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Energy Mapping Approach for QoS in MANETs

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Abstract— The mobile ad-hoc networks are the mobile wireless networks which have no fixed infrastructure and routers, each node act as a router such that the end to end quality of service (QoS) is unpredictable or the single node. The end to end quality of service metrics is not changeable or fixed when the mobile networks have seen in the whole formed by combining several different nodes. Logical time (coherence time) is the time taken to send the information or a file to all the nodes is max and the end to end quality of service metrics is constant. The spreading period is the area covered or extended over a wide area over a period of time, it's the time duration to send the information or file to the mobile network of the individual nodes. If found that the logical time is more than the spreading period the quality of service metrics is followed a particular path. The objective of this paper is to calculate or measure the end to end quality of service of each node in a mobile network and describe how energy map is constructed in a mobile wireless network.

Keywords— QoS, Logical Time, Spreading period, QoS metrics.

I. Introduction

The mobile wireless networks are the collection of mobile nodes which have no fixed infrastructure or no fixed access points. In the mobile wireless networks, each individual node act as a router and these nodes also acts as an access point for sending and receiving information from source node to destination node. In mobile wireless networks the routing protocols such as geographical routing unable to provide the end to end quality of service [2]. To maintain the end to end quality of service in mobile networks we use the path integration algorithm such that the end to end quality of service guarantees from source to destination.

The unpredictable mobile networks at individual node scale can tight with the end-to-end quality of service (QoS) metrics can be rigid when the network is viewed in aggregate [5]. Coherence time is defined as the maximum duration for which the end-to-end QoS metric remains roughly constant, and the spreading period as the minimum duration required to spread QoS information to all the nodes. If the coherence time is greater than the spreading period, the end-to-end QoS metric can be tracked [1].

The objective of this is to focus on the energy consumption as the end-to-end QoS metric by which an energy map can be constructed and refined in the joint memory of the mobile nodes so that energy maps can be utilized by an application that aims to minimize a node's total energy consumption over its near future trajectory [8]. An Ad Hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration. The absence of any fixed infrastructure, such as access points, makes Ad-Hoc networks prominently different from other wireless LANs. In such an environment each node may act as a router, source and destination, and forwards packets to the next hop allowing them to reach the final destination through multiple hops. With the proliferation of portable computing platforms and small wireless devices, Ad Hoc wireless networks have received more and more attention as a means for providing data communications among devices regardless of their physical locations.

II. Major Challenges to QoS

Meeting QoS requirements in sensor networks are the difficult task. There are major limitations to this. Some challenges limitations are described below [4].

Resource limitations: The most severe constraint node restricted by is the limited access to battery power, the limited bandwidth of the wireless channel, limited processing capabilities, limited memory size and buffering, as well as the transmission power the nodes. So we can clearly see that under such resource restricted properties traditional QoS of routing and MAC protocols are not applicable in WBAN applications [4].

Unpredictable traffic patterns: QoS support in traditional networks is often dependent on a certain periodicity of the data traffic. But we all know that in WBAN, it is entirely different. Sometimes we might experience data burst, sometimes no traffic and sometimes real-time responses required such as in the emergency case of heart failure scenarios [4].

Network instability: The network topology might change frequently due to link failure, power failure, and mobility of the nodes. Also for the fact that sometimes certain devices need not be in operational mode and hence are in sleep mode to save energy. This changes the network structure. The network topology might change frequently. Routing and medium access under these unstable conditions is challenging [5].

Network dynamics: It may arise from dynamic topology changes and unreliable nature of wireless networks. Dynamic topology can change in WBAN due to node mobility, failure, and an addition of new nodes. Unreliable nature of wireless links may cause havoc in emergency data transfer. Hence it increases the complexity of Quality of Service.

Energy balance: This is always a key concern in all sensor networks application areas. Hence it always requires careful management of the energy resources. The energy load must be equally distributed among the sensor nodes and the devices [5].

Data redundancy: There might be possibilities of data redundancy in the sensor nodes. It causes the energy loss. The solutions can be in the form of data fusion and data aggregation. These techniques help decrease redundancy in the data.

Heterogeneous traffic types: The Heterogeneous data of different sensors has different sampling rates.

Packet criticality: Some data in WBAN needs attention. Priority structure is set up to maintain a quality of service.

Unbalanced traffic: Data may flow from many sensor devices (many patients in a hospital along with outside people) to a small number of sinks. Hence it is argued that QoS mechanisms should be designed for an unbalanced QoS-constrained traffic [6].

Multiple sinks: WBAN applications prefer central coordinator which acts as the sink too. It is not usual to have multiple sinks. But it may happen that due to different nature of sensors for different types of data in WBAN multiple sinks are used. It arises from the need of different requirements on the network. For example, one sink may ask data from heart monitoring sensors in every minute, while another sink node may need the only emergency event from heart sensors or blood pressure monitoring sensors etc. Hence it is necessary that WBAN supports different QoS levels in such cases of multiple sinks.

III. Methodology

In mobile networks to send information from one node to the fixed base station, it takes lots of energy and time, for this till now proactive and reactive routing is used. To send the limited information among the nodes large amount of energy is consumed and importantly end to end quality metrics is not implied in the system [7].

Deficiency of an Existing System

- No geographical routing protocol/protocols.
- End-to-end QoS metrics is not implied.

IV. Proposed System

To send the information from one location to a fixed base station in mobile wireless networks and to maintain the end to end quality of service metrics using different paths is adopted by the path integration algorithm.

A. Modules

In this approach, here we come up with three modules they are:

1. Node Module
2. Energy Calculation
3. Time Calculation

- Node Module

  Here we take five nodes named as Node A, Node B, Node C, Node D, and Node E from these nodes we transfer data to destination node in which after receiving the data in that node data will be displayed

- Energy calculator

  In this module, we calculate the energy used by nodes to receive the data, to calculate the energy using the path integration algorithm, firstly we consider the size of the file and find the distance between the nodes as follows: Air = 1100, Energy T1= size of the file / Air. Data energy is calculated using the formula data energy = size of the file / 60 (time), total energy = Energy T1/ Data energy.

- Time calculation

  Time calculation is done using Energy T1= size of the file / Air.

B. Algorithm

To calculate the energy used by nodes to receive the data, here we use the path integration algorithm.

The Path Integration Algorithm as follows

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Step 1: Read the file.

Step 2:  Find the Size of the File.

Step 3:  Fix the Air as 1100. Air=1100

Step 4:  Calculate the Energy in Time T1 Energy
         T1 = Size of the File / Air

Step 5:  Time1 = Energy T1

Step 6:  Find the Data Energy,
         Data Energy = Size of the File / 60

Step 7: Calculate the Total Energy,

 Total Energy = Energy T1 / Data Energy
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V. CONCLUSION

The dire need of quality of service in MANETs as emerged as it as a vital role in the modern-day ad-hoc communication, In this paper we focused to calculate the logical time versus the area covered or the external area of a wide area over a period of time (Spreading period), this analysis resulted in that the logical time is greater than the spreading period, with the conclusion that the end to end quality of service metrics are tracked. We also calculated the energy map between the mobile nodes in the mobile network, future scope of this paper is to enhance the quality of service by mapping the individual node energy with the network.

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Vijay Kumar Bura received his Bachelors Degree (B.Tech) in Computer Science Information Technology from JNTUH in 2006 and Masters degree (M.Tech) in Software Engineering form Jawaharlal Nehru Techno-logical University, Hyderabad, Telangana, India in 2011. He worked as Software Engineer at ITP Software India Private Limited, Hyderabad for 2 years. He developed various web applications for different clients. He worked as Asst. Prof. in the Dept. of IT, SVS Institute of Technology, Warangal for 2 years. Presently he is working as Assistant Professor in the Department of Computer Science and Engineering, S R Engineering College (Autonomous), Warangal Telangana, India. As a mentor, he represented a team to participate in CISCO IoT Hackathon 2017 held at Trident Group of Institutions, Orissa, The team idea was selected for "Best Jury Award" and secured *RUNNER UP position*.

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