

BANDWIDTH RESERVATION AND ENERGY CONSTRAIN DISTANCE VECTOR ROUTING PROTOCOL

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Abstract— The design goal of effective routing protocol is challenging task in MANET due to its dynamic challenging characteristics. To design an effective routing protocol which provide correct path between source nodes to destination node is not enough but to improve the quality of service, like bandwidth guarantee battery life and delay. In this paper we are going to improve QoS parameters with the use of cross layer approach. With the use of cross layer we are going to utilize the energy related information from physical and MAC layer of the data link layer which is the responsible of computing the power. And also we are calculating the bandwidth .Both of these parameters is used to detect the stable path from source to destination. We are avoiding the node which has less energy and path which has low bandwidth so as to improve the QoS parameters like network performance, stable route and better delivery of data packets. The routing protocol is built on the top of DSDV. Simulation is done using network simulator 2.35 and results compared with DSDV

Keywords— QoS, MANETs, vector, routing, bandwidth, energy

I. Introduction

The mobile Adhoc networks (MANETs) are wireless networks where a collection of mobile nodes may dynamically vary the topological structure. With respect to the more widely used mobile cellular networks (GSM), MANETs do not use any form of fixed infrastructure or central co-ordinator. The characteristics of MANETs are dynamic topology, bandwidth-constrained variable-capacity links, limited physical security and energy-constrained operations. Since MANETs are self-configured and allow ubiquitous service access, anywhere, anytime without any fixed infrastructure they can have several types of applications like rescue operations, military law enforcement and security operation, home network and conferencing. Wireless mobile ad-hoc network (MANET) technology is designed for the establishment of a network anywhere and anytime, without any fixed infrastructure to support the mobility of the users in the network where network

technology is designed for the establishment of a network anywhere and anytime, without any fixed infrastructure to support the mobility of the users in the network where network & intelligence placed inside mobile device. Since MANETs are self-configured, and allow ubiquitous service access, anywhere, anytime without any fixed infrastructure they can have several types of applications like rescue. operations, military, law enforcement and security operation, home network and conferencing .

Mobile ad hoc networks (on-the- fly) are characterized by lack of infrastructure .Nodes in a network free to move and organize themselves in a arbiter fashion. Communication between two nodes may have multiple links and heterogeneous radio, and can operate in a stand-alone fashion, well suited in a situation where infrastructure is unavailable or cost effective, time effective and also be used in crises management service applications. MANET has received good attention because of its self-configuration and self-maintenance capability

The design of efficient routing protocols is a fundamental problem in a MANETs due to its characteristics. Many different protocols have been proposed in the literature, each one based on different characteristics and properties. Basically MANETs protocols are classified based on routing table maintenance I.e. Table driven and on demand. Table driven Maintain routes with every host at all time, where on demand Create routes to remote hosts on-demand

II. QOS OVERVIEW AND QOS ROUTING IN MANET

QoS is the performance level of service offered by a network to the user. The Goal of QoS is to achieve a more deterministic network behavior so that the information carried by the network can be better delivered and the resources can be better utilized. QoS routing is the process of providing end to end loop free paths to ensure the necessary QoS parameters are met. Different services require different QoS parameters. Multimedia- Bandwidth, delay jitter &delay Emergency services- Network availability and Group communications- Battery life.

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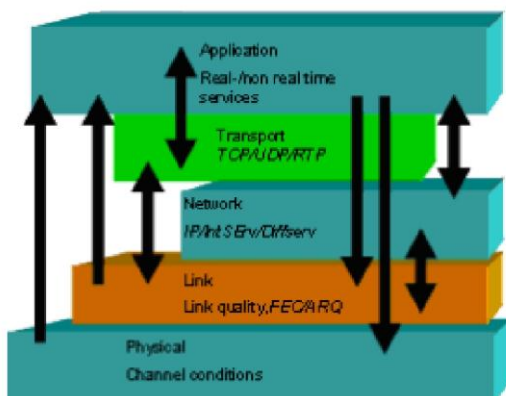
Generally the parameters that are important are: bandwidth delay jitter battery charge processing power and buffer space. QoS routing usually consider two things one is collecting and maintaining up-to-date state information of network second is finding QoS routing path .But in MANET QoS routing challenging because of its characteristics dynamically varying network topology imprecise state information Lack of central

coordination Hidden node problem limited resource Insecure medium. Design consideration of QoS in MANET is hard state versus soft state reservation, Stateful versus stateless approach, Hard QoS versus soft QoS approach:

III. Cross Layer [4,5]

Cross layer design is said to be the violation of the layered architecture in order to get some improvements in the network parameters in current and future .It means the protocol design by violating of layered communication architecture is said to be cross layer design with respect to original architecture where violation of architecture involves giving up the luxury of designing protocol at different layers independently.

If we consider one example, in layered architecture each layer is communicate with next layer with the use of interface which exist between them. We can say that each layer provide a services to next layer through the interface and vice versa. If we define an interface such that the layer talk with the other layer rather than next layer to it called a cross layering. Means here we are violating the real architecture of design, at the same time one has to take care by the headers and responsibilities of layer which is ignoring.



Cross layer offers a new challenges and opportunities for network design for ad-hoc networks [5]. To full fill the challenges of MANET and utilize the limited resources efficiently and effectively cross layer design is used. In MANET every node has several task to do like system Management, power Management, security Management, Mobility Management, which are intern inter related to each

other.

If we consider Mobility Management of MANET, this management processes an added challenge to battery power of nodes, which have adjust this behavior to the changing node location. Mobility of nodes are depend on the layers like physical layer due to mobility interference may occur ,data link layer due to mobility change in link scheduling, Transport layer due to mobility connection time out may occur. Thus with the use of cross layer design one can enhance the performance of MNET design.

MANET work on the concept of broadcast nature to enhance the channel performance. In MANET nodes can snake into neighbor nodes transmission range in order to estimate and evaluate the quality of links with neighbors. So it may cause the nodes to simultaneously enable the reception of multiple packets in wireless channels. So here requirement of cooperation of various layers such as routing and forwarding, data link and connection of link with time. Thus with the use of cross layer design one can enhance the performance of MNET design

IV. DSDV [1]

DSDV [1] finds the shortest path using classical Bellman-Foard algorithm. It is belongs to distance vector routing protocol, which are easy to implement, and require relatively little memory and cup processing capacity compared to other types of routing protocols .a popular example of distance vector routing protocol is RIP [2,3].In distance vector routing, each node act as a router and host and maintain a routing table containing address of some destinations and shortest path to reach that node, and address of neighbor nodes to reach shortest path(towards destinations) ,the length of the route is known as metric in routing table. To maintain the routing table s, each node periodically broadcast a routing update to each of its neighbor nodes; in addition to this DSDV contain a sequence number in each routing table entry, to preventing routing loops. Each node maintain a sequence number that it include in each routing update message that it send, and each eatery in a node’s routing table is tagged with the most recent sequence number its knows for destination. When node detects a broken links with its neighbor, then the node create a new routing update for that neighbor as a destination, with an infinite metric and next address sequence number in its corresponding routing table entry. If sequence number in the update is less than the current sequence number in the table entry, the new update for this destination is ignored .DSDV uses two types of routing updates one is periodic update second is triggered update in turn these updates are of two types depending on the situation i.e. full dump or incremental update. Clearly, the sequence number and metric value containing in each update plays a vital rule in DSDV protocol.

V. Proposed System

In order to implement QoS we propose to develop a protocol which guarantees QoS parameters with the help of cross layering. To achieve our goal we design a framework to calculate the path bandwidth and residual energy. The proposed protocol is a modified DSDV routing protocol. In our BRECDV uses path selection with minimum hop count and maximum residual energy of nodes and maximum path bandwidth.

We are calculating residual battery energy of each node and keep it in routing table at every node at physical and Mac layer of the data link layer which is responsible for compute power and residual energy. The residual energy of nodes are indication of energy stability with which we can improve the network performance. MAC layer functions are modified to provide the RTS/CTS after the route is discovered. In MANET, there is high power consumption for sending RTS and CTS signals. In our routing protocol hand shake is happen after path is established between source and destination. We select

Our routing protocol satisfies the some of the QoS parameters such as bandwidth and energy consumption, which in turns increases the life time of the network and reduce energy depletion of nodes because we are selecting a stable path from source to destination.

Initially we assume that all the nodes in the given network have same transmission power and every node select a threshold energy level and stores in routing tables of every node. The residual energy of the node can obtained to network layer and stored in routing table, which is used to take route diction from source to destination.

The node then calculates the residual energy Eres using the following parameters: which is discussed in paper [6]

$$RE_{node} = IE_{node} - CE_{node} \quad (1)$$

Whers

$$CE_{node} = Et + Er + Ei$$

IE_{node} – Initial energy taken by the node

Et – Energy consumed in transmitting packets

Er – Energy consumed in receiving packets

Ei – Energy consumption in IDLE state.

$$\text{Bandwidth} = \text{packet size} \setminus \text{Packet Delivery time [1] (2)}$$

$$\text{Packet delivery time} = \text{Packet receive time by receiver} - \text{packet send time by sender}$$

$$\text{Packet delay} = \text{packet travelling in channel} + \text{packet processing time in nodes.}$$

Consider N number of nodes (n-1) channels

T_{dn} = time to travel in (n-1) channel + packet processing time in N nodes

$$T_{dn} = \sum_{i=1}^{(n-1)} T_{chi} + \sum_{i=1}^n P_{ti}$$

Packet travel in channel effected by Channel error i.e., error bits present in channel sensing mechanism

More channel utilized by sensing mechanism i.e., due to more RTS/CTS and high – back off

Our proposed routing protocol is proactive routing protocol which gains some of the qualities of distance vector routing. In a proactive routing protocol' each node repeatedly maintains the information of other nodes. In our protocol we are maintain the information of residual energy in every routing table of each node. Routing information is periodically transmitted throughout the network in order to preserve routing table stability. When route process is initiated then bandwidth and residual energy is calculated using (1) (2). This information is mainly used to determine the path between source and destination nodes. We are sense the RTS/CTS after detection of the route discover but before the data packet

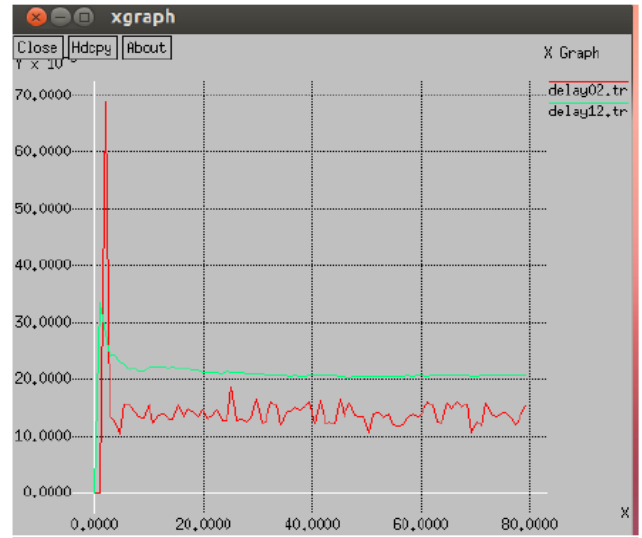
VI. Performance Analysis

To simulate proposed routing protocol, network simulator version NS- 2.35 [8, 9] which is a event driven packet level network simulator developed as a part of the VINT (virtual internet tested) project. NS2 is an object oriented TCL (OTCL) script interpreter that has a simulation event scheduler and network component object libraries on Linux operating system is used. The results which we obtained gives the better performance compare with DSDV protocol in throughput, Delay.. All network components of mobile node are considered their default values. (E.g. Link Layer, Interface Queue, Mac Layer etc.) Agent, Router and Movement traces are kept ON and Mac trace is kept OFF for all three mobile nodes. In below diagram shows our network scenario

TABLE I. TABLE TYPE STYLES

Simulation;

No. of Nodes	10, 20, 30
Area Size	600 * 600
Mac	802.11
Radio Range	250m
Simulation Time	100 sec
Traffic Source	CBR
Packet Size	512
Mobility Model	Random Way Point
Speed	2,4,6,8,10 and 12 m/sec.



VII. Performance Metrics

We used the QoS parameters throughput and delay to evaluate the performance of our proposed protocol.

1. Throughput: This is the ratio of packets received by the receiver to packets delivered by the sender (CBR packets delivered)

2. Average end-to-end delay: This is the average of the delays incurred by all the packets that are successfully transmitted

Figure below indicated how the proposed system protocol has shown a good increase in throughput when compared to the general DSDV

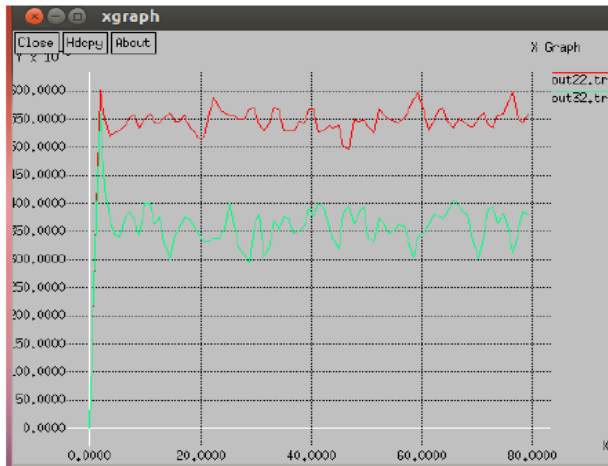


Figure below indicated how the proposed system protocol has shown a good decrease in delay when compared to the general DSDV. At initially it takes long time to set up but then it will good decreased

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