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Quality of Service with Link Availability and Energy Optimization in MANET

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ABSTRACT: The advent of ubiquitous computing and the proliferation of portable computing devices have raised the importance of mobile and wireless networking. Recently, there has been a tremendous interest in broadband wireless access systems, including wireless local area networks, broadband wireless access and wireless personal area networks (WLAN/WPAN/WWAN). Energy conservation is a critical issue in wireless ad hoc networks since batteries are the only limited-life energy source to power the nodes. One major metric for energy conservation is to route a communication session along the routes which require the lowest total energy consumption. Most recent algorithms for the MEM (Minimum Energy Multicast) problem considered energy efficiency as the ultimate objective in order to increase longevity of such networks. However, the introduction of real-time applications has posed additional challenges. Transmission of video and imaging data requires both energy and QoS-aware routing in order to ensure efficient usage of the networks. In this paper, we consider "Energy constraints and link availability" as the QoS in wireless ad hoc networks.

Keywords--MANET, QoS Routing, Power aware Routing, Minimum spanning Tree.

I.INTRODUCTION

A MANET is an autonomous collection of mobile nodes forming a dynamic network and communicating over wireless links. Ad hoc communication concept allows users to communicate with each other in a temporary manner with nodes Centralized administration and in a dynamic topology that changes frequently. Each node, participating in this network, acts both as a host and a router and must therefore be willing to forward packets to other nodes. QoS routing is a critical issue in MANETs due to mobility and resource limitations [2]. Actually, it is difficult to ensure the respect of the constraints throughout communication, even Impossible when mobility is such as topology changes more quickly than the propagation of update-information or the search of a new route[6]. Some technical challenges are depicted like: minimizing network load, providing reliable transmission, designing optimal routes, providing robustness, efficiency, adaptability, and unlimited mobility.

Quality of service is more difficult to guarantee in ad hoc networks than in most other type of networks, because the wireless bandwidth is shared among adjacent nodes and the network topology changes as the nodes move. This requires extensive collaboration between the nodes, both to establish the route and to secure the resources necessary to provide the QoS. In this research we ensure QoS by optimizing Energy and the availability of path during the dynamic linking for ad hoc networks.

We will develop a protocol for the shortest route discovery so that it must take minimum energy. This technique is called route discovery. On the other hand if the shortest path is found then even it takes minimum energy for data delivery. We can found that the total energy required for any link would be the sum of the energy consumed of all the nodes using this link. Similarly the probability of available links during the minimum energy consumption would be the movement of the node plus the energy remaining.

II.RELATED WORK

The energy-efficiency problem in wireless network design has received significant attention in the past few years. Some works are on the configuration of a network topology with good (or required) connectivity by using minimal power consumption such as minimizing the maximum power of nodes or minimizing the total power consumption of all nodes. Some other works about energy-efficient broadcast are focused on routing protocols. These routing protocols are distributed routing algorithms that select routes with less energy cost. There is no theoretical analysis or guarantees over the performance. Most of the works on energy efficient broadcast/multicast are focused on configuring energy power of each node. That is, given the geometry position of a set of nodes in a plane, find the transmitting power of each node such that the energy cost of the broadcast/multicast tree is minimized. Some fundamental issues associated with energy-efficient multicast were discussed and several multicast schemes were proposed and evaluated. some energy-efficient broadcast/multicast algorithms were proposed, namely, the Broadcast Incremental Power (BIP), Multicast Incremental Power (MIP) algorithms, MST (minimum spanning tree), and SPT (shortest-path tree). The proposed algorithms were evaluated through simulations, but little is known about their analytical performances in terms of the approximation ratios. The authors got the quantitative characterization of performances of these three greedy heuristics. By exploring geometric structures of Euclidean MSTs, they proved that the approximation ratio of MST is between 6 and 12, the approximation ratio of BIP is between 13/3 and 12, and the approximation ratio of SPT is at least n=2, where n is the number of receiving nodes [3]. The problem of broadcasting in large ad hoc wireless networks was discussed and a method MLE (Minimum Longest Edge) based on MST was proposed. This algorithm provided a scheme to balance the energy consumption among all nodes. The solutions developed are mainly based on geometry features of the nodes in the plane. Some other solutions are based on graph theory (i.e., based on the connectivity among the nodes in the network), the minimum-energy broadcast problem was addressed and proven to be NP hard in general and an $O(n^{k+2})$ algorithm was proposed for the problem under the assumption that each node is able to reach all the other nodes in the network, where n is the number of nodes and k is the number of transmitters. The algorithm is a not polynomial time algorithm when k % n. The works assume each node has a limited number of adjustable power levels [4]. For the special case of the problem where each node has a fixed level of power, a heuristic with performance ratio log3 n was proposed. We assume each node has a preconfigured transmission power and we aim at, for each broadcast request, finding path that has the minimum energy consumption. This is a more practical issue in real systems because each node would have a transmission power after the network is configured.

III.APPROACH

Minimum energy consumption in portable communication devices has been one of the major design goals in wireless communication systems. The need for low power becomes even more pronounced when designing RF transceivers for small-sized portable user sets. For wireless network designers, on the other hand, the emphasis has traditionally been on increasing system capacity (e.g., the number of users a base station can support), maximizing point-to-point throughput in packet-switching networks, and minimizing network delay. Significant reductions in energy consumption can be achieved if wireless networks are designed specifically for minimum energy. In order to maximize the total battery life of a wireless network, we must minimize the energy consumption of the entire network. Applications where minimum energy networking can affect significant benefits include the digital battlefield, where soldiers are deployed over an unfamiliar terrain, and multisensor networks, where sensors communicate with each other with no base station nearby. Even in the presence of base stations, such as in cellular phone systems, minimum energy network design can allow longer battery life and mitigate interference [8]. A position-based algorithm to set up and maintain a minimum energy network between users that are randomly deployed over an area and are allowed to move with random velocities. Each mobile node is assumed to have a portable set with transmission, reception, and processing capabilities. In addition, each has a low-power global positioning system(GPS) receiver on board, which provides position information within at least 5 m of accuracy. The resent low-power implementation of a GPS receiver makes its presence a viable option in minimum energy network design. Our work is based on the following criteria:

- We introduce a local optimization procedure that find the minimum energy links and dynamically updates them.
- We will try to show that our protocol is self-reconfiguring in mobile scenarios.
- Our scheme assumes no underlying infrastructure or protocols.
- Our protocol is designed for mobile nodes.
- In our work, energy consumption with link available is the key metric.

We will develop a theory of minimum energy for stationary networks and prove this notion in a rigorous mathematical setting. We will set up a stationary network simulator and measure energy consumption as a function of the number of nodes in a distributed network. We apply this protocol to mobile networks and show that it is Self-reconfiguring. It will also demonstrate the low energy performance of the protocol for mobile networks.

IV.DESIGN METHODOLOGY

Due to the effects of changes in network topology and the theoretical computation of QoS performance become complex, an adaptive QoS routing mechanism needs several cross layer functions cooperating harmoniously. Firstly, a local QoS performance prediction mechanism is needed. It should include local information collections and local QoS performance computations. Once this prediction mechanism is built, the second step is to construct a distributed routing strategy based on the predicted QoS performance along selected paths to ensure link availability. This includes route discovery and routing maintenance. Also, a hybrid asynchronous local information update mechanism is introduced. To build such an adaptive QoS routing system, the following tasks need to be accomplished.

- Extract affected parameters within the mobile environment. These parameters may be located either in the higher layer or in the lower layer. This part will include node and channel classification. Mobility and its effects are normalized by some quantifiable variables.
- Manage local information dynamically. Two functions are implemented in this part. One is the local state monitoring and collection; another is the local information exchange. Update will be asynchronous corresponding to the local states, which will affect the local QoS performance.
- Predict local QoS performance. Building analytical models and theoretical computation are the two main tasks in this part. It is a pre-computing mechanism. A cross layer model will be charged with the task to move up the lower layer parameters to the higher layer in order that they can participate the analysis of the QoS performance.

Traditional queuing theory and MAC layer analysis are used in the theoretical computation.

LOCAL PERFORMANCE PREDICTION

Actually, the end-to-end delay of a path is the summation of the node delay at each node plus the link delay at each link on the path. Node delay includes the protocol processing time and the queuing delay at node i for link (i,j). Link delay is the propagation delay on link Since we are discussing wireless link, the propagation delays are very small and almost equal for each hop on the path. Assuming that the network is heavy, we consider queuing delay and MAC delay as two main factors that accumulated the node's delay.

LOCATION INFORMATION MANAGEMENT

We will use the local information to predict the local link performance in order that the QoS routing can adapt to the changes of the network. Local information monitoring and collecting mechanisms are constructed in our scheme, and to overcome the conflict of the dynamic property and network overhead in the routing scheme, a hybrid asynchronous update mechanism is proposed also.

Monitoring and collecting: A node is assumed to keep up-to-date local information, including all outgoing links and all its neighbors. Since a distributed QoS routing is used, we can define an arbitrary link weight based on our objective. Because of the speed and direction changes of the nodes in mobile network, local information tables need updating frequently. This causes excessive overhead in the network. Therefore, how to choose the exchanged parameters and how to update the local information are very important. We choose to exchange an ID as the node's movement type since each node's mobility level has different characteristics. In order to distinguish the different characteristics of each node at the same level, we add some parameters as the link weight, which can be obtained from the monitoring and collecting mechanisms. So, state information of an outgoing link may include:

1) Average signal to noise ratio S(i, j) / N0 ,
2) Link capacity C(i, j) ,
3) Average aggregate traffic A(i, j) ,
4) Neighbor node's mobility characteristics sorted by several types M(i,j) , and
5) Link stability L(i,j) , etc.

Obviously, a local information table consists of two parts:

1) Exchange information, which comes from its neighbors, and
2) Statistical information, which comes from its monitoring mechanism.

V.MOTIVATION AND REQUIREMENTS

The network interface is a significant source of energy consumption in portable wireless devices. At any given time, the energy consumed by an interface depends on its operating mode. A sleeping interface can neither transmit nor receive traffic and as a result, it consumes very little energy. To be able to transmit or receive, an interface must explicitly transition to the wake state, which requires both time and energy. An interface that is in the wake state can transmit or receive data at any time; if it is neither transmitting nor receiving, is said to be idle. In all of these states, an interface consumes significantly more energy than it does in the sleep state, due to the number of circuit elements that must be powered. There has recently been interest in investigating the energy consumption of commercially available network interfaces. Largely because of its ubiquity, IEEE 802.11b is particularly interesting. Measurements show that an idle network interface can consume over 800mW. This is comparable to the energy consumed while receiving or transmitting (1000mW and 1300mW respectively), and an order of magnitude larger than the energy consumed while sleeping (66mW - 130mW). A rough calculation based on data in for Lucent devices suggests that an interface sending ten 128-byte broadcasts per second and receiving the same from each of five neighbors consumes only about 1% more energy than an idle interface. In short, sending and receiving are not the dominant source of energy consumption: being awake and ready to send or receive traffic. To reduce energy consumption, an interface must therefore spend as much time as possible in the sleep state. In this view, a power save protocol is a coordination mechanism to arrange that stations that want to exchange traffic are awake at the same time. For the case of a multi hop wireless ad hoc network, this is a challenging research problem. The goal of this work is to develop a practical power save protocol that operates effectively in an infrastructure less environment. The protocol is intended for use in general purpose ad hoc networks; it is spherically not directed to the special case of a sensor network. To maximize the applicability of the work, the protocol should depend as little as possible on the details of a specific MAC protocol and should be able to work with any kind of collision avoidance mechanism. (Like most research in this area, the protocol is based on IEEE 802.11.) Similarly, the protocol should place as few requirements as possible on the overlying routing protocol. Of particular importance is the interaction with energy aware routing. Because the power save protocol operates at a low layer, it must take care to avoid introducing inappropriate feedback effects to higher layer energy management.

Most importantly, the protocol must provide support for QoS functionality. Because an ad hoc network has variable link quality, dynamic topology and complex interference across multiple links and between disjoint flows, the ability to adapt easily to the unpredictable environment is the essential feature. To this end, the coordination mechanism that is responsible for energy management must also be aware of network QoS constraints in its scheduling of the network interface. In addition to reducing energy consumption, any solution must address the following performance goals:

- Minimize adverse impact on capacity, throughput, packet latency and route latency.
- Minimize overhead imposed by the energy management scheme.
- Maximize system lifetime by minimizing disparities in energy consumption.

VI.CONCLUSION

The topology control problem is to find a set of transmit powers that obtain a minimum power topology, while still maintaining network connectivity. A linear programming technique which combines energy aware routing with topology control. An alternative approach distributes the traffic load so as to take advantage of charge recovery effects in the battery. More specialized energy management techniques have also been developed, particularly for sensor networks. Sensor networks are usually modeled as dense, low mobility networks comprised of largely interchangeable nodes, all of which are participating in a common data gathering activity.

FUTURE SCOPE

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REFERENCES

[1]. Samarth H. Shah, Klara Nahrstedt, "Predictive Location - Based QoS Routing in Mobile Ad Hoc Networks," in Proc. of IEEE ICC 2006.

[2]. Hongxia Sun, Herman D. Hughes, "A cross -layer analysis of delay and packet loss for support QoS in ad hoc networks," submitted to ICC 2005.

[3]. Dongkyun Kim; Chai-Keong Toh; Yanghee Choi , Location-aware long-life route selection in wireless ad hoc networks, Electronics Leners , Volume: 36 Issue: 18 , 31 Aug. 2000 Page: 1584-1586

[4]. M. Cagalj, J.P. Hubaux, and C. Enz, "Minimum-Energy Broadcast in All-Wireless Networks: NP-Completeness and Distribution Issues," Proc. MOBICOM '02, 2002.

[5]. O. Egecioglu and T.F. Gonzalez, "Minimum-Energy Broadcast in Simple Graphs with Limited Node Power," Proc.

p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 02 Issue 09
September 2015

IASED Int'l Conf. Parallel and Distributed Computing and Systems (PDCS '01), pp. 334- 338, Aug. 2001.

[6]. Internet Engineering Task Force "MANET working group charter" http://www.ietf.org/html.chapters/manet-charter.html

[7]. Shigang Chen, Klara Nahrstedt, Distributed Quality-of-Service Routing in Ad-Hoc Networks , IEEE Journal on Selected areas in Communication, Vol.l7,No. X,AUGUST 2007.

[8]. Sobriiiho and A. S. Krislinakumar. "Quality of service in Mobile Adhoc Carrier Sense Multiple Access Wireless Networks". lEEE Journal on selected areas in communication 17(X). August 2005. pp. 135.3 - 1368.

[9]. S. Singh. M. Woo. and C. S. Rilghavendra. "Power-Aware Routing in Mobile Ad hoc Networks", IEEE International Parallel and Distributed processing symposium , 2003 pp 371-376.

[10]. Edited by Ivan Stojmenovic, Security and Fraud detection in Mobile and Wireless Network, chapter 14 in handbook of wireless networks and mobile computing, by Willy Inter science, pp 309-322.

[11]. X. Masip- Bruin, M. Yannuzzi, J Domingo Pascal, A. Fonte, M. Curada, E. Monterio, F. Kuipers, P. Van Mieghem, S. Avallone, G. Ventre, P. Arnada-Gutierrez, M. Hillich, R. Steinmetz, L Iannone, K. Salamatian, Research Challenges in QoS routing, Computer Communications (2006) p 563-581.