ENHANCING QUALITY OF SERVICE IN WIRELESS SENSOR NETWORK USING MIN-MAX (MM) APPROACH

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ABSTRACT

When data is transmitted over network channels, slices of data may be tainted due to many reasons, comprising multipath fading, interference, signal diminution, shadowing and low bandwidth allocation. Even if there is only one bit uncorrectable, the data block or packet will be measured as invalid, and will be discarded. In this way to overcome this problem we have proposed a Min-Max (MM) approach. The Min-Max (MM) is an important algorithm to avoid packet getting lost on unbalanced or congested networks. A Min-Max is also applied on the network, when an Access Categories (AC) have the low priority bandwidth. However, it requires basic bandwidth allocation for a data transmission.

Our MM approach provides the proper bandwidth allocation for each access category, and it can result in shorter delay. For some applications, such as layered video streaming, the usefulness of each packet of a stream can be different. The QoS requirements of different flows can vary as well. In this paper, a priority-based scheduling method for data transmission is proposed for wireless sensor networks with limited bandwidth resources. For intra-flow traffic, which can be preserved as more than a few link-layer flows, the priorities can be assigned to the flows using different QoS classes. In our work a dynamic scheduling approach is developed for the scheduling of packets in the queue such that the overall usefulness can be enhanced. The amount of resources for transmission is also delimited dynamically such that each flow can conquer reasonable bandwidth. The improved performance is verified with simulation results. We also conducted a performance evaluation via simulations and showed that Min-Max provides a more efficient QoS solution than conventional IEEE 802.15.4 in terms of packet delivery ratio and end-to-end delay.

Key words : QoS, WSN, MATLAB, CSP, MAC

INTRODUCTION

A new class of networks has appeared in the last few years: the wireless sensor networks. These networks consist of individual sensor nodes deployed in a given area that cooperatively collect and carry data to a main entity in order to monitor physical or environmental conditions. The main entity, also denoted as base station or sink, can be connected to an infrastructure or to the Internet through a gateway. The system can also operate

without the need for an existing infrastructure, thus the network operates autonomously. The user can periodically collect the gathered data through a direct connection to the sink using a mobile device, such as a laptop or a smart phone.

Quality of service

This chapter describes problems and existing solutions of quality of service provisioning in wireless sensor networks. First, we introduce our definition of Quality of Service (QoS), then we discuss QoS provisioning approaches in traditional data networks and QoS support in wireless sensor networks. . Finally, we assess the state of the art on QoS support in WSN at each layer of the protocol stack and we highlight the remaining research challenges open issues.

Factors affecting the quality of service

Some applications like multimedia and critical applications have high requirements such as high availability of service, stability of service, and low delays. Basically, these user-oriented requirements translates into packet latency, throughput, and reliability concerns. If the network is not able to provide an appropriate support to these demanding applications (adequate latency, sufficient throughput and high reliability), the user experience can be degraded, or the application can even become ineffective. Data networks carry data packets from a sender to the intended receiver. As packets travel from source to destination, several problems may happen affecting packet delivery and decreasing the level of QoS.

LITERATURE SURVEY

RASHA SAMIR et al presented the different Cognitive Radio Wireless Sensor Networks (CRWSNs) cluster structures; modified single-hop structure, multi-hop cluster structure and hybrid cluster structure. The effect of the three structures in several setups in regards to varying the particular area. The results conceded out using MATLAB package revealed that the end-to-end delay is minimum for the hybrid algorithm on the expense of a slight increase in energy consumption compared to the single-hop and the multi-hop cluster structures.

Shin Horie et al proposed a novel ad-hoc routing protocol based on IRDT-GEDIR associate intermittent wireless multi hop networks with location based hop-by-hop routing. Here, end to-end transmission delay becomes smaller due to decrease of waiting time for wake-up switching in the candidate next hop neighbor wireless sensor node by dynamic alteration of wake-up schedule with help of eavesdropping of control messages. This work not handles the relation between end-to-end transmission delay and battery power consumption.

Mary Nsabagwa et al narrated a minimal idle-listen centralized 6TiSCH scheduling algorithm (MILS) with the aim of reducing idle listening between sender nodes. They frame a Constraint Satisfaction Problem (CSP) problem which plans relay links in parallel with the leaf links to reduce waiting at bottleneck regions. Reducing the number of packets sent to nodes nearby the sink, at a given time reduces delays and packet

dropping, which would be brought about as a result of buffer overflows. This work reducing the number of packets in nodes close to the sink node only.

Alper Sinan Akyurek et al presented an optimal packet aggregation algorithm that permits individual modification on an application stream level, packet level and network-wide level using a concept of gain functions. Gain functions describe a positive metric that the designer wants to maximize. It is a mathematical function and as long as it is dished and positive, in this work solution is definite to converge to the optimal aggregation time without knowing the details of the function formulations.

Laith Farhan et al presented algorithm makes an effective decision for categorizing packets in the queue based on number of hops and distances. The long hop (LH) first pattern is created to allot high priority for packets come from long distances and access higher number of devices to schedule first at CH nodes. During queuing time, some packets remove due to time beat message Also, other packets reached the RF antenna at the same time. In that case, LH policy takes the packet that used higher energy and drops other. Then Low energy packet is rejected during the packet transmission.

Amit Samanta et al proposed a cost-effective heuristic scheduling and admission control for WBSNs in the presence of mobility and postural dynamics. Firstly, proposed an optimal admission control to provide a reasonable amount of resources to WBSNs for efficient packet transmission. They also propose a cost-effective experiential packet scheduling scheme to minimize the packet delivery delay and cost for WBSNs.

Jipeng Zhou et al proposed a transmission priorities of the flows are determined by the length of queues and the size of the transmitting packets to assurance the throughput of the networks, the retransmission priorities of flows are determined by their potential reliability during transmitting process. The proposed scheme MWPS-R with the dynamic priority view can reduce packet drop ratio caused by immediate retransmission and to protect the expected service resource, which is with fairness.

Dr.P.N.Chatur et al proposed a congestion moderation technique in congestion avoidance system. As all the nodes need not to be active at all time, only some region is active depend upon the distance from source node, the energy prerequisite is reduced. This system uses the shortest path method to find out the least distance to the destination, so the time for transmission will be reduced and transmission delay decreases automatically. The unwanted data packets will be removed before transmission, so the power for handling unwanted and redundant data is saved. Also the reliability is achieved as if the intermediate node fails then the source node send the data through another sensor node.

Bizender Kumar et al discussed a routing technique in clustered wireless sensor networks. In order to reduce communication overhead and to growth the total network lifetime, proposed a threefold QoS-aware and energy efficient heuristic. They update batteries of those sensors which are taking part in this process.

C. Ramakristanaiah et al discussed the analysis of the starvation of lower priority queues in the QoS policies especially 802.11e. IEEE 802.11e is aimed to provide the QoS for time sensitive applications but doesn't consider the starvation of BE and BK. IEEE 802.11aa is aimed to provide better QoS for video conferencing and VOIP but ignored the importance of BE and BK. This work uses four queues for differentiated

traffics namely Voice, Video, Best effort (BE) and Background (BK). IEEE 802.11e gives highest priority to voice and video queues this causes the starvation for BE and BK traffic. This work concentrated to ensure best QoS for voice and video but not for BE and BK traffics. In this paper the author investigated the reasons for starvation and analyzed some solutions that had been proposed to solve the starvation.

Ajit et al studied how the use of B-MAC, the default CSMA based MAC protocol can be the cause of starvation in a 35 node multi-hop wireless sensor testbed. This work then shows that the use of Z-MAC, a hybrid MAC, can alleviate such starvation, while at the same time giving high channel utilization. We show specific cases of starvation that occurs when using B-MAC. Z- MAC is able to achieve the goal of high channel utilization without sacrificing fairness. Wireless sensor networks using CSMA-based channel access are subject to unfairness, and to some degree starvation of some nodes. The use of slotted TDMA-based channel access would mitigate the effect of unfairness, while still maintaining high channel utilization.

Yu-Shiang et al introduced a simple but yet well performing backoff algorithm with the view of alleviating starvation problem for sensor nodes in high density WSNs. Besides, it can eliminate fairness problem in a partially connected network topology. An analytical analysis is carried out to study the system saturation throughput of the proposed scheme. In addition, this work also carried out comprehensive simulations to evaluate its performance. Compared with the SMAC, the simulation results show that this approach can effectively reduce the fairness problem and achieve higher system throughput and lower blocking rate in high density WSNs

Alexandru et al proposed an extension to the well-known Fair Scheduler algorithm from Hadoop which takes into consideration soft deadlines for jobs in homogeneous clusters, aiming to improve productivity by better satisfying the user time needs. This model contains when a job is launched, a deadline is provided. When the job starts running, it has a default priority assigned by which Fair Scheduler splits resources. The job gets allocated resources and at a certain moment in time it has a current execution speed. Based on speed, it is computed how many more resources the job needs to finish in time. Given this, the job priority is dynamically adjusted so the Fair Scheduler's resource division policy can meet the deadlines.

Chi-Kin et al mitigate the interference among simultaneous transmitting wireless devices (e.g., for Internet-of things), more effective CSMA protocols are proposed in this paper. The interactions between links in realistic CSMA networks are affected by the special properties attributed to SINR, effects of arbitrary ordering of local measurements, and ACK frames. This paper presented a viable standard-compatible solution to ensure interference-safe transmissions by determining a robust interference-safe carrier sensing threshold in Cumulative-interference-Power Carrier Sensing (CPCS). Moreover, this work presented a adaptive approaches that adjusts the carrier sensing thresholds dynamically based on the feedback of nearby transmissions.

METHODOLOGY

In this paper, we focus on the bandwidth allocation issue in wireless sensor networks. The bandwidth allocation scheme largely determines the performance of the entire wireless access network, in the past decades, researchers have dedicated much effort to design bandwidth allocation algorithms based on different criteria in order to satisfy various performance requirements. Various types of bandwidth allocation scheme based on

Proportional Fairness (PF) criteria have been developed to increase not only system throughput but also user fairness. However, in general, there is a tradeoff relationship between maximizing system throughput and increasing the fairness among users in delivery ratio, and the user satisfaction in their Quality of Service (QoS) cannot always be maximized by adopting fair bandwidth allocation methods.

Due to the scarce energy supplies of devices, it is essential to design the architecture and operation of the network to optimize the power usage. Scheduling algorithm is a vital part of WSNs. Such algorithms lets us to classify the queues and select which process to run. GWPS-RD algorithm is new unified scheduling technique that schedules high priority for data comes from faraway and to consider the packets being dropped in the network. All nodes send the composed information to the central application (BS). Therefore, few nodes becomes burdened due to higher number of packets sent from the sensors around it. A sensor device cannot afford to have large memory to avoid delay packets and potential drops and misses. A buffer must be assigned and free at the time a data arrives. Otherwise, the data will be lost and the number of misses is incremented. Some packets could be cast-off due to memory size is full. Packets loss arise when the data reach at the same time or time exceeded messages at CHs queue.

In this paper, a modified proportional fair scheduling approach is proposed, where the utility of data can vary. Packet retransmission and drop is performed according to the priority assignment, such that a participant with higher priority can have better chance to retransmit the corrupted packets or participant have a lower weight then it will be discarded. Traffic classes will be assigned to data with different priorities, and the goal of the proposed method is to perform retransmission and packet drop for better overall utility without suffocating the flows without priority.

We deployed a skip octree in this paper based on the multidimensional and multi-resolution storage approach for data discovery, by balancing the traffic load equally as possible the energy consumption also balanced here. Thus consuming a maximum lifetime of a network. In wireless sensor networks (WSN), the query and storage of data are the very important things. It is importantly used to answer how to efficiently manage the distributed data in the watching area with highly limited resources. The recent advantage in technology is create the count of the sensing modules from single to multiple in one sensor develop.

For one-dimensional data, the existing storage scheme is does not helpful for the multidimensional data or costing too much of energy. To search and retrieve scheme supporting in multidimensional query, here we developed a data storage. This scheme stores the high-dimensional similar data in the same piece of multi-dimensional storage area in an efficient manner. By examining the query condition and then fetch back the query result, it rapidly fix the event's storage area. Which means certain degree of robustness are occurred in this scheme due to the node failure and packet loss.

CONCLUSION

In this work, we consider the bandwidth allocation based on priority of the data for the applications where sensor nodes are deployed in the network to detect critical events. The nature of the events generated in the system is stochastic, discrete, and dynamic.

In general terms, throughput is the maximum rate of production or the maximum rate at which something can be processed. When used in the context of communication networks, such as Ethernet or packet radio, throughput or network throughput is the rate of successful message delivery over a communication channel. The data these messages belong to may be delivered over a physical or logical link, or it can pass through a certain network node. Throughput is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second (p/s or pps) or data packets per time slot.

The system throughput or aggregate throughput is the sum of the data rates that are delivered to all terminals in a network. Throughput is essentially synonymous to digital bandwidth consumption; it can be analyzed mathematically by applying the queuing theory, where the load in packets per time unit is denoted as the arrival rate (λ), and the throughput, where the drop in packets per time unit, is denoted as the departure rate (μ).

$$\text{Throughput}=\frac{total\ received}{simulation\ time} \qquad \text{------- (7)}$$

We conduct a series of simulation experiment, to calculate the performance of our developed approach. The first main thing of the proposed approach is an improvement of QoS which has studied by focusing the simulation. To measure the improvements in QoS and improvements of the lifetime of the network are done by identifying these three important performance metrics.

Centralized indexing mechanisms is the basic for most of the existing approaches. We also used this in our baseline. A single centralized index of all network resources is implemented where there no identification for the location and/or the region of requested resources given a demanded query in the centralized approach. For giving response to the user queries, all data resources get scanned on the centralized indexing in this technique. The query generation is performed in random manner. The key element for calculating our approach is to identify successfully a list of nearby MBRs that cross with being the query region and that contain a resource that also have the needed attributes. The midpoint based information retrieval decreases the storage space of an index, data and query response time and develops the efficiency in query performance has been shown this result.

In the recent years a dependence on networks get improved, for the purpose of efficiently operating the network in a present state only more various network multi-dimensional query analysis systems have been developed. This paper explained the issues of existing multi-dimensional query analysis methodologies. By using the data cube we developed a multidimensional query retrieval model to extract the comprehensive analysis results that's suitable for different purposes. The data cube can also use in the multidimensional query analysis system to simply extract comprehensive analysis results within the point, trend viewpoints and layer analyses for long-term dimensional data, in an existing limited area, the system has used for event monitoring.

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