A TDMA BASED SECURED AND EFFICIENT DATA COMMUNICATION PROTOCOL FOR WIRELESS BODY AREA NETWORKS

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ABSTRACT
The Wireless Body Sensor Network (WBSN) is a wireless network used for communication among sensor nodes operating on or inside the human body in order to monitor vital body parameters and movements. A Body area networks provides a continuous health monitoring and athlete practice session of a patient without any condition on his/her normal daily life activities. The Body sensor Network with central gateway node can control wireless transmission and optimize the network lifetime. The sensors are implementation according to star and multi hop topology. One of the major challenges is establish a secure communication between the Implanted/Wearable sensors and the user. The data in cipher text format at the data sink, hence ensuring data security. In this we also design two protocols to securely retrieve the sensitive data. It provides the Message Authenticity and collision resistance and also evaluates the performance in the term of communication/computation TDMA with different multiplexing.
Keywords: TDMA, WBAN, Performance, Cryptography

I. Introduction

In Wireless body area network, the wearable//implanted sensors are not only provide mobility for users but also provide the real-time feedback by continuously monitoring and analyzing sensed information. This can help professionals to measure the athlete training session and perform early diagnosis and treatment. The most Important thing is that need for reliable communication with each WBAN node. The Network reliability is defined by the speed and amount of information received. The network can be affected in many ways they are, number of nodes, overlapping transmissions and total amount of traffic generated on the network. Many wireless communication techniques have been adopted to increase the network capacity and enhance the reliability such as CSMA/CA, CDMA, TDMA and FDMA. In project introduced a human gesture transmission method based on the dynamic time division mapping. The BAN is technology that allows the sensors to communication between ultra-small and ultra-low power sensors/devices that are located on/inside body. The radio enabled sensors can be used to gather the information continuously. The radio enabled implantable medical devices set of application among which we can point to smart pills for drug delivery, glucose monitors and eye pressure sensing systems.

II. Literature Survey

Recent developments and technological advancements in wireless communication, Micro Electro Mechanical Systems (MEMS) technology. Around the human body to be used in various applications, such as personal health monitoring. The aim of WBANs is to improve speed, accuracy, and reliability of communication of sensors/actuators. [1]

Developments in health monitoring technologies. It measure critical physical and physiological parameters e.g., mobility, heart rate, and glucose levels. BAN technology is key to its success as it grants portability and flexibility to the user. [2] Random incomplete coloring (RIC) with low time-complexity and high spatial reuse. Interference-avoidance scheduling of wireless networks can be modeled as a problem of graph coloring. High spatial-reuse coloring, fast convergence scheduling for a mobile ad hoc network (MANET). [3] In wireless body area network (BAN), node authentication is essential for trustworthy and reliable gathering of patient's critical health information. Traditional authentication solutions depend on prior trust among nodes whose establishment would require either key pre-distribution or non-intuitive participation by inexperienced users. Most existing non-cryptographic authentication schemes require advanced hardware or significant modifications to the system software, which are impractical for BANs. [4] Health and sport applications have been a flourishing area for deploying Wireless Body Area Networks (WBAN) as this technology can provide a real time feedback which is important for the user, coaches, doctors and the viewing public. The wireless channel reliability and efficiency for time multiplexing and star shape body area network operating on 2.45GHz with a data rate of 1Mbps. The results show a tradeoff between the channel occupancy and traffic generated to provide high channel reliability for the body network. [5] Motion sensing has played an important role in the study of human biomechanics as well as the entertainment industry. Although existing technologies, such as optical or inertial based motion capture systems, have relatively high accuracy in detecting body motions, they still have inherent limitations with regards to mobility and wear ability. The sensing suit prototype includes a pair of elastic tights and three hyper elastic strain sensors. [6] Time division multiple access based MAC protocol designed for body sensor networks (BSNs) is presented. H-medium-access control (MAC) aims to improve BSNs energy efficiency by exploiting heartbeat rhythm information, instead of using periodic synchronization beacons, to perform time synchronization. Heartbeat rhythm is inherent in every human body and observable in various bio signals.[7] Many elder patients have multiple health conditions such as heart attacks (of various kinds), brain problems (such as seizure, mental disorder, etc.), high blood pressure, etc. To reduce mobile-health (m-health) cost, the above sensors should be made in tiny size, low memory, and long-term battery operations. In this paper, we report our work in three aspects: (1) networked embedded system design, (2) network congestion reduction, and (3) network loss com-sensation.[8] Health and sport applications have been a court area for deploying wireless body area networks as this technology can provide a real-time feedback, which is important for the user, coaches, doctors, and viewing public. A wireless accelerometer sensor module was used to determine the link performance by recording the data and traffic lost on different runners and for different transmitter locations around the human body (foot, leg, and arm). An approximate swing time calculation algorithm was employed to find the swing time effect on these losses.[9] The rapid growth of wireless technologies and personal area networks has enabled the continuous healthcare monitoring of mobile patients using compact sensors that collect and evaluate body parameters and movements. A BAN, consisting of two nodes and a base station was successfully built and tested using open source and inexpensive hardware to measure pulse rate, body temperature, and patient's location. Each node consisted of a pulse sensor, a temperature sensor, a GPS module and a ZigBee wireless modem packaged together. The nodes were designed to merge other sensors, such as an accelerometer, in the future.[10] The increasing use of wireless networks and the constant miniaturization of electrical invasive/non-invasive devices have empowered the development of Wireless Body Area Networks (WBANs). Many technologies have proved their efficiency in supporting WBANs applications, such as remote monitoring, biofeedback and assisted living by responding to their specific quality of service (QoS) requirements. Finally, a matching between each application and the corresponding suitable technology is studied.[11] Wireless Body Area Networks (WBANs) supporting healthcare applications are in early development stage but offer valuable contributions at monitoring, diagnostic, or

therapeutic levels. The most important features under consideration in our analysis include wireless communication protocols, frequency bands, data bandwidth, transmission distance, encryption, authentication methods, power consumption, and mobility. Our study demonstrates that some characteristics of surveyed protocols are very useful to medical appliances and patients in a WBAN domain. [12]

III. Existing Work

In Previous work was carried out to select the best node location and human body and to achieve a maximum connectivity to receiving data. In wireless sensor module was used to determine the link performance by recording the data and graphic classes on different transmitter location around human body. Algorithms are used to calculate the swing time effect on these loses sensor locations and data rate on the link performance. The drawback is reduced network lifetime as more power is consumed to its normal operation. In existing Malicious node detection scheme named BAN-Trust is proposed to better secure BANs. The data sink can be an IMD designed to store data in a smart phone, which has the ability to communicate with a remote healthcare agency through cellular networks or the Internet. All those IMDs, which will later be simply referred as sensors, and the data sink together consist a small-scale wireless sensor network, called a Wireless Body Area Network (WBAN). This makes WBANs a perfect candidate for enabling in home monitoring diagnosis. Especially for more people having chronic diseases. Disadvantages of Existing Work is when a doctor wants to send instructions or commands to a sensor in a BAN, direct communications between the doctor and the sensor are needed. Since energy consumption is linearly proportional to the message size. Revocation (Cancellation) is a practical problem in real life applications. A doctor may be transferred to another hospital and his secret keys for the attributes should be revoked. Indeed, this is a problem regarding how to revoke a user in the ABE system. In a typical ABE system, an attribute is associated with a time stamp

Proposed Work

With Identity-based cryptography, the public key of each user can be easily computed from a string corresponding to the user's identity. Since this eliminates the cost of certificate distribution, identity-based cryptography is especially suitable for BANs. Developed a distributed fine grained access-control mechanism for wireless sensor networks. In contrast, we develop a data communication scheme in this paper which has significantly lower communication overhead and power consumption. We apply the attribute-based encryption proposed by Bettencourt, Sahai, and Waters to encrypt the data and store the cipher text in the data sink according to the requirements of the BAN. Therefore the advantage Of Proposed System is high efficient to transformation of packets from the source node to the destination nodes in Wireless Body Area Network. It provides message authenticity and collision resistance, and is efficient and feasible. We evaluate the performance of the proposed scheme in terms of energy consumption and communication/computation overhead. They were proposed for general sensor networks and could be applicable to BANs to secure the inter-device communications.

IV. Architecture Diagram

1. Route Discovery with AODV

- The 3 methods are RREQ, RREP, RERR with the Acknowledgement gained finds the right path with Shortest Distance. It takes into account only the nearby node. It transfers the packet to that Discovered Node. Whenever a router receives a request to send a message, it checks its routing table to see if a route exists. Each routing table entry consists of the following fields:Destination address
- □ Next hop address
- □ Destination sequence number
- □ Hop count

If a route exists, the router simply forwards the message to the next hop. Otherwise, it saves the message in a message queue, and then it initiates a route request to decide a route.

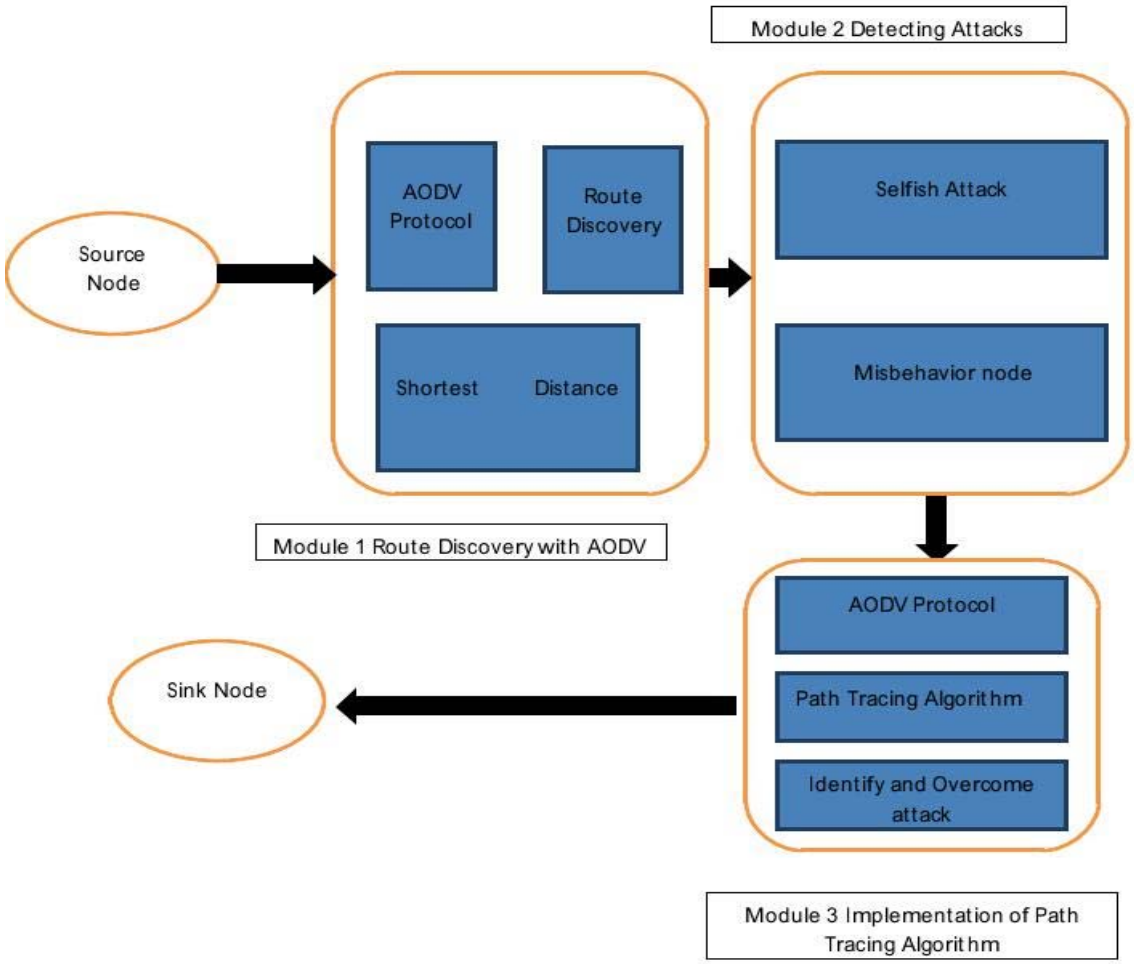

Fig.1 Architecture diagram of Proposed System.

2. Detecting Attacks and Apply ECC

ECC Algorithm

For secure data transmission we use Elliptic Curve Cryptography algorithm which uses key generation technique by using TDMA. The sender will encrypt the message with receiver's public key and the receiver will decrypt its private key. The plain text is

The RTT computation is based on its own clock Compute per hop distance value using RTT value. The computed per hop distance value and timestamp are stored in each packet header. This information's are stored to identify the misbehavior link. Every node in a path computes per hop distance with its neighbor and compares it with the prior per hop distance. If the per hop distance exceeds the maximum threshold range, RTh.

Encoded and perform Encryption and Decryption

3. Implementation of Route/Path Tracing

Nodes in a path computes RTT values based on the time between the RREQ sent and RREP received.

Check for the maximum count a link takes part in the path. Mark the link as Misbehavior link and the corresponding node informs other nodes in the network. These nodes are then isolated from the network. That describes the path tracing algorithm.

V. Simulation and Analysis

Parameters	Value
Channel	Wireless
Protocol Type	TDMA
Transmitting node range	1m
Bandwidth	3M bit
Interface queue length	50
Simulation time	30sec
Number of nodes	40
Traffic type	CBR
Packet rate	250kb
Packet size	1200
Scenario size	1200m*1200m

Fig. 3 .Performance of ECC-TDMA

Protocols	PDR	Throughput	Delay
Traditional Techniques	63	19	0.42
TDMA	61.20	27	0.3
ECC - TDMA	95	72	0.15

The comparison of parameters such as PDR, Throughput, and Delay in Tradition Techniques the PDR 63%, Throughput 19kbps and Delay 0.42s were achieved. Then in TDMA parameter PDR value is 61.2%, Throughput 27kbps and Delay 0.3s were achieved. Finally using ECC-TDMA parameter PDR value is 95%, Throughput 72kbps and Delay 0.15s compare with other parameters ECC-TDMA parameter is efficient and perform higher

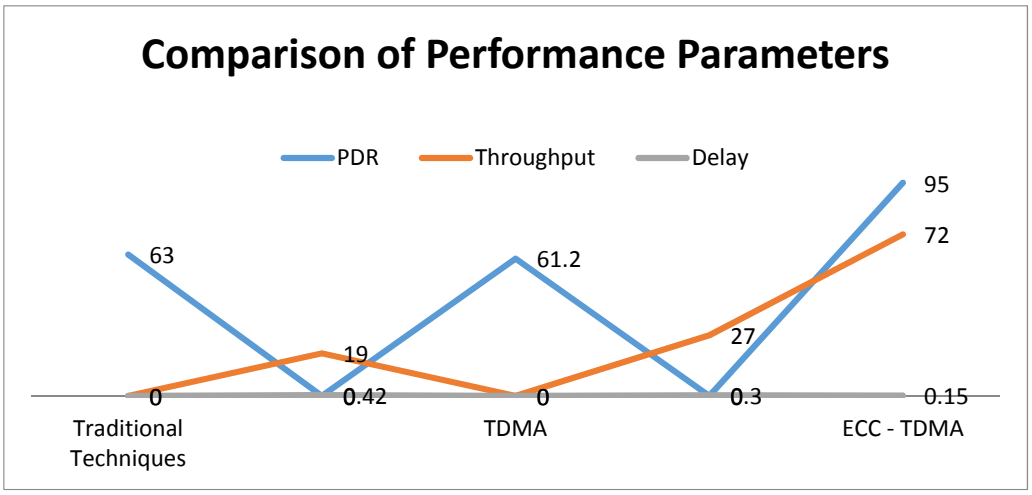

Fig. 4 .Comparison of performance parameters of protocol

VI. Conclusion and Future Work

A wireless accelerometer sensor module was used to determine the high reliability locations by recording the data delivered for different node locations (wrists and thighs) on the human body during running. A self-calibrating algorithm was employed to find these time location points and the running cycle of the participants was used in a dynamic time division multiplexing algorithm. The results showed that all transmissions attempts were successful in a node to node communication, and there were a few data losses (10%) in multi-node network when two nodes were trying to transmit at the same time. Future work will involve the design of an interactive application that presents the data in a more understandable form for the coaches by showing the symmetry between the right and left body limbs during running cycles for different runners

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