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Optimization of Query Processing Using Wireless Body Area Networks Based On Cloud

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***Abstract*--Recent enhancements in wireless sensor networks have paved the path towards modernized healthcare services. It monitors the patient's health parameters such as pressure, sugar level, respiratory level and other vital signs using sensors and stores the health details at cloud storage from there anyone related to the patient can access their details. There are some constraints in Wireless Body Area Networks(WBAN) such as energy consumption, less efficiency in data retrieval, and network lifetime. This paper proposes a system which monitors the patient's health continuously using sensors and stores the details in the cloud storage. Query optimization techniques such as probabilistic techniques and statistical modeling techniques to optimize the data retrieval process. By optimizing the queries congestion can be controlled, repeated values can be avoided and increases the network lifetime.**

***Keywords*: WBAN, Data retrieval, Probabilistic technique, Statistical Modeling, Storage.**

I.Introduction

Wireless Sensor Networks are spatially distributed sensors to monitor physical or environment conditions such as temperature, sound, pressure, etc. Wireless Body Area Networks is the advancement of Wireless Sensor Networks (WSN),WBAN is a key component for ubiquitous healthcare services. Body Area Network is a type of WSN, which is aimed to deploy on person in order to collect physiological parameters for healthcare monitoring purpose. The body area network is an interdisciplinary area which could allow inexpensive and continuous health monitoring with real-time updates of medical records through the internet. The aging population in many developed countries and the rising costs of health care have triggered the introduction of novel technology-driven enhancements to current health care practices. The implanted or fixed sensors in human body will collect various physiological changes in order to monitor the patient's health status no matter about their location. Sensors measure the physical parameters such heartbeat rate, body temperature, blood pressure, sugar level,

etc. The gathered parameters are stored in storage device because it has to be operated anytime from environment. WBAN monitor the patient's health and to detect any anomaly in patient health status. Using WBAN the patient experiences a greater physical mobility and is no longer compelled to stay in the hospital. The wireless nature of the network and wide variety of sensors offers numerous new, practical and innovative applications to improve the health care services and quality of life. The sensors need to send their data to an external medical server where it can be analyzed and stored. From the medical server, system can get the updated the details of the patient health and detect any anomaly occurs.

II.Related Work

Several works has been done to improve the WBAN in terms of energy consumption, query latency, network lifetime, secured information storage and bandwidth of the network. In [28], Real-time query processing techniques are used to optimize the queries, which can control the energy consumption, efficiency and increase the network lifetime. In [15], the energy efficient protocols such as cluster based protocol and tree based protocol which analyzes the network by varying parameters such as number of nodes, distance between the nodes. In [27], polling based protocol is used to minimize the energy consumption among the nodes and

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query latency. In [29], A design aspect of an autonomic cloud environment that collects people's health data and disseminates them to a cloud based information repository and facilitates analysis on the data using software services hosted in the cloud. In [10], Use of e-health records in healthcare improves the healthcare services provided to the patients. Usage of ubiquitous e-health helps the health professional to pursue early detection of abnormal status on patient's health. In[16], Challenges faced by WSN is handling a real-time storage and querying the data they process. Real-time database management on WSN, it deals with time constraint data, time constraint transaction and limited resource of wireless sensors. A framework of real-time database management on WSN uses a distributed approach. Proposition model is used for simulation framework of the real-time database management on WSN.

III.Proposed Work

In Wireless Body Area Networks, sensors are used to monitor the person activities especially for healthcare services. Sensors can be implanted or fixed in the clothes of the patient to monitor them continuously. Query optimizing techniques such as probabilistic and statistical modeling techniques are used to check the freshness of the query and to get the newly updated details. The proposed system consists of three user i.e. Family member, Doctors and Emergency services. It monitors the patient continuously and updates the recent health parameters in the cloud storage. Hospital can be tied with some other hospitals, if there any patient can change the hospital and no need take all the test and treatment from beginning. It detects the anomalies at earlier stage itself by continuous monitoring. In case of any emergency, the alert will be send to the family member, doctors and emergency services.

IV.System Architecture

The proposed architecture represents how the system functions, the health parameters are gathered via sensors which are implanted or fixed in the cloth of the patient's body. The collected parameters are forwarded to centralized cloud storage via personal area network such as Bluetooth or internet. The sensor gathers the health parameters continuously so that cloud storage has the updated health status of the patient.

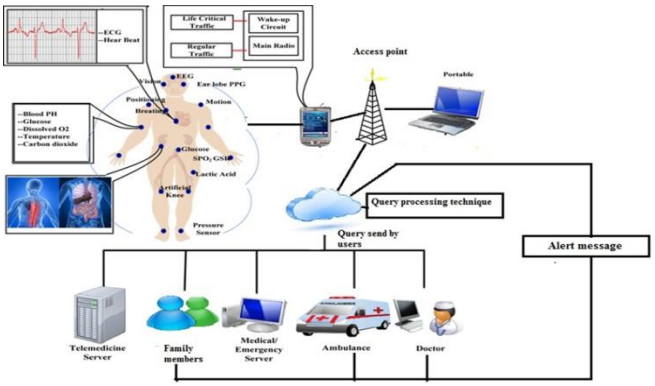

Fig.1. Architecture of optimization of ubiquitous healthcare service based on cloud using WBAN

Users such as patients, family members, Doctors can retrieve the health status efficiently from the cloud storage. In case of any emergency the alert message will be send to Family members, Doctors and Emergency services. The queries are optimized using Query processing techniques such statistical modeling and query processing algorithm.

V.Modules Description

A. Login and Registration Process

The proposed system has many numbers of users, each need a individual id for privacy purpose. The users of the system are Patients, Doctors, Hospitals and Family members. For new users registration process is the first step, while registration system requires the basic details of users. Details of users are collected and stored in database. During registration profile for each user is created and the details can be updated periodically whenever there are any changes. The database is created for each user. For patients the two databases are created one for storing their personal details and another for storing their health parameters. For Doctors individual database are created for storing the personal database and appointment details. Hospitals database also created for to view the number of hospitals which has tie up with that particular hospital. BAN is created by using sensors. Human can be tracked and monitored using the BAN. Monitoring from healthcare perspective can be with or without the consent of the particular person. Sensor monitors the human body continuously and collects the health parameters like pressure, temperature, heart beats and other vital signs. BAN can be used to monitors the patient continuously by which pre-hospital, In-hospital, ambulatory monitoring and family members. It collects periodic or

continuous data and it is updated to database. It reduces the length of hospital stay. The parameters are collected forwarded to the centralized storage via Personal Area Network (PAN) such as Bluetooth or internet. BAN also supports mobility monitoring. The collected health parameters are stored in the cloud environment.

B. Integrating Database with Cloud Storage

BAN also supports mobility monitoring. The collected health parameters are stored in the cloud environment**.** The health parameters are fetched from the human body and forwarded to the cloud storage. Large-scale of information can be stored and accessed in cloud environment. Many numbers of users can access the patient health detail, where it is centralized storage. Cloud environment is integrated with WBAN to facilitate the development of cost-effective scalable and data-driven healthcare system which must be able to realize long term health monitoring and data analysis of patient in different environment. The cloud tier may encompass other servers such as commercial healthcare provider and emergency services accessible via internet. Medical database server is composed of query processor, probabilistic model and database. By using cloud environment, secured access can be provided. Query processor process either historical query or real-time query with respect to query's parameter. A database stores the medical data of registered hospital, doctor and patients.

C. Data Retrieval from Cloud

Query processor is to process the queries and access the historical data in medical server database. The probabilistic model uses the data stored in the database, to estimate the answer of the real-time queries to their requested data freshness constraints. Queries are sending by the user and the answer retrieved must represent the data about the current human health status, by supporting temporal validity. User sends SQL query to the medical database server. This query is parsed and translated by the query processor into probabilistic computation over the model. Using probabilistic technique, it calculates the probability of parameter variation. It is used to estimate the answer of user queries about the current state of body sensor reading according to data freshness. Using probabilistic technique can answer many complex queries.

V.Implementation

New users of the system are registered and provided with new login id, then password. The database is maintained with the details of hospitals, doctors, patients, and emergency service those who registered. Patient health can be tracked using sensors and updated in database continuously. Hospital administrator can view the registered hospital, doctors and patients. Patient can view the details of the treatment taken and fix appointment with the consent doctor. Query optimization techniques such as probabilistic and statistical modeling are used to optimize the queries send by the user. These techniques will check the freshness of the query and reply with the updated health details. A user submits a SQL query to the cloud storage server at time t2 and asks to estimate the temperature values of a specific body sensor Si in the WBAN with an error e and a confidence 1–h (h 2 [0, 1]). Once the query is send it is parsed and translated for further probabilistic computations. The difference t2 _ t1 gives us the late time of the query from the last reading. The time interval is denoted by Q and average time is calculated between the timings.

VI.Result and Discussion

To evaluate the performance of proposed methodology is compared with the existing query processing technique. It encompasses query processing algorithm and probabilistic model. The proper utilization of query processing algorithm and probabilistic model overcomes main constraints. The proposed system provides a secure and powerful storage. Query processing mechanism that takes into account both the temporal constraint of data and energy consumption in WBAN architecture. The performance indices, which are based on the energy cost and the latency of the user query processing. The energy cost is determined according to the nodes visited by the queries, the data sensing, processing, transmission and the sensor's duty cycle operation

A.Energy and Cost Using Freshness

A query is submitted by the user to the medical database server. The server is encompassed more than ten servers in WBAN environment. If the query is for temperature or any other parameter or health status of patient, the result sent back to the user must within a tolerated level. Let us assume the tolerated level is 50◦ c to 80◦ c, if the result exceeds the tolerated level, then error may occur and anomaly is detected. When the error increases the percentage of energy consumed. The proposed model is programmed to send the health parameter and periodically to medical database server. The proposed model remains very smaller and increases gradually

then energy consumption is low, which also reduces the cost. For example, Queries are sent to retrieve the body temperature and assume the temperature between 50◦ c to 80◦ c be normal and the confidence level is fixed up to 95%. When any error occurs, it increases the query latency in time unit. In query processing proposed model, the queries do not put in wait mode. It optimized to extract the data from medical database server. It reduces time and energy constraints.

VII.Conclusion

Mobility is an important aspect of WBAN. The proposed model has query processing algorithm for energy- efficiency, secure and powerful storage of patient data. It detects the anomaly at earlier stage by continuous monitoring process. Real-time data processing in WBAN is integrated with cloud services and statistical modeling techniques to perform a query optimization that uses the error tolerance and probabilistic model. Our future work will be centralized medical database server is shared with other hospital. In case of any emergency alert message will be send to family members, doctors and emergency services. It grants permission to access the particular patient record, when the patient shifted to other hospital. Real-time query processing is with granting permission to access a particular record are expected to be developed towards overall performance increment, reduces the time and energy consumption. It will increase the network lifetime by reducing the query latency.

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