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Review on "A priority adaptive routing to optimize WBAN"

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Abstract: Body Area network is the advanced for of sensor network defined specially for real time environment with specification of various associated constraints. These constraints are defined specific for the application, environment and the network. These constraints include the energy limitation, node placement, sensing range, communication type etc. To utilize the available resources in restricted constraints is a challenge. In this work, body area network is defined specially for the patients to analyze the various physical statistics. Based on the node placement and the type of communicating data, a routing algorithm is defined in this work. Each of the patients is here defined as the network. The work is here defined to optimize the internetwork and intra-network communication. In this present work, a priority adaptive routing approach is defined. The prioritization vector considered here for selection of intermediate hop. These vectors include node criticality, energy and the type of communication data. The work also includes the setup of the BAN architecture with specification of patient constraints and identifies the critical patient based on the network statistics. The work is here about to improve the network QOS. The work will be implemented in mat lab environment.

Keywords: WBAN, EARBAN, HWB, BANA etc.

INTRODUCTION

WBAN demonstrates an intelligent and autonomous system for monitoring the activities of a person. It is a Smart network which offers promising and significant services in advanced application fields like research, business, industrial, defense, and viable lifestyles. A WBAN is consists of various type of low power sensor devices in the human centric network to serve a variety of applications including healthcare, personal entertainment, advance sports training, live events, aviation, special forces (i.e. military, air force, fire fighters, terrorist trackers, bomb diffusers, astronaut monitoring etc.), disasters, consumer electronics devices. WBAN provides a way to remotely monitor human vital signs, movements, activities using an intranet or an internet which save a lot of money. Now a day's demand of wearable wireless devices in each and every application is grown, and they need to fulfill reliability, security, fault assurance and quality of service aspect. Till now WBAN is not able to satisfy these requirements due to its dynamic topology, time-varying wireless channel, variation in channel bandwidth, limited resources like battery, processors and memory.

Related Layer wise issues

WBAN is internally designed with layered architecture. Surveying of layers is done to reduce the bare bones of implementation, testing, to debug designed and enhance network management. The possible problems faced by WBAN system at each of layer is given below:

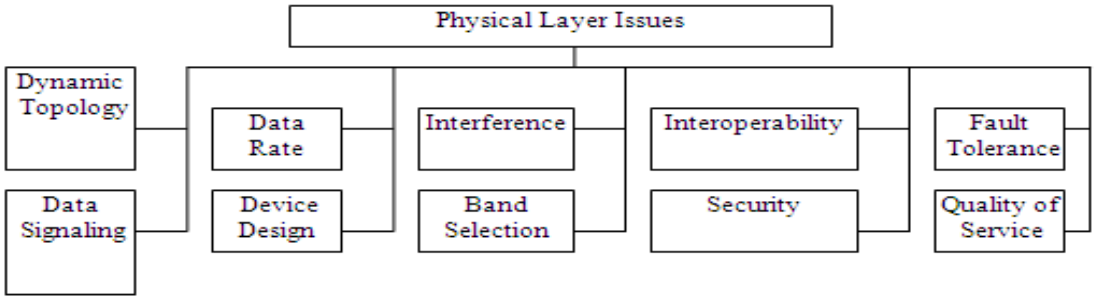

Fig. 1: Structural design of physical layer issues

i) Dynamic topology: In WBAN as body moves the topology is changed.

ii) Data signaling: Some applications of WBAN system required constant signaling as they captures of continuous and real time data.

iii) Data Rates: Needs to handle different data rates due to heterogeneous kind of nodes present in WBAN.

iv) Device design: WBAN systems consist of tiny devices with low powered transceivers which radiate heat, and tolerate the heat or radiation of human body.

v) Interference: Induced by inner body tissues, temperature, heat radiation, surrounding devices and external WBAN.

vi) Band selection: Different WBAN applications require different kinds of Bandwidth for example Zig-Bee deals with health monitoring applications need low data rates. UWB provides low latency and expected throughput in real-time multimedia application.

vii) Interoperability: The integration of several sensing device operating at different frequencies raises an interoperability problem.

viii) Security: Physical layer threat includes Jamming, Tampering and Eavesdropping.

The structural design of MAC layer issues is given in Figure 2:

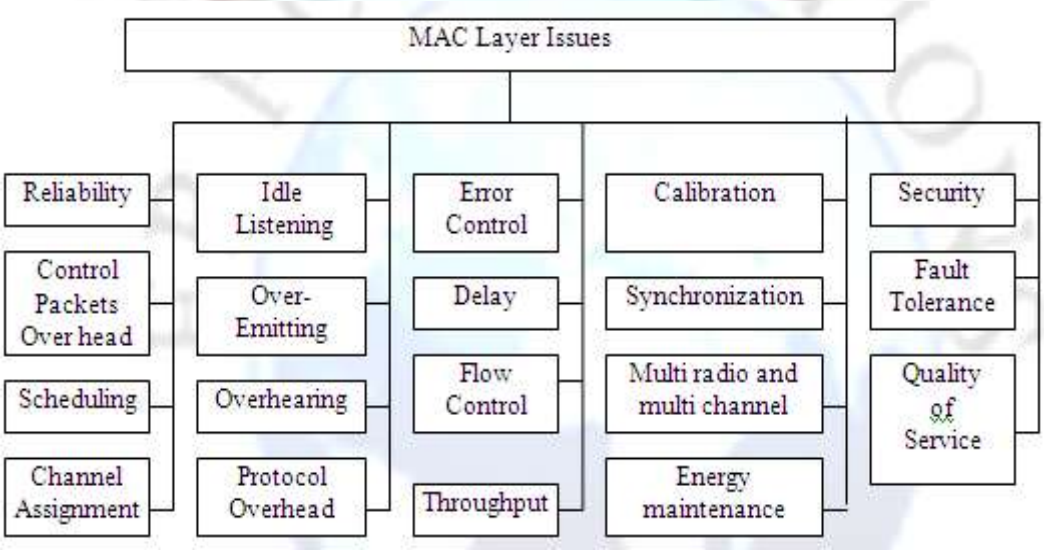

Fig. 2: Structural design of MAC layer issues

ix) Fault tolerance: WBAN system needs to maintain seamless connectivity, faultless communication as affected by many factors like environment, topology and transmission power.

x) Quality of Service (QoS): As WBAN deals with real time streaming of data, capacity of data transmission medium and standards needs to increase to enhance QoS.

i) Reliability: Reliability directly related to packet loss probability which is influenced by bit error rate of a channel and the packet transmission delay.

ii) Control packets overhead: Control packets consume energy and reduce the effective throughput as they do not convey data.

iii) Scheduling: Each packet does not hold the same concern for an application. Some carry important data and needs urgent delivery while other needs reliable delivery.

iv Dynamic channel assignment: Intelligent bandwidth assignment or dynamic channel sharing must be providing to avoid low throughput, high delay, high loss occurs due to noisy channel or interference.

v) Idle listening: It arises when a node listens to an idle channel or when it is expected to receive packets and no packets are received. It consumes more power.

vi) Over-emitting: It takes place by long duration transmission of a message when the destination node is not ready to receive. It may arises flooding at sink, channel busy, waste power and degrade performance.

vii) Overhearing: Overhearing is occurring when one node receives a packet that is destined for other nodes. Waste of energy take place due to acceptance of irrelevant packets.

viii) Protocol overhead: Some fields in the header like protocol specific information (sequence number, sensor type, and packet type), connection identification (source, destination, and port address), and message specific information (checksum, timestamp, message length, priority) are increases significantly to handle some applications and cause this problem.

ix) Error Control: WBAN required error resilience source, channel and network coding schema to control error and to increase network reliability because data get corrupted or lost due to many external factors.

x) Delay: High delay of packets occurs due to low duty cycles. Transmission Delay needs be reduced by forwarding data instead of saving it into the local memory of sensor nodes.

xi) Flow control: Transmission delay and propagation delay occurs due to flooding at receiver side and can be reduced by controlling the flow of data rates.

xii) Throughput: Low duty cycles and exchange of control packets leads to lower throughput. Hence self adjustable duty cycle is required for better performance.

xiii) Calibration: It is a time consuming and difficult task due to failure of sensor nodes, random noise, complex and dynamic environment with many obstacles like damage, delay, aging and random errors.

xiv) Synchronization: Synchronization of duty cycles of sensors with variation in power and traffic is distress throughput and energy.

xv) Multi radio and multi channel design: To avoid collision, to improve performance and network capacity multiple channels can be used. Additional radios bands are desirable for some WBAN applications like disasters and live concert.

xvi) Energy maintenance: Retransmission, collision, control packets overhead, over-emitting, overhearing, idle listening and traffic fluctuation are the main source of energy consumption.

xvii) Security: Collision, Exhaustion, Unfairness, Denial of sleep, Spoofing, Sinkhole, Sybil, Eavesdrop, Traffic analysis are the main attacks of this layer.

xviii) Fault Tolerance: Addition of new nodes, path redundancy, priority management and resource reservation based on dynamic priority queue are required to deal with node failure.

Literature Survey

Samaneh Movassaghi [1] has defined a survey based work on Body area network. Author explored the Aim of WBAN. In this paper, Author survey the current state-of-art of WBANs based on the latest standards and publications. Open issues and challenges within each area are also explored as a source of inspiration towards future developments in WBANs.

Aung Aung Phyo Wai [2] has presented a work on reliability enhancement under visualization system for body area network. Author designed and developed a test bed with integrated hardware and software solution aiming to enhance data reliability and provide performance visualization of WBAN. In this demo, Author showcase Presented current works of improved hardware platform design and development, on-body wireless channel modeling and empirical network profiling, energy-efficient and reliable routing protocol, motion-aware reliability enhancement scheme and visualization of real-time WBAN operations.

Zahoor Khan [3] presented a work on QoS aware peering for routing protocol in delay sensitive data in Body area network. In this paper a routing protocol is proposed by considering the Quality of Service requirements of the body

area network data packets. The proposed algorithm provides better performance than other QoS-aware routing protocols in terms of higher successful transmission rates, lower overall network traffic load, and fewer number of packet timeouts in both the mobile and static patient scenarios.

Jocelyne Elias [4] has defined a topology based energy aware communication in Body area network. This work investigates the optimal design of wireless body area networks by studying the joint data routing and relay positioning problem in a WBAN, in order to increase the network lifetime. Author solve the proposed model in realistic WBAN scenarios, and discuss the effect of different parameters on the characteristics of the planned networks. Numerical results demonstrate that Presented model can design energy-efficient and cost-effective wireless body area networks in a very short computing time, thus representing an interesting framework for the WBAN planning problem.

Hassine Moungla [5] has defined a Min-Max based approach for commodity flow model under dynamic topology generation. In this paper, Author propose a Min-Max multi-commodity flow model for WBSNs which allows to prevent sensor node saturation and take best action against reliability and the path loss, by imposing an equilibrium use of sensors during the routing process. Simulation results show that the algorithm balances the energy consumption of nodes effectively and maximize the network lifetime.

Christian H. W. Oey [6] defined an energy aware routing approach for Wireless Body area network. In this paper, Author introduces the issues in the design of energy-aware routing protocols in WBANs and review the existing protocols. The comparative discussion of the protocols and their perspectives are also covered.

N. Javaid[7] has presented a measurement analysis for fatigue of soldiers using body area network. In this paper, Author propose a routing protocol for measuring fatigue of a soldier. Three sensors are attached to soldier's body that monitor specific parameters. Presented proposed protocol is an event driven protocol and takes three scenarios for measuring the fatigue of a soldier. Author evaluates Presented proposed work in terms of network lifetime, throughput, remaining energy of sensors and fatigue of a soldier.

Md. Tanvir Ishtaique ul Huque [8] has defined an energy adaptive routing approach under body area network. In this paper, Author propose an energy efficient cluster based routing protocol for WBANs, named as energy efficient adaptive routing in wireless body area network (EARBAN). Although EAR-BAN is a cluster based routing protocol, it also combines the benefits of direct and multi hop transmission methods, depending on the energy level and spatial information of body nodes, to formalize an energy efficient, adaptive and opportunistic routing.

Muhannad Quwaider [9] has presented a physical context detection approach for wireless sensor network. This paper presents the architecture of a wearable sensor network and a Hidden Markov Model (HMM) processing framework for stochastic identification of body postures and physical contexts. The key idea is to collect multi-modal sensor data from strategically placed wireless sensors over a human subject's body segments, and to process that using HMM in order to identify the subject's instantaneous physical context.

Lu Shi[10] has presented an authentication system under channel characteristics exploration for body area network. Author propose a lightweight body area network authentication scheme (BANA) that does not depend on prior-trust among the nodes and can be efficiently realized on commercial off-the-shelf low-end sensor devices. This is achieved by exploiting physical layer characteristics unique to a BAN, namely, the distinct re- ceived signal strength (RSS) variation behaviors between an on-body communication channel and an off-body channel. Presented main finding is that the latter is more unpredictable over time, especially under various body motion scenarios.

Benoit Latre [11] has presented survey based work for body area network. This paper offers a survey of the concept of Wireless Body Area Networks. First, Author focus on some applications with special interest in patient monitoring. Then the communication in a WBAN and its positioning between the different technologies is discussed. An overview of the current research on the physical layer, existing MAC and network protocols is given. Further, cross layer and quality of service is discussed.

Jeong Gil Ko[12] has defined a work health care system under sensor network. In this review, Author present some representative applications in the healthcare domain and describe the challenges they introduce to wireless sensor networks due to the required level of trustworthiness and the need to ensure the privacy and security of medical data. These challenges are exacerbated by the resource scarcity that is inherent with wireless sensor network platforms.

Subir Biswas[13] has defined protocol and application specification approach for body area network. This paper provided a formulation of the network protocol-centric problems specific to Wireless Body Area Networks. It will also present a number of specific protocol level solutions for: 1) Transmission Power Assignment with Postural Position

Inference for On-body Wireless Communication Links, 2) Probabilistic Routing in On-body Sensor Networks with Postural Disconnections, and 3) Physical Context Detection using Wearable Wireless Sensor Networks.

Significance of Work

The presented work will provide the following advantages

- The work is about to perform the inter and intera BAN communication analysis so that the work will provide the scalability for BAN system.
- The work is presented as a framework that can be implemented on other application.

References

[1]. Samaneh Movassaghi, "Wireless Body Area Networks: A Survey", IEEE COMMUNICATIONS SURVEYS & TUTORIALS, ACCEPTED FOR PUBLICATION 1553-877X/13@ 2013 IEEE.
[2]. Aung Aung Phyo Wai," Reliability Enhancement and Performance Visualization System for Wireless Body Area Network", PerCom Demos 2012 978-1-4244-9529-0/12©2012 IEEE.
[3]. Zahoor Khan," QPRD: QoS-aware Peering Routing Protocol for Delay Sensitive Data in Hospital Body Area Network Communication", 2012 Seventh International Conference on Broadband, Wireless Computing, Communication and Applications 978-0-7695-4842-5/12 © 2012 IEEE.
[4]. Jocelyne Elias," Energy-aware Topology Design for Wireless Body Area Networks", IEEE ICC 2012 - Selected Areas in Communications Symposium 978-1-4577-2053-6/12 ©2012 IEEE.
[5]. Hassine Moungla," A Reliable, Efficient Routing Protocol for Dynamic Topology in Wireless Body Area Networks using Min-Max multi-commodity flow model", 2012 IEEE 14th International Conference on e-Health Networking, Applications and Services (Healthcom) 978-1-4577-2040-6/12©2012 IEEE .
[6]. Christian H. W. Oey," Energy-aware Routing Protocols in Wireless Body Area Networks".
[7]. N. Javaid," Measuring Fatigue of Soldiers in Wireless Body Area Sensor Networks", 2013 Eighth International Conference on Broadband, Wireless Computing, Communication and Applications 978-0-7695-5093-0/13 © 2013 IEEE.
[8]. Md. Tanvir Ishtaique ul Huque," EAR-BAN: Energy Efficient Adaptive Routing in Wireless Body Area Networks", 978-1-4799-1319-0/13 ©2013 IEEE.
[9]. Muhannad Quwaider," Physical Context Detection using Wearable Wireless Sensor Networks", JOURNAL OF COMMUNICATIONS SOFTWARE AND SYSTEMS 1845-6421/08/8141 © 2008 CCIS.
[10]. Lu Shi," BANA: Body Area Network Authentication Exploiting Channel Characteristics", WiSec'12, April 16–18, 2012, Tucson, Arizona, USA. ACM 978-1-4503-1265-3/12/04.
[11]. Benoit Latre," A Survey on Wireless Body Area Networks".
[12]. JeongGil Ko," Wireless Sensor Networks for Healthcare", 0018-9219@2010 IEEE.
[13]. Dr. Subir Biswas," Network Protocols and Applications for Wireless Body Area Networks", 2009.