Chapter-4

Proposed Energy Model of WLAN

This chapter elaborates our discussion up to the implementation level. Firstly, this chapter gives the idea about the approach we adopted and then we devised an algorithm NBE and by modifying beacon in PCF and then the second we enhance the MAC by MWPCF and a protocol is developed with the help of another energy model called MWTPP [2]. Finally, we compared the results we found with the existing.

4.1 Introduction

In the proposed work, one model is developed for enhancing the conservation of energy in WLAN and thus achieving the efficiency in consumption of energy. In the proposed model we introduce one algorithm named it as NBE [1] and by devising the PCF with its transmission mechanism by enhancing the MAC for the PCF and we name it as Multi-Way PCF (MW-PCF).
Energy Efficiency Analysis in Wireless LAN

The goal of this work is to enhance the performance of WLAN with the intention to better the energy conservation. This is achieved by devising a protocol NBEP [1]. For this one algorithm is proposed which is based on energy. In the proposed study, the movements of the wireless nodes yield in old routing-paths, due to the lack of route accumulation updating. For that, a new cross layer framework is implemented along with the proposed algorithm to improve route supply performance in AODV. Using simulation, the results found for the proposed algorithm. The results are compared with different QoS of WLAN with the cross-layer protocol and with the proposed NBEP protocol.

4.2 Experimental Environment

The basic definition of WLAN is the collection of mobile nodes with a centralized infrastructure, i.e. Access-Point (AP). The simple architecture of any WLAN can visualized as given below
Energy Efficiency Analysis in Wireless LAN

A Simple Wireless LAN Architecture

Figure: 4.2(a) Simple Wireless LAN
Access Point
Server Hub

Figure-4.2(b): General Architecture of WLAN

Figure-4.2(b): General Architecture of WLAN
4.2.1. Assumptions for the study:

(a) The fundamental assumption or supposition is that the nodes involved in the Network i.e. in the WLAN will always have same type of packets.

(b) Nodes spend same amount of energy to forward any packet.

(c) The data rate will be fixed in the network.

4.2.2. Proposed study includes the following in the WLAN model:

a) Sending beacon message to check the nodes availability

b) Maintaining Routing table

c) Select the path based on the energy level from routing table

d) Choose the best quality of service parameter

e) Implemented message broad casting to minimize packet loss

f) Increase the quality of service

g) Increase the efficiency in energy consumption

h) Increase the delivery ratio and decrease the delay and packet loss
4.3. Experiments and algorithms used

Generally, the nodes in any WLAN collect route information through overhearing and accumulate those in route caches by using AODV protocol. These nodes devour power unnecessarily due to overhearing the transmissions of their neighbors. For this reason, the network performance is enhanced but more energy consumption occurs unnecessarily. The study aims to reduce the effect of spending energy with the help of the proposed algorithm Need Based Energy (NBE) algorithm. The movements of the nodes yield in old routing-paths, due to the lack of route accumulation updating. For that, a new cross layer framework is implemented along with the NBE to improve route supply performance in AODV. Using simulation, the results found for the proposed algorithm shows that it achieves better performance than the existing methods, the work is published in IJCA in 2013, [1].

4.3.1 Test Design

We propose a Test-Design for the experiments and thus we have devised an algorithm for getting more energy efficiency in WLAN and for implementing it we designed a model which is shown in the figure-4.3.2(a).
4.3.2 Devising Model or Algorithm

In the energy computation, a simple energy model is used where every node or station initializes with an initial energy and while transmitting any packet from one node to another it consumes one unit of energy. To organize the entire work four module are used.
Energy Efficiency Analysis in Wireless LAN

**NBE-Algorithm:**

Create a WLAN (N\_WN) // WLAN with N number of wireless nodes (WN)

for each node or station of WLAN compute n // Locate the BSS in the WLAN

for each active node or station

compute the BSA associated with that node // locate all the neighbouring nodes or stations and

compute \text{neighbor}(SRC, DEST) // prepare a log where SRC is the source and DEST

// is the destination.

compute AVG\_DIST(NN, ND) // compute the average distance with NN nodes and

// ND neeighboring distance

for all nodes in the WLAN

if node is active
then check if neighbouring distance is less than any other associated nodes
then send message to the neighbouring nodes
deduct the energy and then
receive message form the neighbouring node
else
search the new active node
if searched node is active
then check if neighbouring distance is less than any other associated nodes
then send message to the neighbouring nodes
deduct the energy and then
receive message form the neighbouring node
else discard or drop the packet
Figure-4.3.2(b): The Working of the Energy Model based on NBEP

Modular Components of the NBEP Model:

1. BBCM (Basic-Service-Set, Basic-Service-Area Creation Module):

[ 107 ]
Energy Efficiency Analysis in Wireless LAN

This module creates the BSS and BSA. The module takes two parameters data rate and number of nodes.

2. AOM (Address Organization Module):

This module takes address of each node and specifies the source and destination for sending and receiving data. Message is sent to each node randomly.

3. LPM (Log-Preparing-Module):

This module takes location information of the network and prepares a log-table along with the necessary information its weights. Then it selects the next hop on the basis of its energy consumption. It does by calculating the average distance of all the neighbouring nodes and checks their energy level. Finally it selects all such nodes which are active and having maximum energy with less than or equal to the average distance among its entire neighbours discussed in [1].

4. HDMGM (Hop Destination Map Generator Module):

This module forwards the packets to other nodes and generates the next hop destination map which is the result of the routing algorithm we used and forwards the
received packets to the selected nodes. This gives the entire information to each node about its own as well as all the possible neighbouring nodes along with their energy level. This information updates after each transmission. Finally, the module gives the output nodes in the network as given in [1].

4.4 Metrics used to get the results

The following QoS metrics are used to analyze the performance of the network of the Existing and Proposed Model:

4.4.1 End-to-End Delay (E2E Delay)

4.4.2 PDR (Packet Delivery Ratio)

4.4.3 Packet Lost

4.4.4 Energy Consumption

4.4.1 End-to-End Delay (E2E Delay)

The basic definition of End-to-end Delay in network is the average time taken by a data packet to arrive in the destination. It also includes the delay caused by route discovery process and the queue in data packet transmission. Only the data packets that successfully delivered to destinations that counted.
Energy Efficiency Analysis in Wireless LAN

\[ E2E\ \text{Delay} = \frac{\sum (\text{arrive time} - \text{send time})}{\sum \text{Number of connections}} \]

### 4.4.2 PDR (Packet Delivery Ratio):

The meaning of Packet delivery ratio in terms of network performance metric is the ratio of the number of delivered data packet to the destination. This actually illustrates the level of delivered data to the destination i.e.

\[ \text{PDR} = \frac{\text{Sum of all Number of packets received}}{\text{Sum of all Number of packets sent}} \]

### 4.4.3. Packet Lost

The Packet Lost in any network means the total number of packets dropped during the simulation. The packet lost depends on many factors like the architecture of the network, the protocol used in the network, the mobile situation and the coordination between the devices in the network etc.

\[ \text{Packet lost} = \text{Number of packet send} - \text{Number of packet received}. \]
4.4.4 Energy Consumption

The energy consumption in a network means the amount of energy spent by all the nodes involved in the network during the different activities like packet sending, packet receiving, or even the nodes consume energy during their different modes they are in the network in the entire session.