QoS Aware - Cloud Based Patient Monitoring During Emergency Using Wireless Body Area Networks

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Abstract
Elderly patients are monitored by the doctors. Many hospitals are sharing patient data on cloud as a service. Hence in the present study, a new approach of Qos (quality of service) aware cloud based patient monitoring system during emergency was proposed as a prototype to monitor the vital health data . The heart rate, pulse, oxygen saturation, body temperature, lungs air volume and blood glucose level are measured. Using NS2 simulation,nodes are assembled and using Enhanced EAODV protocol the packets are transmitted between patient nodes and doctor's node . Every node has maximum transmission rate(maximum packets it can transmit) and receiving rate(maximum packets it can receive). A RREQ packet(route request packet) is transmitted to the neighbouring nodes .The neighbouring nodes will check for the destination sequence number .If it is not the destination sequence number ,the RREQ packet is forwarded until it reaches the destination.If it is the destination a RREP (route reply) packet is forwarded to the source node. Hence a path is established between source node to destination node.A packet of length "PL"is transmitted at every node .TXX is the cumulative transmission rate, RXX is the cumulated receiving rate at every path. The route which has highest TXX, RXX is selected as the optimal route between source node and destination node. The data packets are prioritized . In the existing system AODV was simulated where the data packets are transmitted in a queue, Results are compared with AODV and enhanced EAODV protocol. With the proposed system, throughput is increased by 13% of existing system

Keywords
QOS; RPM, TX, RX, TXX, RXX , RREQ, RREP

1. Introduction

Wireless body area network (WBAN) is a collection of sensors embedded on the patients.The vital sign parameters like blood glucose,heart rate,eeg,temperature are sensed and transferred to the cloud server. Sensor value will be analyzed for every cycle time period.Threshold value will be fixed for every sensor data. Each sensor data will be checked with the threshold value.

Cloud computing is of three types.: Infrastructure-as-a-service (IaaS), Platform-as-a-Service (PaaS), and Software as- a-Service (SaaS). Iaas is a model in which service provider makes a set of virtualized computer components (e.g., virtual machines or networked storage) available to consumers as a fully outsourced service that can be used to build and run applications without purchasing the actual computer components. An example of an IaaS service is Amazon.com.

2. Related Work

A multimedia healthcare data sharing approach through cloud-based has efficient network model that combines WBAN and Cloud for valid data sharing. The proposed network architecture is designed as four layers: perception layer, network layer, cloud computing layer, and application layer. In the network, the integration of TCP/IP and Zigbee in the coordinator devices is utilized.[1] Multi-tier cloud infrastructure support for reliable global health awareness system proposes a mixed integer optimization formulation to tackle the issues re- lated to the latency of detecting outbreaks. Our results show that processing the data in multi-tier health awareness system will reduce the overall delay significantly and enable efficient health data sharing. [2] Cloudlet-based Efficient Data Collection in Wireless Body Area networks proposes a prototype of WBANs, including Virtual Machine (VM) and Virtualized cloudlet.[3] A MAC protocol for reliable communication in low power body area network medium access control (MAC) protocol based on cross-layer design approach where medium access decisions are tightly integrated with physical layer conditions. BANMAC monitors and predicts the channel fluctuations and schedules

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transmissions opportunistically when the RSS is likely to be higher.[4]

Extended AODV routing method based on distributed minimumtransmission (DMT) for WSN proposes a dynamic strategy to change the multicast treestructure based on the characteristic of node mobility of WSN.[5] Highly Personalized Health Services using Cloud and Sensors has proposed new medical services such as telemedicine, monitoring of chronic patients, personalized health services, creating new services for dependants[6]. Novel Cloud and SOA Based Framework for E-health Monitoring using Wireless biosensors, has proposed Chronic Diseases (CD) in governmental and private healthcare systems[7]

Usability and Interoperability in Wireless Sensor Networks for Patient Tele-monitoring in Chronic Disease Management was proposed for patient tele-Monitoring systems for chronic disease management namely, usability and sensor device interoperability [8]. Applying Cloud computing technologies to Gerontology and Geriatrics Health Care System (GGHCS) has proposed overall healthcare IT market with great potential impact on Gerontology and Geriatrics[9]. Cloud Computing for u-Health and Automotive Environment has proposed elderly and the chronic disease can have their own personal healthcare devices and they can monitor themselves easily[10].

Cloud-Enabled Wireless Body Area Networks for pervasive was proposed methodologies for transmitting vital sign data to the cloud by using energy-efficient routingcloud resource allocation, semantic interactions, and data security[11]. Enabling Smart Personalized Healthcare: a Hybrid Mobile- Cloud Approach for ECG Telemonitoring was proposed personalized medical diagnosis and treatment[12]. SeaMo+: A Virtual Real-time Multimedia Service Framework on Handhelds to enable Remote Real-time Patient Monitoring for Mobile Doctors was proposed the key requirements for enabling real-time remote healthcare service[13].

3. Proposed Work

At the patient's bedside, there are *sensor nodes* which are loaded with software to collects, encode, and transmit data through wireless communication channels to be stored. Data from sensors is stored on the cloud.

A RREQ packet(route request packet) is transmitted to the neighbouring nodes .The neighbouring nodes will check for the destination sequence number .If it is not the destination sequence number ,the RREQ packet is forwarded until it reaches the destination.If it is the destination a RREP (route reply) packet is forwarded to the source node.Hence a path is established between source node to destination node.A packet of length "PL"is transmitted and at every node "PL" is subtracted from maximum packet size ,"PL" is subtracted from maximum receiving packet size to get TXX,RXX at every node.TXX,RXX is cumulated for every route established. between source node and destination node.The route which has highest TXX,RXX is selected as the optimal route between source and destination. The data packets are prioritized.

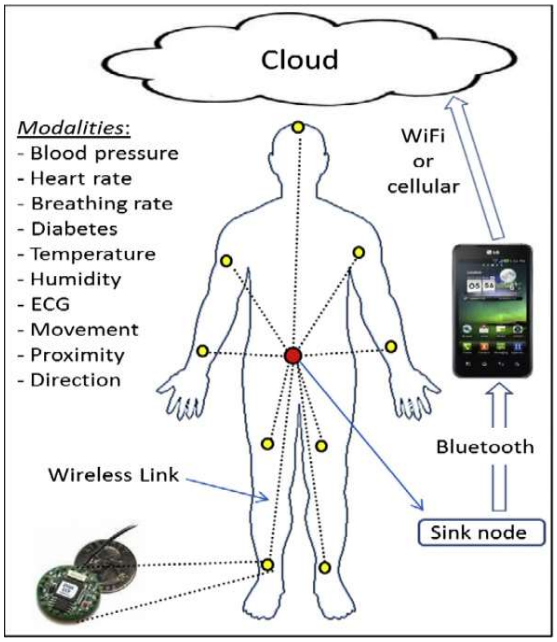

Figure 1. Wireless body area networks system prototype.

4. Results and Discussion

In the proposing system, we are enhancing the AODV protocol with the traffic as parameter. Sensor value will be analyzed for every cycle of time period. Threshold value will be fixed for every sensor data Each value will be checked with the threshold value.

In our algorithm, we followed two criteria, If sensor data value does not exceeds the threshold then the ordinary aodv will be followed. If sensor data value

exceeds the threshold then enhanced aodv will be followed. In enhanced aodv the path with minimum traffic will be selected to reduce data loss and to minimize the transmission time.In the selected path, the intermediate nodes will be forced to process the priority data first.The alert will be generated in the mobile node which is responsible for the action for the alert.

FLOW CHART

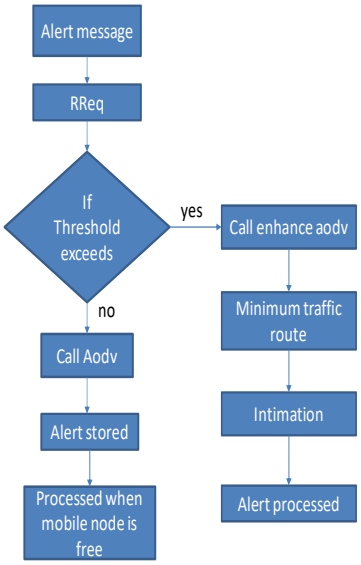

Figure 2 Algorithmn:

Step 1: If the sensor data value does not exceeds the threshod value then AODV protocol is called. Else enhanced EAODV protocol is called.

Step 2: The data packet is appended by the fragment priority number.

Step 3: Every node is assigned transmission rate and receiving rate.TX, RX. TX=maximum number of packets it can transmit, RX= maximum number of packets it can receive.

Step 4: For communication ,RREQ control packet is broadcasted to the neighbouring nodes.
It will check if it is the destination sequence number.

Step 5: If not ,RREQ packet is further forwarded.

Step 6: I f it is the destination ,RREP(route reply) packet is forwarded to the source.

Step 7: At every node TXX= TX-PL is calculated, RXX=RX-PL is calculated, PL is the packet size.

Step 7: The sum of all TXX,RXX is cumulated.

Step 8: The route with highest cumulated TXX,RXX is considered as optimal path for transmission with minimum transmission time ,hence reduce delay and improve throughput.

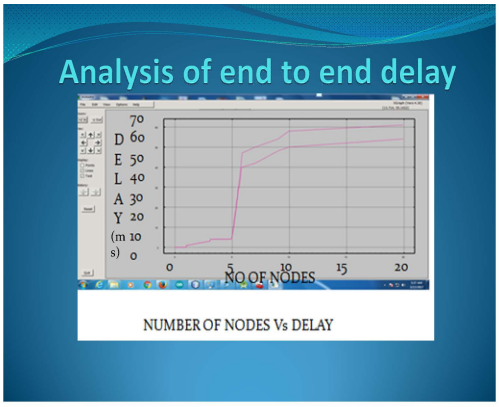

Figure 3 End to End delay

Due to priority of packets, the communication between the low priority path are diverted/paused. The delay of the priority packets has been reduced.

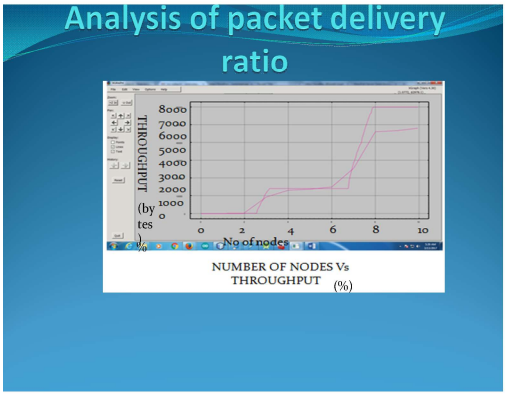

Figure 4 Throughput

The packets will flow in a higher resource path only, so the probability for the error and packet loss has been minimized.

5. Conclusion

Wireless Remote Elderly Patient Monitoring during emergency helped in monitoring the health data by the doctors. These parameters like heart rate, pulse, oxygen saturation, body temperature, lungs air volume and blood glucose level are measured. In addition, a two-way audio/video cares greatly valuable for doctors to monitor the patients. In this paper, we have presented a comprehensive survey of the significant and recent researches that are concerned with wireless patient monitoring using cloud Along with this, an introduction to Wireless Sensor Networks, Cloud computing are provided. With the proposed system, throughput is increased by 13% of existing system.

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