

**REPUTATION BASED ENERGY AND QOS EFFICIENT ALGORITHM FOR
OPPORTUNISTIC BODY AREA NETWORKS**Mr. Niraj Korde¹, Mrs. Urmila Deshmukh²¹PG Student, Department of Electronics & Telecommunication,
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Abstract—Recently significant research works reported on communication standards of wireless body area networks (WBANs) due to emergence of WBAN in real time applications. There two primary challenges in opportunistic WBANs such as network management cost reduction and energy consumption reduction in order deliver the cost-effective and reliable services to critical patients in healthcare application. There are number solutions reported to address this challenges in recent past, however failed to cover all the aspects of WBANs communication. In this, project we propose novel opportunistic communication protocol for WBANs with aim to solve the research challenges not only the energy efficiency and network management cost reduction but also solves the problem non-reliable nodes data dissemination. Initially we proposed the novel energy-efficient and distributed network administration cost minimization system for dynamic availability and data dissemination in shrewd WBANs. At that point we proposed the estimating based approach for dependable hub data dissemination. This should be possible by notoriety based incentive strategies to rouse members to scatter dependable data in participatory sensing framework, while limiting incentive cost for keeping up adequate number of solid members. The reproduction comes about uncovers the adequacy of proposed technique.

Keywords— Cost Management, Energy Management, Opportunistic communications, reliable data dissemination, WBAN.

I. INTRODUCTION

Wireless Body Area Networks (WBAN)/Wireless Body Area Sensor Network (WBASN) comprise of sensor nodes joined in and around the human body to screen the bio signals of individual for an assortment of utilizations, for example, persistent observing, gaming and so forth. This term has been first authored by Van Dam et al (2001) and got the enthusiasm of a few analysts. Because of the progressions in MEMS and wireless communication technologies, WBAN has experienced a specialized blast in the most recent decade. The schematic outline of contrasts between Wireless Sensor Networks and Wireless Body Area Networks is given by [1]. There are huge focuses to be noted in the Wireless body area network. Instead of the wireless sensor network, the WBAN observing condition is limited to the human body, heterogeneous data rate, the prerequisite of heterogeneous data rate and more factor network topology because of body development.

The communication in the Body sensor network is arranged into two sorts, in body communication is the RF communication between obtrusive sensor nodes embedded inside the human body and on body communication is the communication between wearable sensor nodes. The MICS (Medical Implantable Communication Service) band – 402-405 MHz ought to be utilized for in body communication (Sana Ullah et al 2010a). ISM or UWB can be utilized for on body communication.

A WBAN gives constant electronic healthcare services to medically developing patients in a financially savvy way. In a WBAN, a few body sensor nodes are embedded on/in the human body to detect the physiological signals of patients. In the wake of sensing the physiological signals, the sensor nodes send the detected data to the Local processing Unit (LPU). In this way, the LPU transmits the amassed data to the local access points (APs), which, thusly, send them to the medical servers [3], [4]. The body sensor nodes transmit the medical data to LPUs at extensive variety of data rates from 10 Kb/s to 10 Mb/s [5]. Likewise, the energy utilization rates of sensor nodes are confined as far as possible, as the battery energy of these nodes is restricted. To limit energy utilization, the sensor nodes utilize a one-hop star topology to send their medical data [6]. Be that as it may, mobility, body stances, and natural deterrents increment the dynamism in WBANs, which as often as possible changes the network topology, which, thusly, diminishes the network QoS. Moreover, the connection quality between nodes in WBANs shifts as a component of time because of different body developments, which likewise influences the inter-node connectivity [7].

Because of body developments and mobility of WBANs [6], the connection characteristics of intra-BAN and inter-BAN communication units corrupt altogether, which builds the bundle misfortune rate and reductions the life-time of the body sensor nodes? Further, the above additionally upsets data dissemination. In this manner the QoS administration cost

in the network is increments to keep up reasonable QoS among WBANs. As the network connectivity foundation and QoS administration costs increment in the network, we require a network administration cost minimization structure to give dependable and savvy service to WBANs.

In this paper, we proposed energy efficient and QoS efficient communication protocol for WBAN based on energy management cost minimization and QoS management cost minimization with reliable data dissemination. In section II, the brief review of recent works conducted. In section III, the proposed methodology and algorithms presented. In section IV, the current simulation results discussed. Finally, the conclusion and future work presented in V.

II. RELATED WORKS

In this section, we represent the review of research works on practical communication protocol and energy consumption techniques for WBANs.

Samanta et al. [8], [9] investigated that link-quality-aware resource allocation cum load balancing scheme for node in WBANs. In this technique, the researcher has utilized two sub problems- dynamic resource allocation and link-quality measurement in WBANs. These research works deal with the flexibility of WBANs they does not analysis the dynamics of network management cost in the existence of body/limb activity in WBANs, due to which the total amount of network cost raising and the QoS of WBANs raising.

Elias et al. [10] innovated that an energy-aware optimal design of energy effective and cost-effective WBANs. This technique investigated a cost-effective approach; the researcher does not analysis the impacts of dynamic connectivity and opportunistic data distribution in WBANs. This raising the delay and packet eliminated of the network.

Zhao et al. [11] investigated a network cost minimization scheme for data distribution in WSNs. First, this technique does not analysis the necessity index of WBANs in manner to quantify the medical situation of the WBAN-tools patients, which is one of the unique attributes of WBAN-based communications.

Energy-efficient and reliable communications are significant demands of WBANs; these are supplies sensitive medical information due to shadowing and fading consequences in the networks, the energy consumption rate of sensor nodes increases, and additionally the reliability in statistics transmission decreases, periodically. To boom the electricity performance and reliability in statistics transmission recently wide variety of strategies reported.

Yousaf et al. [12] investigated that, a new three-level cooperative relaying scheme for WBANs. As frame sensor nodes produce clinical statistics at a variable fee, their corresponding traffic pattern is uncertain in nature. Consequently, in the presence of negative hyperlink-satisfactory, the packets drop charge of the network and the power intake of body sensor node increase.

Andreagiovanni and Nardin [13] investigated that robust approach for joint optimization of energy accuracy and data rate in WBANs under traffic unreliability. In this innovation work, the packet transmission rate of body sensor nodes is consider to be homogenous in nature, but in condition of WBANs, the packet transmission rate of body sensor nodes is heterogeneous.

Huang and Cai [14] investigated proposed a concern-conscious scheduling scheme for used by a WBAN inside the presence of more than one coexisting WBANs. to maximize the community throughput of WBANs, a nonlinear optimization trouble is formulated, while considering the priorities amongst WBANs. This work is limited to handiest the concern conscious scheduling of WBANs inside the presence of interference amongst coexisting WBANs. but, they do no longer take into account the elevated network management value in the presence of interference.

Ibarra et al. [15] investigated a joint power and QoS control structure to supplies of energy and obtained the best possible QoS in WBANs. The base paper techniques are analysis the difficulty traffic ministry for the data transmission procedure. However, this technique is not used for all types of traffic management in the network.

Similarly, Seyedi et al. [16] evolved one-of-a-kind energy efficient data transmission scheme for WBANs. As a way to provide power-green statistics transmission, the tradeoffs between energy intake and packet errors possibility is embedded into the sensor nodes. This version fails to provide QoS to WBANs in the presence of community dynamics, because of mobility.

Also, Seyedi et al. [17] investigated that a Markov-chain based analytical approach for energy collective node in WBANs, in which the possibility of situation loss is analyzed to recognize the energy loss condition of body sensors node.

Ren et al. [18] investigated a approach which secure higher network throughput for synchronize WBANs. The base paper works does not fulfil to supplies robustness in the network management approach for WBANs.

III. PROPOSED DESIGN

To explains the present innovation problem for dynamic WBAN communications we innovated novel opportunistic communication protocol for WBANs with goal to solve the innovation difficulty not only the energy efficient and network management cost reduction but also resolve the difficulty non-reliable nodes data distribution network management cost minimization approach for dynamic connectivity and data distribution in principle WBANs. Then innovated the cost based model for dependable node data distributed.

We added a pricing based totally approach to optimize the network management price for opportunistic WBANs. Simultaneously, the behaviours of WBANs are taken into the consideration (i.e., vital and regular condition) to offer

dependable offerings. We investigated algorithms: (1) energy efficient prioritized opportunistic communications algorithm, (2) optimal network cost reduction algorithm.

As the dynamic topological disconnections as well as variations in link traits rising the energy consumption fee of opportunistic WBANs, we layout the energy-green prioritized opportunistic conversation to optimize the energy intake price of WBANs. set of rules 1 suggests the procedure for strength consumption minimization [19].

Algorithm 1: Energy Efficient Algorithm

Inputs:

- B: Number of WBANs.
- AP: Number of APs
- b: number of sensor nodes.
- T: Total time period

Output: Energy consumption rate (F_{ec}^{t*}).

- 1: Measure x_{ij}^{intra} and X_{ij}^{inter} at time t.
- 2: Calculate $f_{ij}(t)$ and $R_{ij}^a(t)$ at time t.
- 3: **if** ($\xi_{decision}^t \geq \xi_{decision}^t$) **then**
- 4: Connectivity establishment
- 5: Calculate F_{ec}^t at time t.
- 6: **if** ($F_{ec}^t \geq F_{ec}^{th}$) **then**
- 7: Formulate opportunistic energy constraint parameter.
- 8: Formulate optimization problem using Equation 24.
- 9: **end if**
- 10: **if** ($\mathcal{P}_i \geq \mathcal{P}^{th}$) **then**
- 11: Update waiting time $T_{wait} = T_{low}$.
- 12: Optimal energy consumption rate (F_{ec}^{t*}).
- 13: **end if**
- 14: **end if**
- 15: Update $T_{wait}^* = (T_{low} + 1)$.
- 16: Return when $T^* = T_{tot}$.

Where, X_{ij}^{inter} variable and x_{ij}^{intra} variable are representing that the inter-BAN and intra-BAN links among i^{th} sensor node and j^{th} LPU node. The decision matrices are $\xi_{decision}^t$ is executed to recognize the opportunistic connectivity for intra-BAN and inter-BAN communication units, based on the link-quality and propagation delay at time t .

Further to decreases the network management costs, we investigate another set of rules for most efficient cost minimization algorithm. This set of rules consists of, interference control price, electricity management value, records distributed cost, and QoS-making sure cost. Algorithm 2 represents the technique to decrease the community management fee.

Algorithm 2: Cost Minimization Algorithm

Inputs:

- B: Number of WBANs.
- AP: Number of APs
- b: number of sensor nodes.
- T: Total time period

Output: Cost Management Matrix ($CM_{i,j}^*$).

1. Measure x_{ij}^{intra} and X_{ij}^{inter} at time t.
2. Calculate $C_{x_{ij}}^{intra}$ and $C_{X_{ij}}^{inter}$ at time t.
3. **if** $\xi_{decision}^t \geq \xi_{decision}^t$ **then**
4. Opportunistic connectivity extraction
5. Update waiting time $T_{wait} = T_{low}$
6. **if** $C_{OC_{tot}}^t \geq C_{OC}^{th}$ **then**
7. Calculate $C_{DC_{tot}}^t, C_{inff_{tot}}^t$.
8. Calculate $C_{qos_{tot}}^t, C_{E_{tot}}^t$
9. **end if**
10. **if** $C_{tot}^t \geq C_{tot}^{th}$ **then**
11. Optimize the network management cost
12. Optimal Network Management Cost Management Matrix ($CM_{i,j}^*$).
13. **end if**
14. **end if**
15. Update $T_{wait}^* = (T_{low} + 1)$.
16. Return when $T^* = T_{tot}$.

Where, $C_{x_{ij}}^{intra}$ and $C_{x_{ij}}^{inter}$ are intra-BAN link cost and inter-BAN link cost respectively. $C_{DC_{tot}}^t$ and $C_{inff_{tot}}^t$ are Data dissemination and interference management costs respectively. The $C_{qos_{tot}}^t$ and $C_{E_{tot}}^t$ are QoS ensuring cost and energy management costs respectively.

Lastly, to effective the dependable data communication model, we implemented the pricing method in this innovation paper. The pricing techniques recompense the nodes that communicate to another node packet and energy those that forward packet. The secure system analysis the nodes reliability and competence in a communicated packet in concepts of multi-dimensional trust values. They consider values are attached to the nodes' public-key certificate to be used in making routing selections. We expand routing method to transmit the records through the ones noticeably-depended on nodes having sufficient energy to limit the chance of breaking the route. This innovated technique can handle route stability and the report accurate battery energy capability. This is due to the fact any loss of consider will result in loss of destiny earnings. Furthermore, for the efficient implementation of the consider packet, they believe values are computed by using processing the price receipts. Figure 1 shown that structure for the proposed pricing based data distribution in WBANs

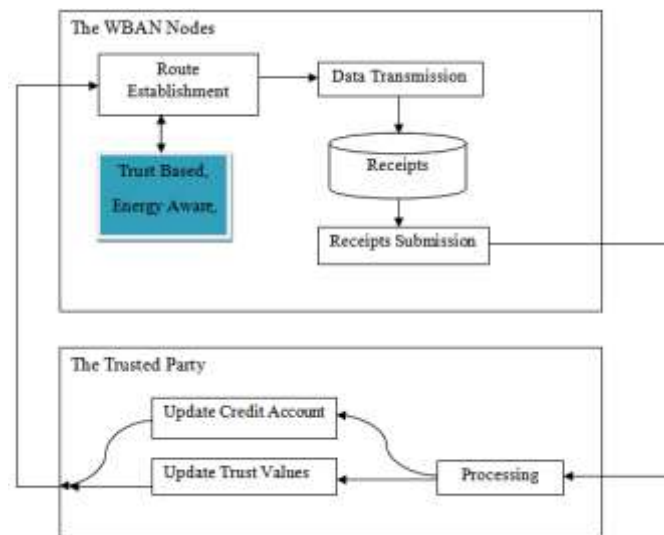


Figure 1: Pricing based data transmission

IV. SIMULATION RESULTS

In this section, we present the current results using the network simulator NS2. We evaluated the methods using the ns-2.34 version. The network parameters and techniques represented in table 1. The proposed RNCMD method is compared with two state-of-art methods in this section such as OPS [19] and NCMD [19].

Table 1: Network Simulation Parameters

Network Area	1000 x 1000
Type of Network	WBAN
Number of Nodes	50-350
Velocity	1.5 m/s
MAC	802.11
Simulation Time	30sec
Initial Energy	0.5 J
Transmitter energy consumption	16.7 nJ
Receiver energy consumption	36.1 nJ

There are five performance metrics evaluated in this paper such as:

- Energy Consumption vs. Number of WBANs
- Data Dissemination delay vs. Number of WBANs
- Network Throughput vs. Number of WBANs
- PDR vs. Number of WBANs
- Number of packet drops vs. Number of WBANs

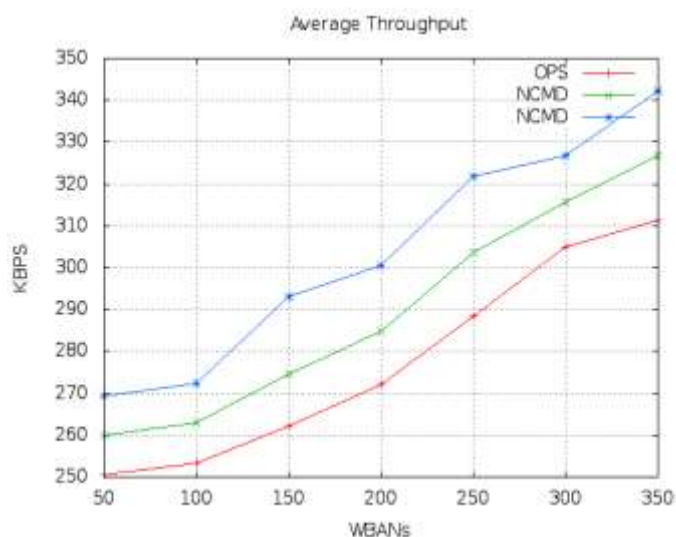


Figure 2: Average throughput performance evaluation

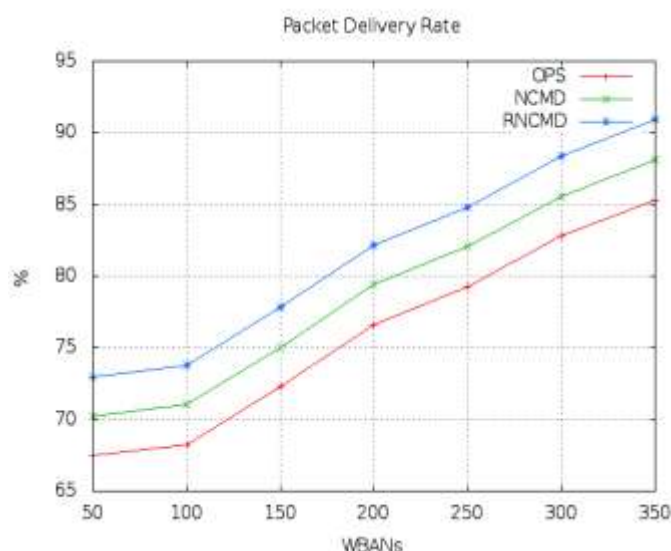


Figure 3: PDR performance evaluation

As showing in the performance of throughput and PDR, the proposed RNCMD technique improves the performance due to the effective strategies designed for the optimum opportunistic routing. The RNCMD is based on NCMD technique.

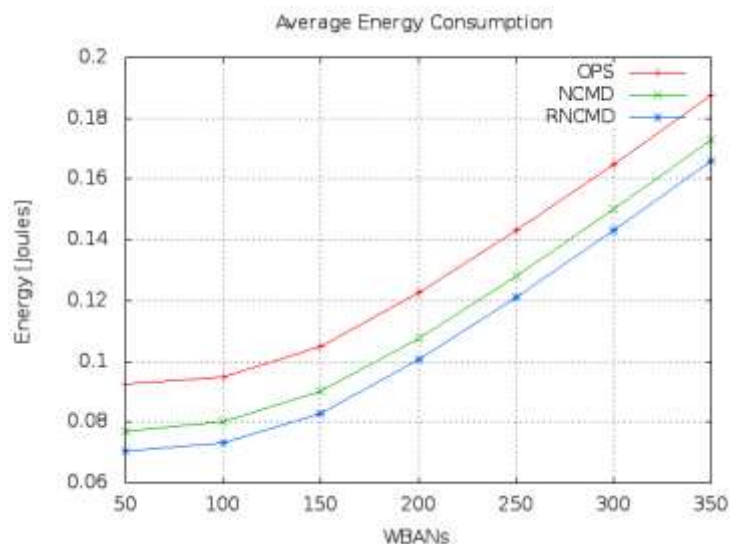


Figure 4: Average energy consumption performance evaluation

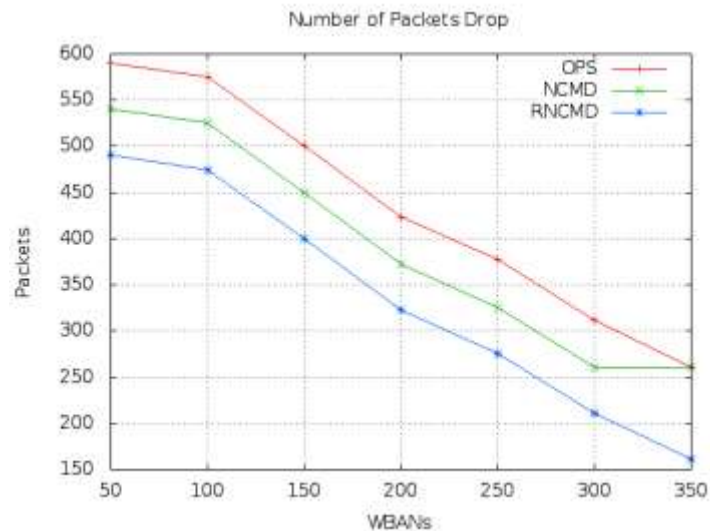


Figure 5: Number of packets drop performance evaluation

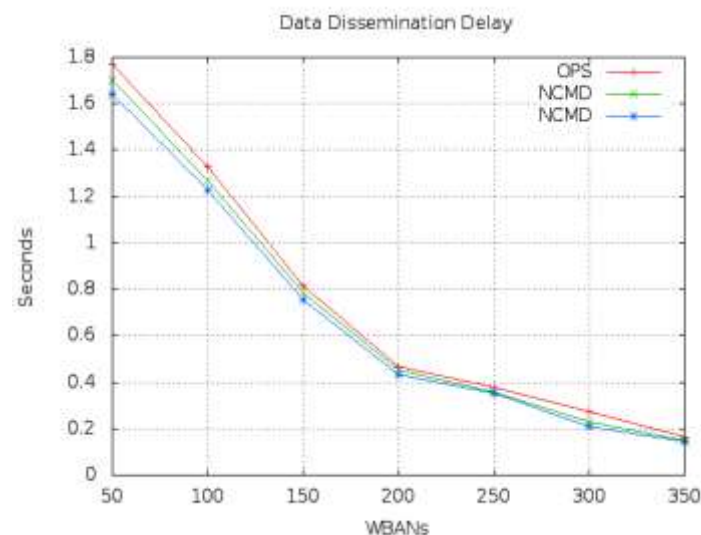


Figure 6: Data dissemination delay performance evaluation

Similarly, the delay and average energy consumption performance is optimized using the proposed solution for the varying WBANs. The throughput and PDR performances are increasing with increased number of WBANs.

CONCLUSION AND FUTURE WORK

In this paper, we proposed the network management cost reduction approach for the opportunistic WBANs in order to manage the increased cost of network management. We first designed the joint distributed network management cost reduction algorithm and energy-efficient algorithm for the dynamic data dissemination process in the opportunistic WBANs. Then we introduced pricing based data transmission for the reliable and stable route selection. The simulation results prove that proposed solution outperforms the existing routing protocols for WBANs. For future work, it will be interesting to investigate the variations in other important parameters of WBAN such as mobility speed, packet rate etc.

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