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WIRELESS SENSOR NETWORK INTEGRATING WITH CLOUD COMPUTING FOR PATIENT MONITORING

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ABSTRACT
In past years, Patient observation is done manually or by using wireless Body Sensor Network which is sensibly observed by medical organization agents. Mesh network is used for reading physiological framework and clear description of the patient using wireless sensors. Inventive Agents are proposed for alerting medical organization and data aggregation. Cloud is also proposed for supporting healthcare community and remote or mobile patient monitoring.

INDEX TERMS*—Sensor Networks, Patient Observing, Agent Technology and Cloud Computing.*

I. INTRODUCTION

In the past, Healthcare has been the focus of many research activities. The project is based on the use of Information and Computing Technology (ICT) to improve efficiency in medical, technical and administrative processes. Patient monitoring is important to care in emergency rooms, operation room, critical care and intensive care unit And also invaluable for recovery rooms, respiratory therapy, transport out-patient care, cath labs, radiology, ambulatory, home gastroenterology departments and sleep application. Many problems occur within this and issues of patient observing. Patient monitoring is a critical function because patient under medical observation can change in any time. In critical cases, ICT enables significant reduction of the possibility of human error. Patient observation is done manually by capture the physiological conditions of the patient such as pulse rate, temperature and blood pressure etc. The patients readings are recorded on the medical chart provided for patients and the treatment plan is based on captured data.ICT not only make the automation of the patient observing process possible and also significantly improve the process. In this paper, we propose a solution to this problem .From the generic nature of the solution that we understand it can be applied in many other situations. This paper gives an overview of Integrating wireless sensor network with cloud computing, which is as follows: Section 2 discusses about WSN and Cloud computing, section 3 discusses about proposed system, section 4 and 5discusses about simulation scenarios and simulation results , section 6 discusses concluding remarks.

II. WIRELESS SENSOR NETWORKS

Wireless Sensor Networks have originated as a vital new area in wireless technology. Initially Sensor Networks were developed only for military applications such as battlefield monitoring and have been successfully retreated for patient monitoring backbone network which creates. The sensor **network**

model is a database model. The term computer network model defines the category in which a computer network can be grouped into. This network models are possibly still the most important of the special structures in linear programming. The network users hardware or software in the share way over the network and this sensor model clearly defines the functions of communication software in a generalized and structured manner which helps to carry out the network product development activities. The approach presented here is simply derived from specializing the rules of the simple method to take advantage of the structure of network models. All WSNs are controlled by software which implements the different routing protocols used by the network.

CLOUD COMPUTING

Cloud computing is used to describe a variety of different types of computing and a large number of computers is connected through Internet. It is based on "Pay-Per-Use" services .In cloud there are three basic services available they are Software as a Service , Platform as a Service and Infrastructure as a Service. But health care service uses only a good Internet connection. This service enables small healthcare hospital to multi-specialty hospital to pay per use service which is cloud service as like paying for Internet connection service. Based on a cloud based hospital management, it uses application program interface which connects emergency ward workers with pre stored data and connected to ambulances. Then Doctors are allowed to see important data which is collected in ambulances through the hospital's Emergency ward and fed it into patient's Electronic Health Record. In before projects the Emergency ward doctors had to fax the patient data manually.

III. THE PROPOSED SYSTEM

Integration of Wireless Body Sensor Network integrating with Cloud Computing are proposed for more efficient patient observing. Currently healthcare centers use Wireless Body Sensor Networks (WBSNs) to observe the patients and normally WBSNs formed in an ad-hoc environment, which bring frequent network failures. Wireless Body Sensor network is proposed in this method.WBSN provides different functionalities to improve the monitoring of environment. It uses wireless sensors for reading physiological parameters and patient identification. And also we are storing the result obtained in QualNet software in the cloud storage device. And also the main contribution of this paper based on integrating the wireless sensor network which is integrated with Cloud computing which would see the patients chart and tshe agent can be programmed to perform some serving job on the sensed data, which lead to reduction in the network traffic so reducing network response time. The system will support patient observing models which are described by Bayesian classifiers and accept the training of agents to make determination by intelligent over the variations in required readings of observed parameters and the original readings. Therefore a Cloud technology is proposed which is used to represent a Community Cloud. The organization of cloud is under the control of multiple organizations which deal some common interest as like health care facilities.

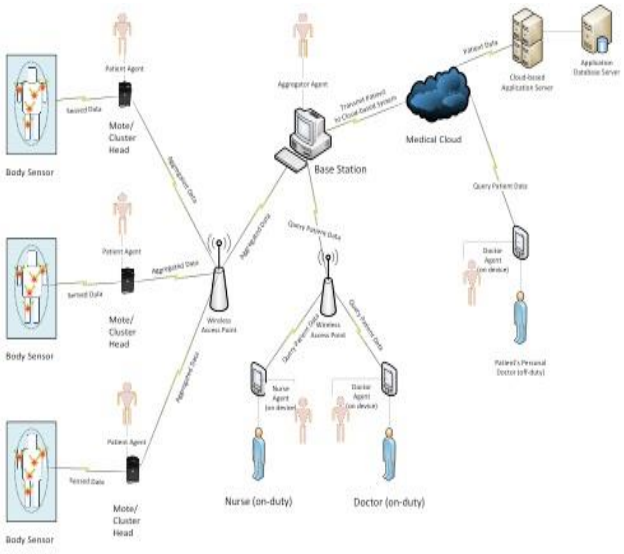

Fig 1 Proposed Architecture

In figure1, it shows the proposed system architecture and its various components. The system architecture has four agents they are Aggregator Agent, Patient Agent, Doctor Agent and Nurse Agent. A group of patients has been connected to the cluster head which act as Patient Agent. Different cluster head is used to send the information to the Access point which is used to access the patient information. The Patient agent is situated at the cluster head of the network and the information has been transferred to the base station where Aggregator Agent presents. The Aggregator Agent is used to receive the information and checks for denotations of anomalous readings which is sent by the Patient Agent and start alerting to Doctor Agent and Nurse Agent. Then the Aggregator Agent transmits the patient's parameters to the Cloud computing for destination processing and storing in the database. The Doctor Agent sand Nurse Agent are situated on the mobile handheld device and send the information for the on duty Doctor and nurse and also to the patient's assigned doctor who may not be on duty. The Doctor Agent and Nurse Agent offer alerts to the medical agents and allow the querying of patient's information which includes current and past sensor readings .The proposed system will be extended to support mobile or remote patients and using Patient Agents which is situated on mobile handheld devices capable of receiving and transmitting readings for the sensors observing the patient's physiological information. By using cloud computing, the information from the Patient information has been stored in the cloud storage device. The Proposed system can be considered as a Medical Internet of Things which is possible to observe, track and uniquely identify all these information which is connected to the system via the Internet.

IV. SIMULATION SCENARIOS

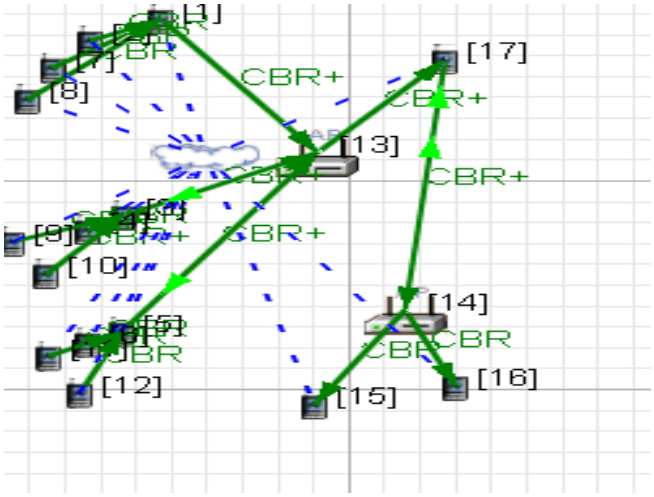

Fig 2 Data transfer between Access points

In this figure 2, the group of nodes has been connected to the cluster head. The information from the group of patients has been transferred to the cluster head which act as a patient Agents. And then from the three different cluster heads, the information has been transferred to the base station where the aggregator agents present to receive the information. From the Aggregator Agent, the information has been transferred to the doctor agent and nurse agent through another Access Point. The information has been transferred from one access point to the other access point and then it transfer to the particular agent which belongs to the information of the patient.

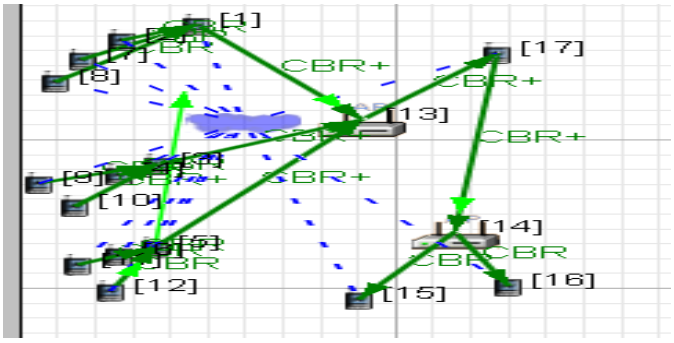

Fig 3 Data transfer between access point and cluster head

In this figure 3, Data transfer from one cluster head to other. It means the group of patient's information has been transferred from one agent to other agent. Then the agent sends the information to the access point which is used to access the information of the patient and send to the base station. From the base station, the data has been transferred to another access point which the information is then passed to the nurse agent and doctor agent.

V. SIMULATION RESULTS

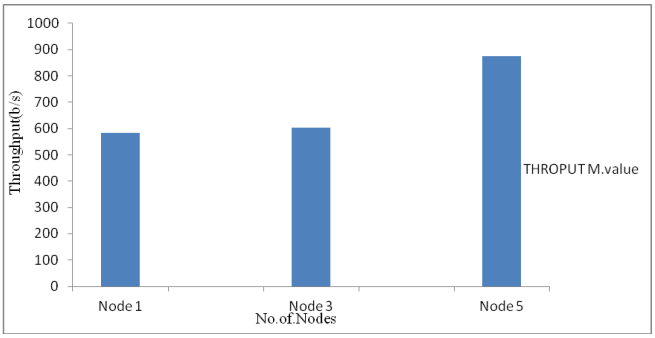

Fig 5: Average throughput

Throughput means sum of data rates that are delivered to all terminals in a network. Average rate of successful message delivery. It passes through certain network node. Measured in bits/second. Graph shows the information which is received at the receiver. Node 1, 3 and 5 are cluster heads which receives information from the patients. And the information received is shown in above graph.

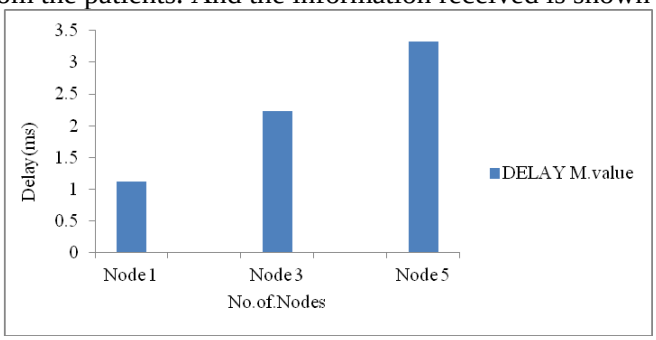

Fig 6: Average Delay

In this figure 6, the average delay shows the information transferring delay time in the simulation process. Delay varies on each and every node due to the variation of packet size. And it only occurs between 0 to 3.5. Nodes 1, 3 and 5 are cluster heads in which delay occurs. Delays occur in the cluster heads which is also called as a patient Agent. Metric value of different nodes is used to determine the best possible route which has low metric value.

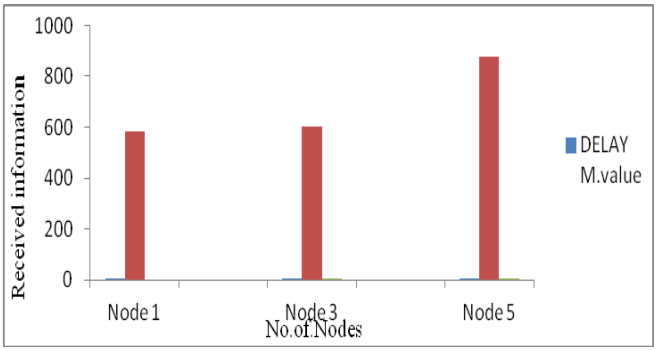

Fig 7: Received information

Received information such as delay, throughput and jitter value from the three different cluster heads is received. The node 1,3 and 5 are cluster heads which sends the information to the access point of node 14.Metric value is to determine the best possible route which has low metric value.

cloud storage simulation

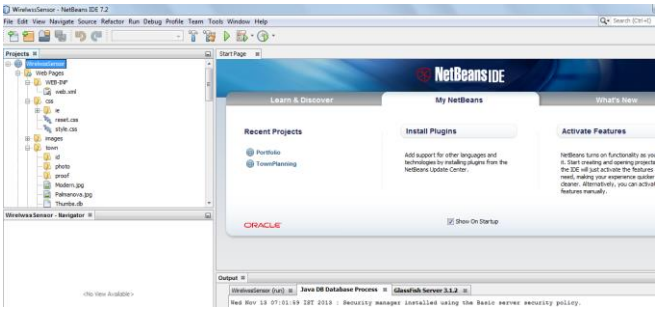

Fig 8: Simulation of Net beans software

In this Net beans software, the java coding is applied for the cloud storage. In the front end process, Java software is used and in the back end, SQL server is used to store the data. The coding is applied in this net bean and run the software in the name applied.

Fig 9: Uploading a file

Then choose the file to be store in the cloud storage device and upload it manually. Then the uploaded data will be stored in the cloud to access the information and enables small healthcare clinics to multi-specialty hospital to pay per (cloud) service, similar to paying for Internet service.

SQL BROWSER

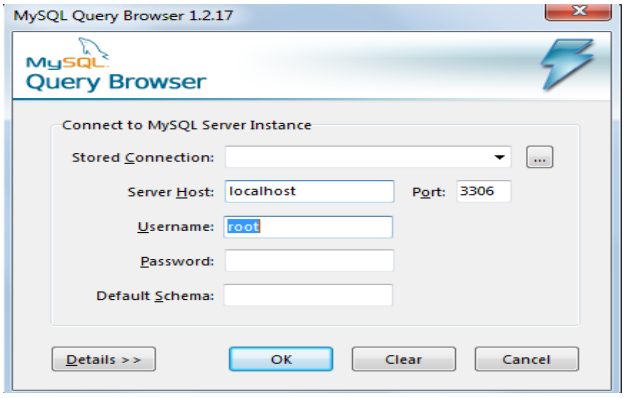

Fig 10: SQL Browser

The data or result we are getting through the QualNet software is stored in the cloud or data base server. To store in the cloud or database, SQL server is used and to access into cloud storage. The SQL query browser is used to access into the cloud using particular unique id such as username and password.

Result Of Cloud Storage Data

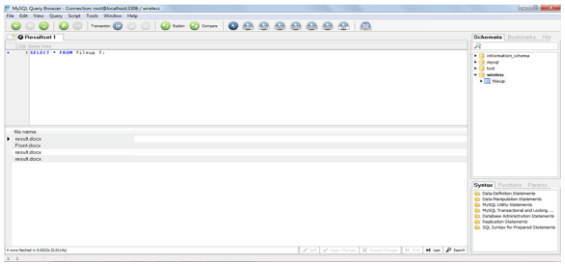

Fig 11: Cloud storage data

In this we are selecting our data which we are going to store in the database. Select the fileup folder in connection root. And select the data name which is to be stored in the system. Then run the simulation. Then the result has been stored in the cloud storage device after the simulation process. The result will be stored in the device in the name which we given in the software

VI. CONCLUSION

Integration of wireless body sensor network integrated with cloud computing is concluded that sensing network can uniquely identify the patient. And data collected from the patient, in addition to determining the patient location within the network and monitoring the patient's condition. Cloud is proposed to store the patient information in it and is based on Pay per use services. This enables small healthcare clinics to multi-specialty hospital to pay per (cloud) service, similar to paying for Internet service

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