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QUALITY OF SERVICE IN WIRELESS SENSOR NETWORKS

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Abstract

A wireless sensor network (WSN) is formed of a lot of sensor nodes in a certain area. Each of these nodes is capable of collecting data from the environment and sending the data collected to the sink node. In this paper we will check and measure the quality of service in wireless sensor networks. Although there have been a lot of studies done about wireless sensor networks, the quality of service QoS in these networks hasn't been investigated enough. The quality of service in wireless sensor networks is much different from the traditional networks.

Keywords: wireless sensor networks, sensor networks, quality of service.

Introduction

The wireless sensor networks are used to collect data in areas where a user cannot be present. In a sensor network, the sensors measure the local values separately and they send this information for other sensors and the sink if it is required. The performance of this network is to send the report of phenomena happened to an observer which isn't required to know anything about the network structure and the sensors separately and the relations among them. These networks are independent and autonomous and they work without the interference of human being.

Usually all the nodes are homogeneous and practically they cooperate with each other to achieve the overall goal of the network. The main purpose of wireless sensor networks is to supervise and control the conditions and changes in weather, physics or chemicals of an environment within a definite limitation [1, 2]. The wireless sensor network is a special kind of Ad Hoc networks. The concept of wireless sensor networks is one of the new subjects in network technologies.

Although there have been plenty of studies on important aspects of sensor networks such as protocol design and architecture, energy consumption improvement and positioning, there hasn't been much done in the field of quality of service [3].This is an important issue because the quality of service in wireless sensor networks is much different from the traditional networks. So we cannot explain the quality of service in these networks completely. The quality of service is a concept with different meanings and viewpoints [4].

The quality of service in wireless sensor networks

The wireless sensor network is a new member of wireless networks with certain characteristics and necessities. A wireless sensor network as composed of a lot of nodes in a certain area, each of which is capable to collect information like the temperature, pressure, humidity, noise, light and etc. from the environment where it is located and send the collected data to the sink node.

Since the application field in these networks is so broad, the necessities of their quality of service are different. It isn't possible for us to analyze them separately. Also we cannot suggest a single problem solving method which can support all kinds of applications. Different committees define the quality of service in wireless sensor networks differently. For the example, in an event recognition or goal tracing application, the error in recognition or wrong information which is caused as a result of a physical event may have a different reason which is

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resulted because of the placement and management of the network that is a place where a certain event happens is not covered by any active sensors. We can regard the environment coverage or the number of active nodes as the parameters to measure the quality of service in wireless sensor networks. Furthermore, the high amount of error is the result of sensors limited performance e.g. low observance accuracy or low rate report by sensors. Thus, we can choose the observance accuracy or measurement errors as the parameters to access the quality of service (QoS).

Also the error is possible to be due to the information loss during the transferring period. We can use some of the parameters related to information transferring in calculating the quality of service. Anyway we cannot consider different aspects of quality of service absolutely as separate ones. And the general necessities of an application can include all of the parameters. Here, we will explain two general outlooks of quality of service in wireless sensor networks:

A) Quality of service based on an application:

In this view, we can consider the parameters of quality of service to be network coverage [5], representation, measurement errors and the optimal number of active sensors. In short we can say that the application programs impose certain necessities in placement of active sensors, measurement accuracy of sensors and so on to a sensor network which are directly related to the quality of the application [6, 7].

B) Quality of service based on the network:

In this view, we consider how a communicative in lower levels can deliver the data sensors with limited quality of service where it uses the network resources efficiently. Although we cannot analyze every possible application in a sensor network, we can analyze each group of applications which are classified according to the delivered models. In this case most of the applications in each group have common network necessities. We ignore the quality of service in applications which are done really and merely we consider how the data are delivered to the sink node. Generally there are two basic data collection models: event based, Query based [8].

1. **Event based:**

   Most event based application in wireless sensor networks act conversationally immediately, and end to end. In these applications some events which happen in the environment should be recognized during the shortest time and with a high insurance capability. In this model we should consider some important points. Firstly, the applications themselves are not end to end; i.e. an end of an application is in sink node and the other end is not a single node but rather it is a group of sensors nodes in the environment which are affected by the event.
   Secondly, the current data trends in these sensors are greatly identical for each one and therefore there is a great increase. The last point is that to respond to these events, it is possible to require the performance to be done on sensors or performers with a highly insured and speeded distribution. These sensors and performers may not be the same sensors which have recognized the events. Those applications in a sensor network which need to discover and estimate or send the signal need to follow this data collection model. For example, a sensor and the response in the emergency recognition system of a building to recognize the release of chemicals.

2. **Query based:**

   Most Query based applications in wireless sensor networks are conversational and accept the delays resulted from the Queries. Also they are not end to end. To save the

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energy consumption in Queries they can be done based on the demand to send them. This data collection model is similar to the event based model. The difference is that in this model, the data is collected from the sensors by the sink node which in event based model; the data is placed on the sink node by the sensors. Also in this model, the applications should be able to receive suitable data with insurance and speed. The same points made for event based model are also important for this model. Notice that a Query can be used to improve the software on sensor nodes, change the sending commission rate of a node; it can send a single order to accomplish these changes.

Conclusion

As a summary we can conclude that the quality of service parameters in wireless sensor networks can have different forms depending on the network applications. Some of these parameters which are used in quality of service measurement are: whole network coverage, the optimal number of active nodes in a network, the observance accuracy or correct measurement by sensors, proper transfer of data during the delivery, the transfer of information in shortest time, insured capability of data transferring, the network lifetime and the amount of energy consumption in a network.

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