

Implementation of web based biotelemetry applications on WiMAX networks

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ABSTRACT

In this world, health is the most important factor and subject in society and social life. Thus, this sector gets more importance to give better service and to use resources more efficiently under the health economy. In this paper, it is designed and conducted a web based biotelemetry application works on WiMAX. First; Patient Communication Node (PCN), Client Communication Node (CCN) and Administrative Communication Node (ACN) systems are designed. Then these systems are implemented on WiMAX networks. Finally proposed model is compared with other equivalents.

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1. Introduction

In today's world, the most important element of society and social life is human. Politics, law, religion and many more social and scientific cases are all based on "Everything is for human" philosophy. The use of technology in the service of environmental and human beings are the core of this goal. With this idea, it is intended to make people physically and spiritually healthy, happy and live in prosperity. At this point, the human health appears to be one of the most important issues.

Medical networks has emerged as a result of the implementation of computer and communication technologies in health field. The most important function of medical networks is that provides remote controlling for doctors to observe their patients. This is called biotelemetry in the literature. There is a wide spectrum if it is looked at studies about biotelemetry and medical networks. AMON [1], SMART [2], CodeBlue [3], UbiMon [4], PPMIM [5], MobiCare [6], AGnES [7], Bi-Fi [8], Alarm-Net [9], AID-N [10], CustoMed [11], MobiHealth [12] and PadNET [13] are examples for such studies. While some of studies focus on specific subjects, some of them approach as a whole to create solutions. The adaptation of existing information and communication technologies to telemedicine and biotelemetry or the implementation of completely new ideas are observed in studied subjects. The basic main points are transmitting vital information of patients to health

centers in accurate and quick way and making patient independent from hospital by increasing their life quality. These studies focus on designing miniaturized, easy to carry sensors that not bothering patients to increase life quality while monitoring vital data. Another research field studies about providing long life and managing power for these sensors [1–18].

Another studied subject about telemedicine and biotelemetry in literature focus on creating solutions to read the vital information on patients quickly and accurately, without calling interrupted and restricting the patient from social environment. Especially in recent years, wireless communication technologies are being used in every area of our lives as well as in biotelemetry field, and various studies on this subject were made [1–18].

Biotelemetry systems usually use Wi-Fi, Bluetooth or ZigBee networks when there is mobility. Such networks have narrow range, this is because WiMAX which has larger range is more popular [19–21].

WiMAX (Worldwide Interoperability for Microwave Access) is a technology based on IEEE 802.16 specification of wireless communication standard. According to the standard known as Wi-Fi 802.11 group serves rapidly in much more extensive areas. WiMAX offers 70 Mbps communication in 50 km area. Thus, by using this technology in biotelemetry field, patients will be more comfortable in their social life [19–21].

In this paper, it is designed and conducted a web based biotelemetry application that works on WiMAX by reference of authors solution approach published in [22,23]. First; Patient Communication Node (PCN), Client Communication Node (CCN) and Administrative Communication Node (ACN) systems have been designed as

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it is mentioned in the solution approach of model [23]. Second; these systems are implemented and WiMAX networks based on the communication issues in a proposed system then compared with other equivalents.

2. The implementation of layered units in model based solution approach

Patient, client and central units are the end points (CU). Patient, client and central units may take different goals and tasks in solution approach. Therefore, it is clear that it will be bringing the appropriate modules together as shown in Fig. 2.1 in [22].

2.1. Modular concept for patient application (Patient Communication Node – PCN)

In the solution approach based on model for biotelemetry applications, patient is the center of the system and the system is designed as patient-central. Biotelemetry applications are based on the observation of vital information about the patient from a remote location [22]. According to this idea there should be a module that measures vital information of the patient. For this SCM module [22] is used. Thus, the measuring problem of vital information is solved. The SCM module is represented by DU in

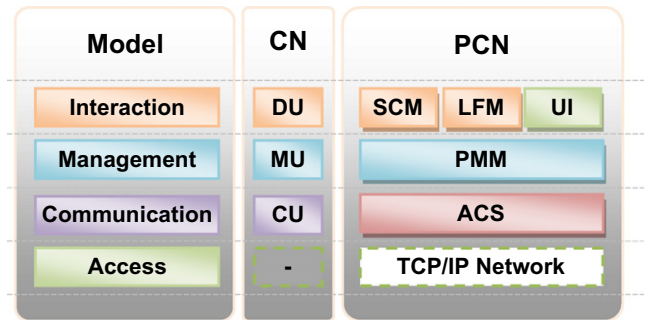


Fig. 2.1. Modular solution and layered units for PCN.

CN = CU + MU + DU equation. One SCM that can measure more than one vital information is used for this application. Also, LFM module which is for measuring of patient's position and UI module for interaction of application and patient are used in this application. There should be a management unit to manage DU and other unit in network. The PMM module is used for this approach. MCM and ACS modules are used according to the operating modes on patient in link layer [22]. The ACS module was preferred for this application since it is web based. This module is the best suited one for web based applications.

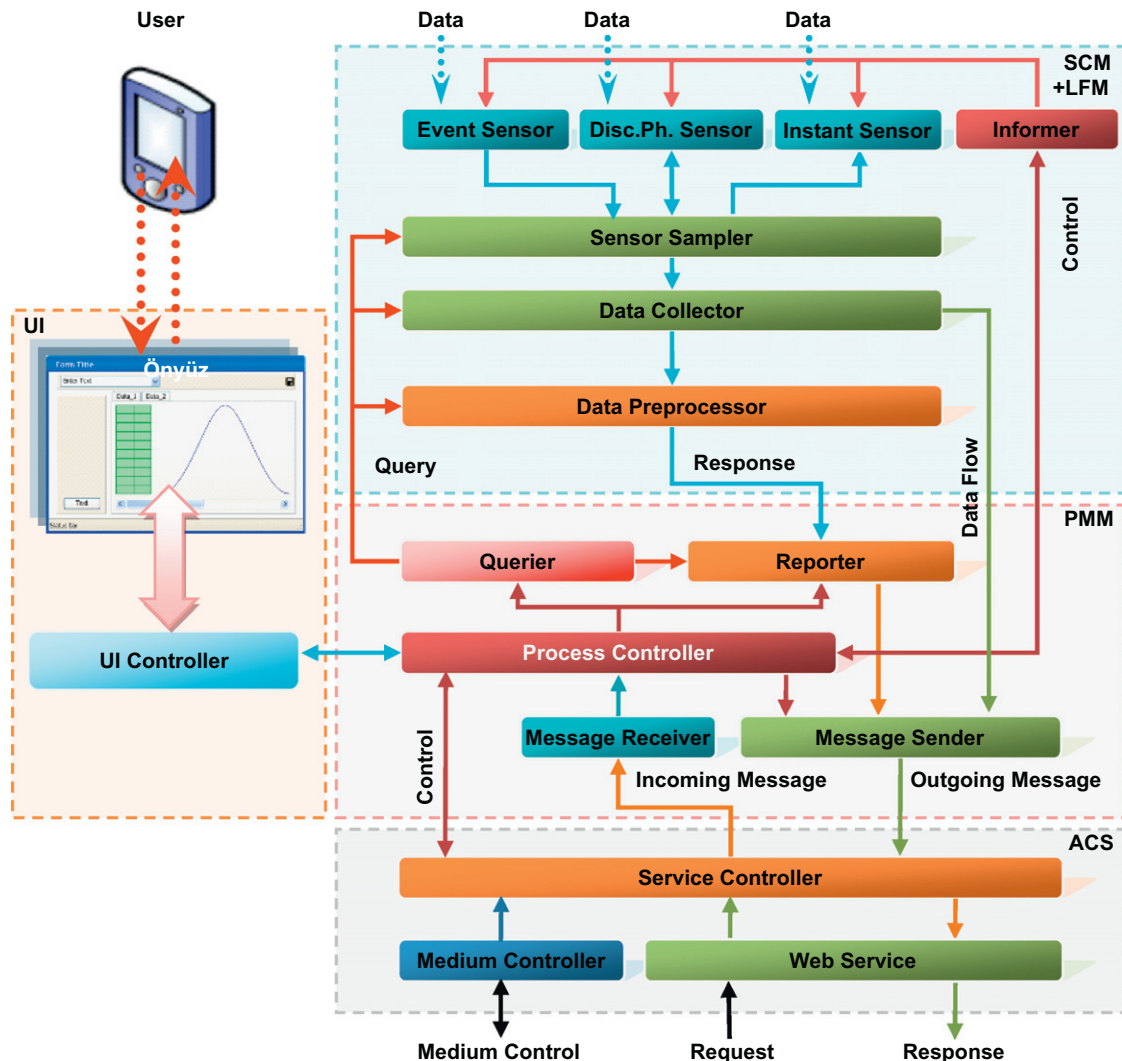


Fig. 2.2. PCN structure for web based biotelemetry application.

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