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Distributed Pricing Policy for Cloud-Assisted WBAN Networks with Optimal QoS and Energy Considerations Using Health Care As A Service

T. Keerthana[1], R.Sudha[2],

PG Student, Department of CSE, A.V.C college of engineering, Mannampandal, India
mahisha142016@gmail.com

Assistant professor of CSE, A.V.C college of engineering, Mannampandal, India

sudharajcse@gmail.com

Abstract - *Cloud-Assisted Wireless Body Area Networks (WBANs) is one of the key emerging technology for medical applications in the era of Internet-of-Things. In cloud-assisted WBANs, the WBANs are able to access the cloud resources, which are geographically close to the local Access Points (APs). Therefore, in order to solve this problem, we propose an energy-efficient Body-to-Body (B2B) communications among coexisting WBANs to relay the information of the patients to nearest Aps to provide real-time healthcare services. In He-aaS, it is very challenging to finalize a price agreement between WBANs and Health-Cloud Service Providers (H-CSPs) as WBANs follow a heterogeneous architecture. The existing pricing mechanisms, which are constrained to the homogeneous applications, are not compatible to He-aaS. We propose an optimal and distributed pricing policy for He-aaS in order to increase the profit level of each WBAN with the consideration of the optimal QoS and energy. Analysis of the proposed algorithms and the inferences of the results validate the usefulness of the proposed energy-efficient B2B communication and distributed pricing policy. Extensive results indicate that our proposed schemes are able to efficiently utilize limited resource with optimal QoS and energy consideration.*

***Key Words*: Wireless Body Area Networks, Cloud-Assisted B2B Communication, QoS, Distributed Pricing Policy**

1. INTRODUCTION

It is well known that current medical systems and healthcare facilities have been facing a heavy burden of overload and inefficiency due to myriad factors and constraints, e.g., the growth of aging population, insufficient healthcare workforce, and limited financial resources for supporting traditional medical infrastructures. Therefore, it is imperative to develop a novel system that can provide convenient, flexible, high quality and low-cost healthcare services. To meet these requirements, electronic health has been proposed as a promising paradigm, which integrates advanced information processing and communication technologies to achieve remote monitoring and automatic medical information delivery from patients.

1.1 ENERGY-EFFICIENT B2B COMMUNICATION

In the presence of poor link-quality, WBANs participate in a cooperative data transmission process, where WBANs Communicate with each other and initiate the B2B communication among them to provide reliable communication to WBANs. In this B2B communication process, WBANs communicate with each other cooperatively and finally deliver the medical data to nearby AP, while the existing link-qualities between LPUs and APs are strong and reliable. However, for B2B communication in WBANs, the energy consumption of sensor nodes is one of the major challenges. Therefore, in this section, we propose an energy efficient B2B communication process for WBANs.

1.2 Distributed Energy-Efficient B2B Communication

Increase traffic load in the network abruptly decreases the packet delivery ratio and resource availability of WBANs, which decreases the QoS of WBANs. Therefore, in order to overcome this situation, WBANs initiate a cooperative B2B Communication among themselves (based on the previous Social interactions). In order to initiate the cooperative B2Bcommunication among themselves, each WBAN calculates its own utility value based on the criticality index, service delay, energy consumption rate and total packet transmission cost. The utility function of WBANs is designed based on the different election parameters

2. LITERATURE SURVEY

Amit Samanta et al [2] deliver the framework for the wireless body area networks communication with improved throughput and low packet delivery. Increased population in an area degrades the performance of Wireless Body Area Networks (WBANs) in terms of throughput and packet delivery latency. WBANs by nature do not get fair amount of resources (bandwidth, time and spectrum). In this work, they consider the WBANs with varying traffic load in an area. In order to minimize the computational complexity of the algorithms executed the WBANs, the latter form different groups named Relational Patient Group (RPG), based on the disease types and the syndromes of the patients who are equipped with WBANs. RPG minimizes the computational complexity but does not minimize the traffic load. To

minimize the traffic load the WBANs in the RPG form optimal grouping based on the optimal decision making process, named as Virtual Patient Group (VPG). They have formulated the proposed scheme mathematically and evaluated through a series of simulations. Results show that the proposed scheme provides significant improvement in the traffic load and the packet drop probability.Misra and Samanta et al [3] present an approach of dynamic pricing model in order to get max profits. Success of cloud computing service depends on an acceptable pricing model, especially in the PaaS. But they also use a theory of revenue maximization and cost minimization. When at a current state, the system content cost minimization to build a hybrid system for revenue maximization, they will get the most profits.

A. Samanta and S. Misra et al [7] presents remote patient monitoring is an health service, which is used to collect and transfer bio-signal data from the patients to the eHealth service. The proposed system architecture and the optimization formulations will be useful for the eHealth service provider to provide flexible and cost-effective monitoring service to remote/mobile patients A. Samanta and S. Bera et al[10] formulate an algorithm for Priority-based Allocation of Time Slots (PATS) that considers a fitness parameter characterizing the criticality of health data that a packet carries, energy consumption rate for a transmitting LDPU, and other crucial LDPU properties. In critical medical emergency situations, wireless body area network (WBAN) equipped health monitoring systems treat data packets with critical information regarding patients' health in the same way as data packets bearing regular healthcare information. This snag results in a higher average waiting time for the local data processing units (LDPUs) transmitting data packets of higher importance. Based on this fitness parameter, they design the constant model hawk-dove game that ensures prioritizing the LDPUs based on crucial properties. In comparison with the existing works on priority-based wireless transmission, they measure and take into consideration the urgency, seriousness, and criticality associated with an LDPU and, thus, allocates transmission time slots proportionately. They show that the number of transmitting LDPUs in medical emergency situations can be reduced by 25.97%, in comparison with the existing time-division-based techniques.

3. SYSTEM DESIGN

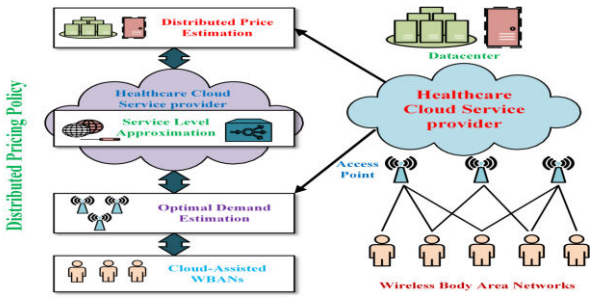


Fig -1: System architecture

After estimation of optimal demand response, the demand profile is forwarded to H-CSPs in order to get the services required by WBANs at a particular instant of time. The H-CSPs allocated available services to WBANs based on their demand profile using the service-oriented approximation approach. Once the demand of WBANs is fulfilled based on their demanded services, the H-CSPs charge the usage of services depending upon different pricing factors.

4 .MODULES

The modules of the proposed system are follows

- ✓ Network formation
- ✓ Cloud Service Provider
- ✓ Optimal Demand Estimation
- ✓ Distributed Pricing Mechanism

4.2.1 NETWORK FORMATION

The construction of service-oriented profile is not alone sufficient to fulfill the requirements of the available services, as the available services change dynamically with time. Therefore, we need to build an optimal global service-oriented profile for H-CSPs in order to provide heterogeneous services to APs in a dynamic. The underlying architecture of B2B networks is different from the general WBAN architecture, as theB2B networks considered the multihop communication protocol with heterogeneous social iterations between coexisting WBANs.

4.2.2 CLOUD SERVICE PROVIDER

The cloud service provider will make connected with the mobile edge devices for data transmission. In this module, the cloud server deployed with the health service provider who assist the people in critical condition. The data signal received from the beyond body area networks by means of connected mobile devices.

4.2.3 OPTIMAL DEMAND ESTIMATION

After the selection of a particular service from H-CSPs, we need to estimate the demand response of WBANs at a particular time instant t, based on the network traffic and

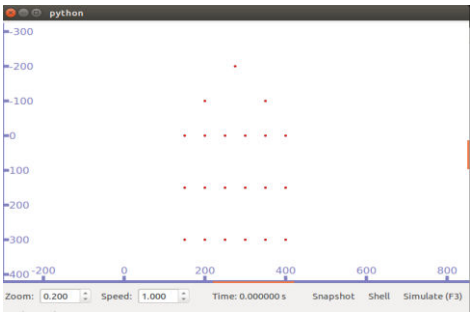
workload of H-CSPs. To quantify it, H-CSPs maintain a demand response profile of each WBAN for a particular time period. After accurately quantifying the demand response of WBANs, H-CSPs analyze the workload of each VM in order to fulfil the demand response of WBANs. Based on the demand response of WBANs, H-CSPs allocates some of VM to WBANs in real-time and schedules the particular data centre, which has the capability to fulfil the demand response.

4.2.4 DISTRIBUTED PRICING MECHANISM

Primarily, WBANs pay a price to H-CSPs for the usage of resources for a particular service. However, H-CSPs not only charge for the usage of resources, they also include different other pricing factors in order to maximize their profit.

5. RESULTS AND DISCUSSIONS

Network Formation are created in a service profile approximation to analysis in order to provide heterogeneous services to APs in a dynamic.



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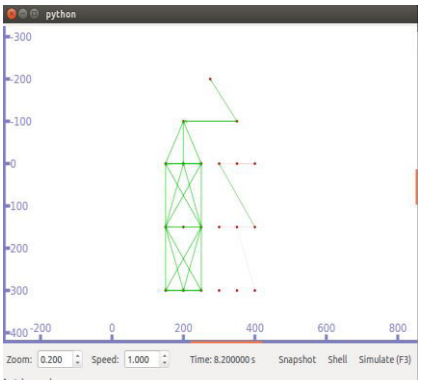

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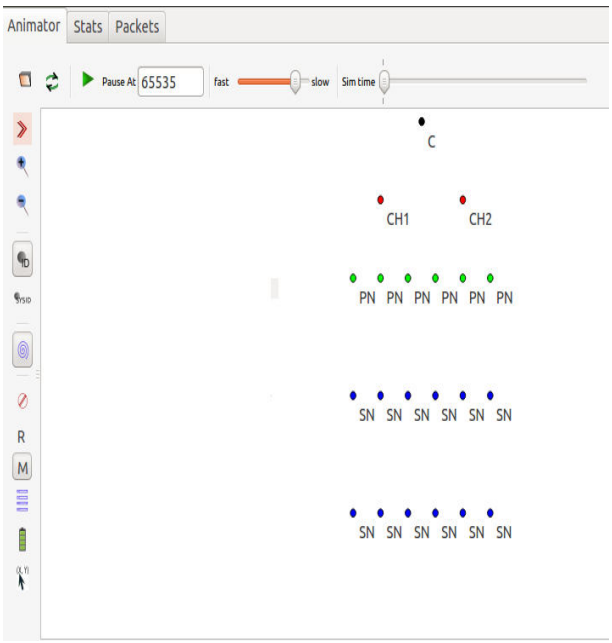
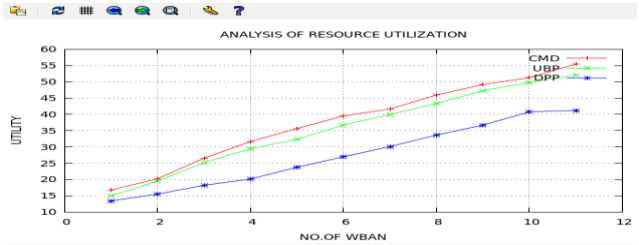
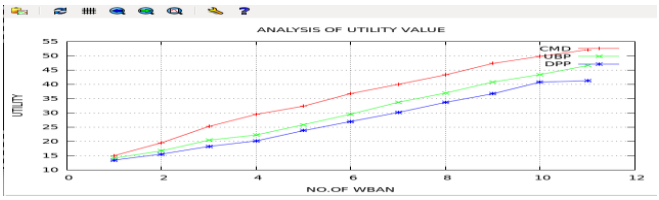


In addition to scheduling cost, the H-CSPs charge other prices for data centre management.





6. CONCLUSIONS

Low link-quality among WBANs and APs increases the packet loss rate and service delay of the network. In order to solve this problem, In this paper proposed an energy-efficient B2Bcommunication mechanism among coexisting WBANs. Additionally ,we proposed an optimal and distributed pricing policy for cloud-assisted WBANs in order to maximize the profit of both WBANs and H-CSPs, which takes in to account the heterogeneity of body sensor nodes and HCSPs. it minimizes the total energy-consumption of body sensor nodes. The proposed distributed pricing policy minimizes the execution of time of the algorithm and it outperforms the existing approaches.

FUTURE WORK

To investigate context-aware optimal data center scheduling algorithm for cloud-assisted WBANs in a critical emergency situation. In addition to this ,we also intend to study energy-efficient software defined architecture for wearable sensor nodes. Additionally, the service delay of the network decreases using energyefficientB2B communication, which dynamically increases the successful data transmission and satisfaction level of WBANs.

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