An Efficient Power Aware Routing in Ad-Hoc Networks Using Cross Layer Approach for Providing Power Control, Energy Efficiency And Quality of Service(QoS)

Prof. Sanjay Jadhav¹,
Research Scholar, Department of Computer Engineering, Faculty of Engineering & Technology, Annamalai University, Tamilnadu
sanjaysaspade@gmail.com

Dr. S. Palanivel²,
Professor, Department of Computer Engineering, Faculty of Engineering & Technology, Annamalai University, Tamilnadu.

Abstract- A hybrid network combines the best features of two or more networks. The wireless sensor network is a wireless hybrid network consisting of sensors and task manager. The wireless sensor monitors physical quantity and gives information to sink node. The path selection for wireless sensor is critical issue. Our research focus on algorithms developed for priority based selection of shortest path for wireless sensor networks. The highest priority sensor uses shortest path where as low priority sensors store information in buffer or may select another path for convey information to sink node. At the same time demand for energy efficient and quality of service in wireless ad-hoc sensor network requires the combination of physical layer, data link layer and application layer together, a cross layer approach.

The existing research work has focused on energy efficient wireless sensor and cross layer approach independently. This paper present algorithm developed for energy efficient and cross layer approach as combined approach to improve system performance.

Keyword- wireless sensor network, cross layer approach, QoS, energy efficiency

I. INTRODUCTION

A) Wireless Sensor Network:

Wireless sensor network (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to operatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations [5]. It can be thought as ad-hoc network consisting of sensor nodes linked by a wireless medium to perform distributed sensing tasks. The development of wireless sensor networks was originally motivated by military applications such as battlefield surveillance.

However, wireless sensor networks are now used in many civilian application areas, including environment and habitat monitoring, healthcare applications, home automation, and traffic control [2]. Although WSNs have unlimited potential, many research challenges exist [3] [4] [5]:

1. Power management: Low-cost deployment is one acclaimed advantage of sensor networks. However, the energy constraint is unlikely to be solved soon due to slow progress in developing battery capacity. Moreover, the untended nature of sensor nodes and hazardous sensing environments preclude battery replacement as a feasible solution. On the other hand, the surveillance nature of many sensor network applications requires a long lifetime; therefore, it is a very important research issue to provide a form of energy-efficient surveillance service for a geographic area.

2. Real-time: WSN deal with real world environments. In many cases, sensor data must be delivered within time constraints so that appropriate observations can be made or actions taken. Very few results exist to date regarding meeting real-time requirements in WSN. Most protocols either ignore real-time or simply attempt to process as fast as possible and hope that this speed is sufficient to meet deadlines.

3. Security and Privacy: WSN are limited in their energy, computation, and communication capabilities. In contrast to traditional networks, sensor nodes are often deployed in inaccessible areas, presenting a risk of physical attacks. Sensor networks interact closely with their physical environment and with people, posing additional security problems. Because of these reasons current security mechanisms are inadequate for WSN. These new constraints pose new research challenges on key establishment, secrecy and authentication, privacy, robustness to denial-of-service attacks, secure routing, and node capture.
B) Cross-layer Design:
The demand for energy efficiency and QoS in wireless ad hoc sensor networks is growing in a rapid speed. To enhance the energy efficiency and QoS, we consider the combination of physical layer, data-link layer and application layer together, a cross-layer approach. A strict layered design is not flexible enough to cope with the dynamics of the mobile ad hoc networks [6]. Cross-layer design for QoS provision. Liu [7] The combine AMC at physical layer and ARQ at the data link layer. Ahn [8] use the info from MAC layer to do rate control at network layer for supporting real-time and best effort traffic. Akan [9] propose a new adaptive transport layer suite including adaptive transport protocol and adaptive rate control protocol based on the lower layer information. Some works related to energy efficiency have been reported. Banblos proposes a power-controlled multiple access schemes in [10]. This protocol reveals the trade-off of the transmitter power cost and backlog/delay cost in power control schemes. Zhu [11] proposes a minimum energy routing scheme, which consider the energy consumption for data packets as well as control packets of routing and multiple access. In [12], Sichitiu proposes a cross-layer scheduling method. Through combining network layer and MAC layer, a deterministic, schedule-based energy conservation scheme is proposed. This scheme drives its power efficiency from eliminating idle listening and collisions. However, cross-layer design can produce unintended interactions among protocols, such as an adaptation loops. It is hard to characterize the interaction at different layers and joint optimization across layers may lead to complex algorithm.

II. DEVELOPED PRIORITY BASED SHORTEST PATH FINDING ALGORITHM

Existing routing protocol such as open shortest path first (OSPF) and Intermediate-System to Intermediate-System (IS-IS) are most used intra-autonomous system routing protocols in the internet.

Figure 1: Dijkstra Algorithm.

These routing protocols used routing algorithm such as Dijkstra for constructing routing table for network. Dijkstra algorithm is static one which computes completely every time link fails. Limitation of Dijkstra is a static one that computes routing table every time a link failure takes place. Also does blind search there by consuming lot of time unnecessary.

ii) Proposed System: Our new algorithm computes new shortest path only to the affected nodes. It use previous knowledge about the network behavior and current change in network topological to compute the routing. Which is much more efficient then computing whole routing table again from scratch? Algorithm is composed of two phase which are as follows:

- Initialization phase
- Main phase

In initialization phase deletion of link takes place where the dynamic algorithm it is first checked if the deleted edge belongs to SP (G). If yes then we delete it from shortest path graph. If no then we keep it as it is. Node shown in dotted area is affected by link deletion, hence we delete link as shown below figure.

Figure 2: Node scenario
Then we find the parents of affected node and find alternative path to affected node, if present more than one, we select one with least cost. Now we check all the Childs of affected node and find alternative path from external node of affected area as shown. For insertion of edge we will first check whether, inserted edge gives any new shortest path in our shortest path Graph. If yes we will add it to SP() otherwise we will add it to original graph but not to the SP().

III. DEVELOPED SYSTEM DESIGN

Proposed system design in three phases as below:
- Insertion Of Edge
- Deletion Of Edge
- Main phase

A) Insertion of edge:
E-Edge, P- Parent node, NH ()-Next Hope

B) Deletion of Edge

Figure 3: Initialization Phase

Figure 4: Link Failure
C) MAIN PHASE

Deletion of edge

Yes

Esp (G)

No

Stop

Compute vs descendents

Update vs parent list

Is vs parent list

No

Yes

Update NH () for v&vs descendents

Exploit multi-path information to reduce the no. of descendents for which new shortest path must

Insert elements in Q to evaluate shortest path towards vs descendents for which multi-path can not

iv. SELECTION OF SIMULATION PARAMETERS:

1. Physical layer: IEEE 802.11 a (OFDM)
2. Modulation Techniques: 64 –QAM
   
<table>
<thead>
<tr>
<th>Code rate</th>
<th>Data rate</th>
<th>BPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4</td>
<td>54 Mbps</td>
<td>27</td>
</tr>
</tbody>
</table>
3. IEEE 802.11 MAC
5. Fading Model: Rayleigh fading

V. RESULT

This module provided simulation for various routing algorithms with some basic algorithms an our algorithm. It can react to manual as well as to the automatic topological events.
This module also provides simulation of hybrid network, that consists of WLAN and cellular access points. It also creates random nodes which differ in services such as voice, video, data calls. It assigns nodes according to available resources to particular systems either cellular or WLAN as shown below:

VI. CONCLUSION

We have analyzed intra-domain routing protocols improvement to support new features required by real-time services. In particular, we introduced and highlighted the advantage of using a dynamic algorithm instead of the Dijkstra one to compute the shortest paths. Then we proposed a new multipath dynamic algorithm which uses multi-path information to make a fast determination about the new shortest paths when a link failure occurs, reducing this way the network reconvergence time. We show how, by exploiting multi-path information, performs, in many case studies, better than the many of the algorithms, especially in a link failure scenario.

References


