approach in the area of e-Healthcare systems it is the more latest advanced technology. Through the best in class WBAN frameworks Healthcare suppliers can remotely screen patients. Since it can able to appreciably reduce the current operational costs and this area of examination is smooth the healthcare systems become more satisfied. During the previous decade it has pulled in the consideration of countless specialists and researchers and because of structure and created many promising models [8]. WBAN technology used on the facet of data transmission are assessing i) type of addressing scheme and object identification; ii) Between internet and user preference location securing the data are transmitted; and iii) multifunctional security system is increased [9].

Based on the above criterion, technologies those are to be pre-assessed through the following surveys. By using CLOSA - IPv6 based PIN algorithm Vinoth Kumar *et. al.*, [10] imagine the use of object identification in healthcare sector to monitor the health conditions of patient and identify patient. Each type of disease diagnosis is surely monitored because separate sensors are connected to the patient's body. Every sensors and actuators are assigns and attaches by using the addressing scheme. To determine their emergency and to guide them that the sensors information is connected to the cloud. Similarly Vinoth Kumar *et. al.*, [11] studies were conducted to secure the information transmission in a biomedical telemetry of e-Health checking framework, on the security calculations that stayed significant. This paper furthermore investigated the security calculations that could work appropriately in an implanted framework which comprise of counterfeit calculation abilities and little memory unit. The blowfish calculation has positively shaped the cryptographic field when it is compared with algorithm. A multifunctional security system was also indicated by the author, thus the multifunctional security system using near field communication (NFC) for interfacing the physical world with the rationale data world where the remote sensor organizes that can be utilized for it to give security to data and vaccination [11].

3. USING BLOWFISH MODEL WITH CLOSA-IPV6 AND WIRELESS BODY AREA NETWORK (WBAN) FOR OBJECT IDENTIFICATION

The proposed object is an appreciable design that has an ability to handle extra number of network nodes for avoiding network congestion with the viewpoint of safeguarding records transmitted over the network in an unidentified domain or workspace. Moreover, Near Field Communication (NFC) technology is included in the proposed architecture of

Internet of Medical Things (IoMT) the confidentiality of information is ensured. To observe the anomalies at any place without any delay with an augmented proficiency by using the WBAN technology exploit by NFC with MAC protocol is used for communicating the body sensors associated with the patient [12]. In this scheme, IPv6 implied with WBAN so that the address uniqueness can be ensured without replication of address uncovering and as a result, decreasing the address configuration cost and delay. Additionally, without any further operations the released addresses can be robotically domesticated, so for allocation there is permanently a copious address space exists.

Blowfish have a very productive and versatile cryptographic calculation, with numerous parameters (key size, square size, number of rounds) can be receptive to trade off security quality with power use and computational overhead. For WBAN applications with different data sizes, this blowfish calculation with appropriate parameters may perform well [12].

From figure 1 the layers are data link, network and transport are the three different layers are participated in layered-addressing architecture. In Figure1 the architecture of three layers are shown. Data link layer is forwarded from one location to another location that the data link layer creates a header. Normally it is isolated expect that there is no two interfaces doesn't share their similar MAC addresses. The header of data link layer was involves by the source interface and a destination interface of a MAC addresses. Likewise at the network level IP address can be recognized. In header of network layer both the source node and a destination node is cover IP addresses. At last several network applications are run by each host and in this way by using the targeted application every application should be recognized by other host. Later the purpose of identifier is to uniquely recognize an object and hence identifiers are handy depiction of the object otherwise in communication protocol address the object [13]. Along these lines, CLOSA tending to plot that allocate a remarkable IPv6 addresses to every hub in the IoT and it ensures uniqueness by separating the slant of every gadget and changing over it into an IPv6 address, sensors and actuators can be associated with IoT are the 2^{128} supporting devices [14].

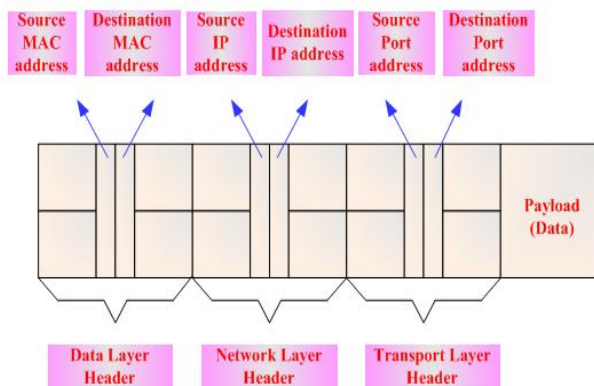


Figure 1: Scheme of PIN addressing

4. PROPOSED METHODOLOGY

4.1 Wireless body area network with MAC protocol

To inculcate greatest extreme throughput with smallest delay and optimum energy efficiency WBAN is developed. For the delivery of data the investigation executed in this paper shows WBAN don't easily challenge other protocols. To warrant most extreme throughput and efficiency in chronological medical applications MAC protocol is recently used for patient monitoring system, a specific target. During common and disaster environments the wearable wireless sensors inclined as outfit and without any intervention of network hierarchy and congestion healthcare supervisor unceasingly monitor the patients. This work investigates and appraises the desires and encounters of these low-control wearable innovations to speak with clinic framework with the help of low-control on-body correspondence advancements where sensors apply specially appointed systems to transmit crisis essential signs.

4.2 Energy efficient protocols

when one node is communicates with the other nodes in the MAC protocol, in track devices it remits most of its energy in many time stages like idle listening, overhead of control packet, over transmitting, collision and fluctuations. Accordingly, to concentrate on parent node is the planning of proposed system, residual energy is high and distance to sink is low. Now on execution of MAC protocol is updated through the low power mechanisms usage separate parameter confirms effective bundle conveyance to sink and rest of the vitality parameter adjusts the vitality use among the sensor hubs. Upsurges the reliability, efficiency and low power during communication these are the few protocol improvement scheme in this. Okundu MAC Protocol, DTDMA Protocol, Med Mac Protocol, B-MAC Protocol, H-MAC Protocol, Ta-MAC Protocol, S-MAC Protocol, Low Duty Cycle MAC Protocol, and T-MAC Protocol [15] are distinctive these are the MAC protocol that are energy efficiency in nature.

Among various MAC conventions, for WBANs in the interim in this convention the Low Duty Cycle MAC convention is favoured, by utilizing slave hubs simple to advanced transformation is accomplished computerized sign preparing is surrendered out at Master Node (MN) is the other complex errand. At the point when contrast with slave hubs MNs should be low power than slave hubs [15] thought of Guard Time (T_g) is presented by receiving compelling TDMA procedures by this convention to abstain from covering among sequential availabilities. Power sparing is cultivated TDMA successfully conquers the impact issue and furthermore it transmit data in short blasts it is a vitality effective convention. By utilizing the most minimal power application it licenses observing patient's condition and can diminish the outstanding task at hand on medicinal staff.

4.3 Low power listening (LPL) method with clear channel assessment (CCA)

LPL is an open MAC-layer strategy for plummeting by consuming the energy in wireless sensor systems, where hubs are intermittently wakeup to test the remote channel to see. A hub is regularly stays in rest mode and checks the direct development intermittently in the LPL innovation. Be that as it may, LPL is truly vulnerable to false wakeups actuated by natural noise being acknowledged as activity on the channel, activating hubs to deceptively wakeup so as to get non-existent transmissions [16]. In exact examination in private conditions, we identify that the false wakeup issue can genuinely rise a hub's obligation cycle, exchanging off the upside of LPL in observational examination in private situations. By utilizing Clear Channel Assessment (CCA) system we find that the vitality level limit conveyed channel movement has an important impact is put on the false awoken rate. Then AEDP is model, in LPL an adaptive energy detection protocol is used, the network solidity is extended that the node CCA threshold is dynamically adjusted and application-specified limits is dependent by the duty cycle. AEDP is indicated by both empirical experiments like controlled tests and real-world satisfactory link dependability is maintained that it can successfully alleviate the effect of noise on radio duty cycles. CCA consist of two fold significant commitments, they are given as follows [17].

- 1) CCA used for avoiding collisions between wireless channels and sampling the channel In CSMA protocols for advanced transmission
- 2) CCA is used as a prevalent MAC-layer technique for the Low Power Listening (LPL), that licenses radio to function at less duty cycles.

In Figure 2 the CCA with LPL packet assessment is given it is relationship graph. CCA is executed that sometime each node awakens its, this is under LPL. To receive packets the nodes are awaked in the wireless channel, that the CCA check notices gesture in the wireless channel or returns to sleep instantly then. In WSNs energy-efficient MAC protocols is

the general technique in LLP, that the owing to its easy and efficiency.

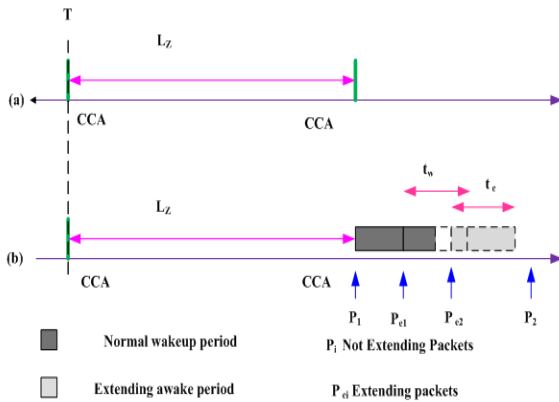


Figure 2: Low power listening (LPL) protocol operation with (a) CCA Checks and (b) CCA

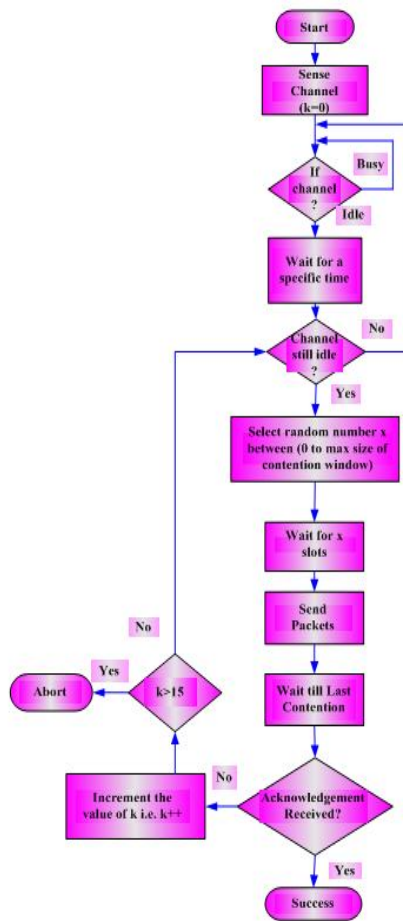


Figure 3: Flow chart of CSMA

After rest mode to active mode node is switched, channel movement is checked, the sensor likewise remain alive and get information when the channel is discovered active. The nodes switch back to idle mode when the channel is idle. Then it is called as channel polling. It lost any alarm from various nodes when every node does not continues this process self-sufficiently. By the sender to monitor receiver's polling length introduction is used. To keep away from collision,

CSMA require more than one attempts and back - off mechanism. The idle channel subsists till the every node repetitively sense channel. The node back - off to the next contention period when the channel is busy.

The flow of channel detection and back - off method exploitation is described in the figure 3. In this situation “energy spent on packet transmission” expansion is energy spent per packet.

4.3 System requirements

Sensor field is not cleared Cluster Head(s) (CHs) are circulated similarly everywhere throughout the sensor field. Assigned CHs will be concentrates in one region of the network so that it is genuinely possible. In their environs different sensors will not discovery any CHs from this time forward. Alternatively, the capability on condition that multi-bounce directing is implemented from few protocols exploited unequal clustering and stab. Consequent disadvantages are presented in this many levels clustering hierarchy [18]. One CH forward information to different CHs in multiple level schemes, in figure 4 which relay data to BS. In this work S sensor is adopted which are incessantly monitor environment and working randomly in an even manner over a vast field. We mean the i^{th} sensor by S_i and set $S = S_1, S_2, \dots, S_n$ is the resulting sensor node.

4.3.1 Message delivery

The level of emergency is determined by the time in important signs remain transported inside certain time. Both indoor and outdoor settings for the architecture should let original-time delivery of emergency vibrant marks. Information conveying emergency vibrant marks necessitate fewest delays (remains).

4.3.2 The measure of information and the Frequency of signal transmission

How much information must be conveyed and to be transmitted are in the essential interrogations. The biological information is learnt for a long period (for instance: 8 hours) and the base station is loaded progressively for our application. The system confirms reliable vibrant marks (signs) are the periodic transmission and urgent messages are quickly transmitted. Sample frequency and digitization strategy is determined that application information traffic. Signal transmission from base station to cluster head is represented in figure 4.

4.3.3 Buffer management

The regular crucial marks are stored in the outdoor environment. Because of capacity limits buffering information may end in a buffer run. Loss of information or temporal application termination may be occurring. The architecture has a superior balance regarding the quantity of sensors and the bulk of patients.

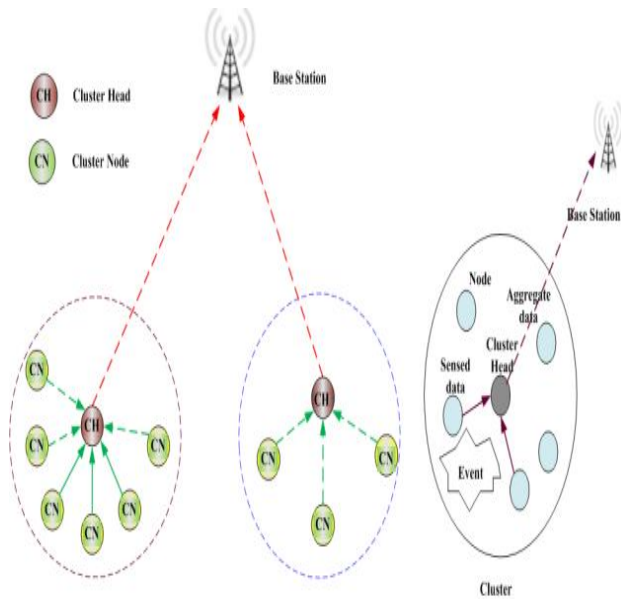


Figure 4: Signal transmission to base station from cluster head

4.4.4 Scalability

Measure of patients and the consignment of sensors on every one of the patient architecture has been improved by balance.

5. SYSTEM ARCHITECTURE

FitLinxx [19] designed a branded technology for Body LAN is an ultra-low power, low-cost and reliable BAN platform. In enormous applications Body LAN is proposed to be castoff, purchaser gadgets, movement and wellbeing gadgets, restorative gadgets and wellness gear these are the case of gigantic application. With respect to the act of intensity, Body LAN contains substantially less power utilization rate differentiated to Bluetooth gadgets. A solitary radio channel is devoured by this remote innovation, short blasted term and very less obligation cycle. Body LAN works in the 2.4 GHz ISM band and assets data rates of 250 kb/s and 1 Mb/s. The shared system topology denied of focal planning is utilized for furthermore. Transmit-just and transmit/get gadgets are the two gatherings of gadgets in a Body LAN systems. With respect to as security reliant on gadget addresses Body LAN scrambles outline payloads and progressively changes calculations. In figure 5 demonstrates the Systems design. In WBAN design comprise of three distinct sorts of resulting levels which are given as pursues,

1. Level 1: Data collecting part.
2. Level 2: Information transmission.
3. Level 3: Information analyzing.

Level 1: Data collecting part

The operation of Data grouping is marked as data fusion. The lifetime of network and throughput is improved by using the middle of network field gateway.

Level 2: Information transmission

The three unique routes are the division of networks and then the sensors is tracked and the information transmission is observed and the situation is assigned to server and lastly the information packets attained the intention and the station is identified.

Level 3: Information analyzing

In like manner condition typical traffic is the data traffic with no time, basic and on-request occasions. By the natural data BNC is requested and oversaw. Wakeup circuit, a fundamental radio, and a security circuit, are incorporated into BNC every one of them connected to a data interface. The wakeup circuit is received by house on-request and crisis traffic. The security circuit is situated to stop vindictive cooperation with a WBAN [19].

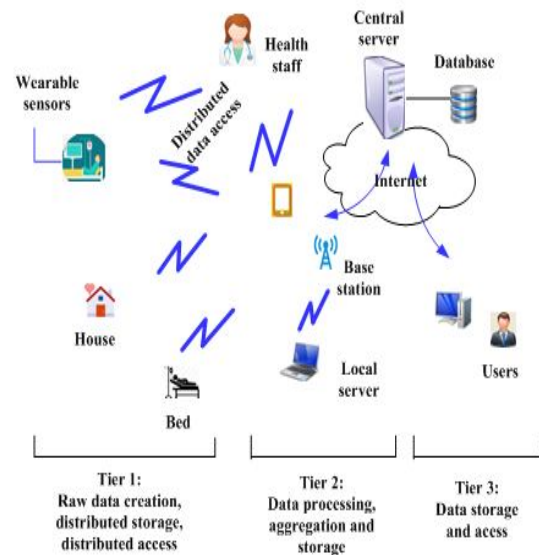


Figure 5: WBAN architecture

6. ALGORITHM FOR PROPOSED SYSTEM

STEP 1	Start
STEP 2	A group based topology with multi jump method of correspondence between the cluster members (CM) and the cluster head (CH) is utilized, cluster head (CH) is picked aimlessly from n hubs
STEP 3	Next a synchronization message (SNmsg) grasping a key is being sent to all of the CMs with conventional range for perceiving heartbeat, circulatory strain, blood glucose level, ECG, EEG like parameters.
STEP 4	After receiving the SNmsg from CH an acknowledgement (ACKmsg) is sent.

STEP 5	An information counter (D_i) set to 0 for each i^{th} hub. For each transmission of data the value of D_i can be calculated as follows, $D_i = D_i + 1$. If $D_i = 5$ then the i^{th} node goes to sleep mode else if $D_i < 5$ then information transmission continues by the i^{th} node else information is shifted by any of $(n-i)$ i^{th} node.
STEP 6	If $n-i < n/2$ then $D_i = 0$, and the particular rest hubs winds up dynamic. Need is given to the hub which previously went to rest mode, hereafter comes in dynamic mode reliant on the line held by CH.
STEP 7	Embedded alongside information to be transmission for security blowfish algorithm (BF).
STEP 8	For each information transmission CH checks SNmsg with the current recorded value V_i for the qualities. If $V_i > V^{th}$ (the threshold value from SNmsg) then the transmission of information begin.
STEP 9	After k sets of data transmission remaining vitality (RE_i) of each i th hub is processed. On the off chance that $RE_i < RE^{th}$ (limit estimation of the residual vitality) at that point go to stage 10.
STEP 10	For each i th hub (where $I = 1 \dots n$), in the event that stage 9 remains constant, at that point $E_i = 2RE_i$, where $HE_{total} =$ absolute collected vitality, $E_i =$ current vitality of the i th hub. E_i is made double the RE_i by taking the RE_i measure of vitality from HE_{total} . At that point present HE_{total} ends up introductory $HE_{total} - RE_i$.
STEP 11	End

7. IMPLEMENTATION

Two or more sensors are connected to the body with one another, or with a central control unit, making together a network is known as wireless body area network (WBAN). Some different terms which are frequently utilized for the WBAN are body sensor network (BSN) or body-centric wireless communication. In a pacemaker, the battery ought to expand the device life time, making the ultra-low power utilization inevitability these are the various examples of body centric communication. As these IOT devices are embedded inside the body or close to the human body, all out size of the device together with the size of the antenna apparatus ought to be little. Besides, these device transmit the power of the electromagnetic (EM) waves must to be under a safe level. Also, over the body or through the body the communications are take place between these devices and henceforth the propagation channel should be inquired and the signal loss must be valued.

8. PERFORMANCE METRICS

The performance of this paper is measured to check the rightness of the plan and execution overhead is contrasted and the viable plan, which just uses the deterministic encryption for question assurance.

By passive attack is access pattern analysis, from 6 to 7 is attached. The security presenting randomization is improved by the proposed scheme for every one of the scheme resulting in various cipher texts in disparate session. The graph introduced the relationship between the number of documents created in order of 10 and index creation in milliseconds. The rate of index creation for 4x10 documents can be attained in short duration say as 3.5 ms, the proposed scheme is compared to the existing scheme. When compared to the time of proposed scheme the amount of creation of existing scheme is very small, wherein existing took 4.7 ms to generate 4x10 documents for example.

In second case from figure 7, the rate of creation of documents corresponding to the index time creation is comparatively very lower for proposed system when compared to the existing system. For proposed system document value is 40x10 that the rate of creation with respect to index time for proposed system is 2 ms whereas the document value for existing system is 40x10 and it has 5.2 ms

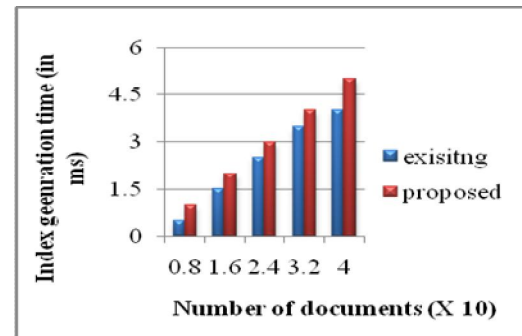


Figure 6: Difference of index generation time with number of documents

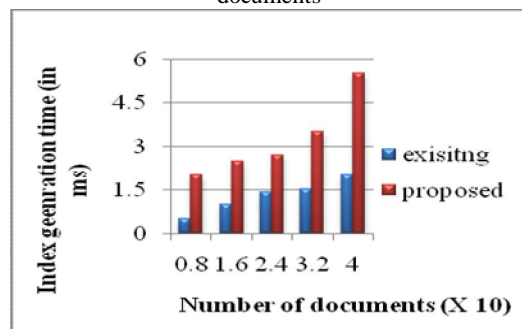


Figure 7: Variation of index generation time with number of documents

9. CONCLUSION

In this paper, recently used low-control remote correspondence MAC conventions that can ostensibly be utilized in WBAN frameworks are contended. A particular spotlight on low-control use, transmission unwavering quality, dormancy, information rates and security with all the more veraciously, and this paper gives a survey of the ebb and flow look into in the territory of WBANs. The wide counsel of vitality productive and solid remote correspondence a MAC

convention is given. This paper likewise overview the need and rivalries of WBAN frameworks in an average e-Healthcare framework to investigate how such frameworks can adequately speak with the home foundation additionally call attention to the limitations and prerequisites of those frameworks. By and large development of this methodology is expecting appropriate course to sink autonomous on the on the separation between from lingering vitality of hub and sink. The parent hubs contain less regard of cost work. Furthermore, different hubs become the children hub of that parent hub and the children hubs forward their data to parent hub. When a node forwards another node information it is not necessary to consume the energy of both nodes. Our outcomes shows that expected best routing strategy with time and packet delivered to sink. Most of the cases we require to involve our system so that the many applications and medical application are improved. Frequency of system enhancement Quality of System, power utilization, continuous health monitoring and mobility are suggested by WBAN. This paper also inspects the future prospects of e-Healthcare frameworks which contains the advantages, challenges and the fastest regions of development soon.

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