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Energy Optimization in Manet Using Enhanced Routing Protocol

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Abstract: In MANET due to new advancement sensing capability has been embedded to the node so MANET can be deployed at any platform for performing various tasks. Mobility & sensing power consumption is the major issue of communication b/w different nodes in MANET. In the process of MANET power consumed in sensing, transmission of data from one source to another. In this procedure various proactive & reactive protocol are used that provide reliable communication. The major Concern in MANET is energy optimization & reliable communication. We will reduce the energy consumption by using dynamic clustering or residual energy concept & implement routing protocol for reliable communication.

Keywords: VANET, Routing Protocols in MANET's, Energy Consumption, DSDV, AODV, DSR.

1. INTRODUCTION

1.1 MOBILE AD HOC NETWORK

A mobile ad-hoc network (MANET) is composed of a group of mobile, wireless nodes which cooperate in forwarding packets in a multi-hop fashion without any centralized administration. Applications of MANETs occur in situations like battlefields, major disaster areas, and outdoor assemblies. A working group called "MANET" has been formed by the Internet Engineering Task Force (IETF) to study the related issues and stimulate research in MANET. MANETs are self configuring wireless networks without any centralized control. As the radio range of mobile nodes is usually small, the nodes must cooperate with each other to keep the network alive. The communication between two nodes usually includes several intermediate nodes forwarding the data packets between the end points.

1.2 TYPES OF MOBILE AD HOC NETWORK

1.2.1Vehicular Ad-Hoc Networks (VANET's): VANET is a type of Mobile Ad-Hoc network where vehicles are equipped with wireless and form a network without help of any infrastructure.The equipment is placed inside vehicles as well as on the road for providing access to other vehicles in order to form a network and communicate.

1.2.2Intelligent Vehicular Ad-Hoc Networks (In VANET's): Vehicles that form Mobile Ad-Hoc Network for communication using Wi Max IEEE abc 802.16 and Wi-Fi802.11 themain aim of designing In VANET's is to avoid vehicle collision so as to keep passengers as safe as possible. This also help drivers to keep secure distance between the vehicles as well as assist them at how much speed other vehicles are approaching.

1.2.3 Internet Based Mobile Ad-Hoc Networks (In MANET's): These are used for linking up the mobile nodes and fixed internet gateways. In these networks the normal routing algorithms does not apply [2].

1.3 Energy Efficient Routing Protocol

Energy is said to be a limiting factor in case of ad hoc. Routing in ad hoc network has some unique characteristics:
Energy of node is crucial and it depends upon battery which has limited power supply.

- Nodes can move in an uncontrolled manner, so frequent route failures are possible.
- Wireless channels have lower and more variable bandwidth compared to wired network.
- Energy efficient routing protocols are the only solution to above situation.

1.3.1 Proactive Routing Protocols: Proactive routing protocols are also called as table driven routing protocols. In this every node maintain routing table which contains information about the network topology even without requiring it. This feature although useful for datagram traffic, incurs substantial signaling traffic and power consumption. The routing tables are updated periodically whenever the network topology changes. Proactive protocols are not suitable for large networks as they need to maintain node entries for each and every node in the routing table of every node. These protocols maintain different number of routing tables varying from protocol to protocol. There are various well known proactive routing protocols. Example: DSDV, OLSR, WRP etc.

1.3.2 Reactive Routing Protocols: Reactive routing protocol is also known as on demand routing protocol. In this protocol route is discovered whenever it is needed Nodes initiate route discovery on demand basis. Source node sees its route cache for the available route from source to destination if the route is not available then it initiates route discovery process. The on-demand routing protocols have two major components Ex: DSR, DSDV, AODV.

1.3.3 Hybrid Routing Protocols: These protocols are developed for better tradeoff between Proactive & Reactive protocols. An example of such a protocol is the Zone Routing Protocol (ZRP). ZRP divides the topology in to zones and then allows transmission between and within the zonesbased on strength and weakness of protocol.

1.3.4 Energy-aware routing protocols: The mobile nodes in MANET usually need to be untethered, and are thus powered by batteries which provide limited energy. In the absence of central controlling entity like a base station, each node have to participate in distributed protocol(s) for building routes, causing them to spend more energy. In the past few years, many energy-aware protocols have been proposed for wireless MANET and sensor networks. They are aiming at solving different goals as

described below. The first set of protocols tries to minimize broadcast traffic, and the energy thus spent. BIP and LMST are based on minimum-energy broadcasting using Minimum Spanning Tree (MST) development. Similarly, uses Shortest Path Tree development.

1.4 ALGORITHMS USED

1.4.1 Dynamic Destination-Sequenced Distance-Vector Routing Protocol (DSDV) DSDV is developed on the basis of Bellman–Ford routing algorithm with some modifications. In this routing protocol, each mobile node in the network keeps a routing table. Each of the routing table contains the list of all available destinations and the number of hops to each. Each table entry is tagged with a sequence number, which is originated by the destination node. Periodic transmissions of updates of the routing tables help maintaining the topology information of the network. If there is any new significant change for the routing information, the updates are transmitted immediately. So the routing information updates might either be periodic or event driven. DSDV protocol requires each mobile node in the network to advertise its own routing table to its current neighbors.

1.4.2 Cluster Gateway Switch Routing Protocol (CGSR): CGSR uses DSDV protocol as the underlying routing scheme and, hence, it has the same overhead as DSDV. However, it modifies DSDV by using a hierarchical cluster-head-to-gateway routing approach to route traffic from source to destination. Gateway nodes are nodes that are within the communication ranges of two or more cluster heads. A packet sent by a node is first sent to its cluster head, and then the packet is sent from the cluster head to a gateway to another cluster head, and so on until the cluster head of the destination node is reached. The packet is then transmitted to the destination from its own cluster head.

1.4.3 Dynamic Source Routing (DSR): is a reactive protocol based on the source route approach. In Dynamic Source Routing (DSR), shown in Figure.2, the protocol is based on the link state algorithm in which source initiates route discovery on demand basis. The sender determines the route from source to destination and it includes the address of intermediate nodes to the route record in the packet. DSR was designed for multi hop networks for small Diameters. It is a beaconless protocol in which no HELLO messages are exchanged between nodes to notify them of their neighbors in the network.

1.4.4 Ad Hoc on-Demand Distance Vector Routing (AODV): AODV is basically an improvement of DSDV. But, AODV is a reactive routing protocol instead of proactive. It minimizes the number of broadcasts by creating routes based on demand, which is not the case for DSDV. When any source node wants to send a packet to a destination, it broadcasts a route request (RREQ) packet. The neighboring nodes in turn broadcast the packet to their neighbors and the process continues until the packet reaches the destination. During the process of forwarding the route request, intermediate nodes record the address of the neighbor from which the first copy of the broadcast packet is received. This record is stored in their route tables, which helps for establishing a reverse path.

2. RELATED WORK

Shivashankar et al [1] "Notice of Violation of IEEE Publication Principles Designing Energy Routing Protocol with Power Consumption Optimization in MANET"The proposed work minimizes the energy consumption per packet and maximizes the network lifetime. The design objective of modifying DSR is to select energy-efficient paths. The main features of modified DSR are: (i) minimize energy consumed per packet (ii) maximize network lifetime for network and (iii) minimize maximum node cost. However, some intermediate nodes might act selfish and drop the packets for other nodes in order to save their own battery power. The proposed algorithm can find selfish nodes and deal with them by using a modified DSR protocol, which we call as *an* efficient DSR (EDSR). The simulation results show an increase in the packet delivery ratio in the network. The average node lifetime of proposed EDSR model is 45-60% longer than that of DSR model.

Sanchez-Iborra, R. et al[2] "Performance Evaluation of BATMAN Routing Protocol for VoIP Services: A QoE Perspective" In this paper, we focus on evaluating the performance of BATMAN supporting VoIP traffic on low power-consumption nodes, from a Quality of Experience (QoE) point of view. Specifically, we evaluate the impact on BATMAN performance of 1) the PHY layer, by employing a fading characterization of the transmission channel; 2) the number and density of ad-hoc nodes; and 3) node mobility. All the results obtained for BATMAN are compared with those attained by using the widely used OLSR routing protocol. From the results, we conclude that neither BATMAN nor OLSR in their respective current implementations are suitable enough for VoIP traffic support in MANETs composed of energy-saving nodes.

Hiranandani, D. et al[3] "MANET protocol simulations considered harmful: the case for benchmarking"Author find that there are still several configuration pitfalls which many papers fall victim to, which in turn damages the integrity of the results as well as any research aimed at reproducing and extending these results. We then describe the simulation "design space" of MANET routing in terms of its basic dimensions and corresponding parameters. We also propose four "auxiliary" metrics to increase simulation integrity. We conclude with several example scenarios that promote modeling simulations after real-world situations.

Shibo He et al[4] "EMD: Energy-Efficient P2P Message Dissemination in Delay-Tolerant Wireless Sensor and Actor Networks" In this paper, we address the problem of peer-to-peer networking for data dissemination among actors in wireless sensor and actor networks (WSANs), which consist of static sensors, responsible for environment monitoring, and mobile actors, in charge of data collection and task performing. This problem has not been received much attention although peer-to-peer networking has achieved great successes in other networks

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such as the Internet and mobile ad hoc networks (MANETs). Unlike the Internet and MANETs, WSANs contain static sensors that are energy-constrained and actors that cannot communicate with each other directly. Author theoretically analyzes the data dissemination strategy under which the original source actor can distribute its messages to all other actors at minimum communication cost within a given delay bound. Through extensive simulations we demonstrate the performance of EMD.

Varaprasad, G. et al[5] "New Power-Aware Multicast Algorithm for Mobile Ad Hoc Networks" A mobile ad hoc network (MANET) is a decentralized network that consists of mobile nodes. The proposed model increases the lifetime of the nodes and the network lifetime. The simulation work shows better results in terms of the node lifetime and network lifetime as compared to other models, ODMRP and AM Route. If the group size is 12, then the proposed model has kept the nodes alive for 8,100 s, whereas the ODMRP and AM Route models have kept the nodes alive for 7,400 s and 6,400 s respectively.

4. PROPOSED METHODOLOGY

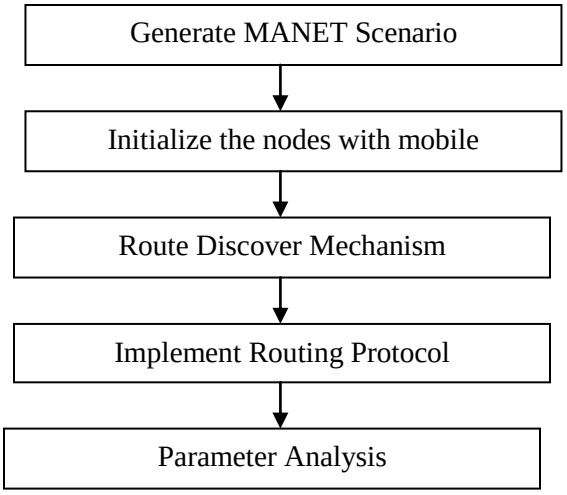

Fig 4.1 Flow diagram for purposed work

Phase 1: In this phase MANET scenario has been developed using network simulation. For designing of scenario different proportion have been defined to the nodes. Nodes position, mobility mode energy has been defined.

Phase 2: In this phase the route discovery mechanism has been used that transmit the RREQ message & computer then residual energy consumed & energy available to all nodes for a single route. After calculation of this the best route has been selected that use minimum pops, uses energy.

Phase 3: In this phase the reactive protocols have been used for transmission of the message by using the best route defined by RDM after transmission of the message the lifetime & packet delay ratio, packet delay & throughput of the system has to be analyzed for performs evolutions.

5. RESULTS AND DISCUSSIONS

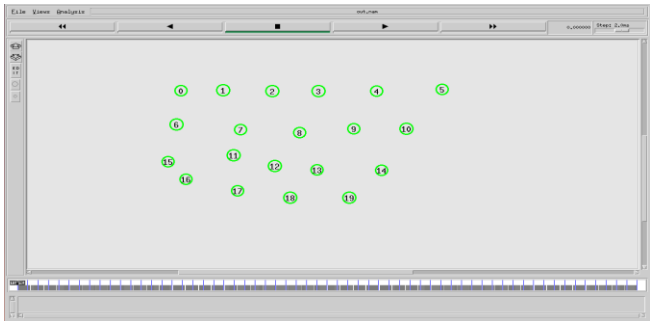

Figure 5.1:Generate MANET Scenario
This figure represents the MANET Scenario.

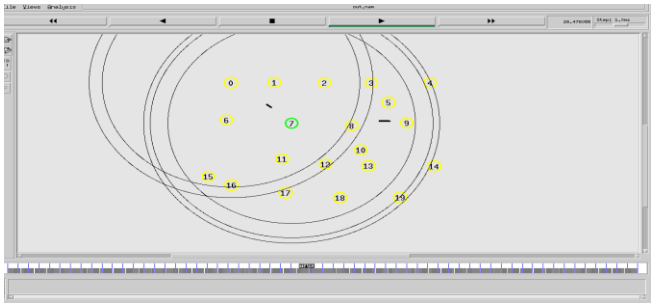

Figure 5.2: Energy consumption during data transmission
This figure represents the consumption of energy during data transmission. The major Concern of MANET is energy optimization. To overcome the energy consumption problem dynamic clustering or residual energy concept can be used that reduce the energy consumption in MANET.

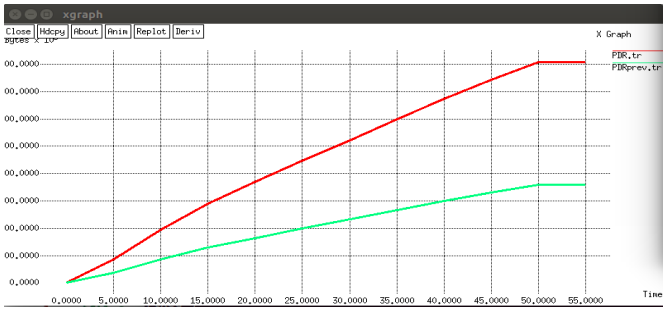

Figure 5.3: Packet Delivery Ratio
It is the ratio of all the received data packets at the destination to the number of data packets sent by all the sources.
It is calculated by dividing the number of packet received by destination through the no. of packet originated from the source.
PDR = $(P_r / P_s) * 100$

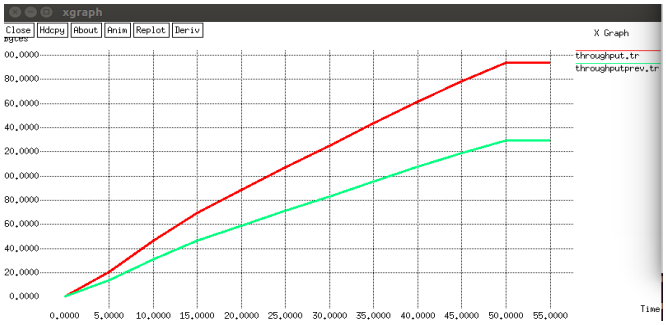

Figure 5.4: Throughput

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It is the average at which data packet is delivered successfully from one node to another over a communication network. It is usually measured in bits per second.

Throughput = (no of delivered packets * packet size) / total duration of simulation. In this graphical representation Green line represents the previous throughput & red line represents the current throughput.

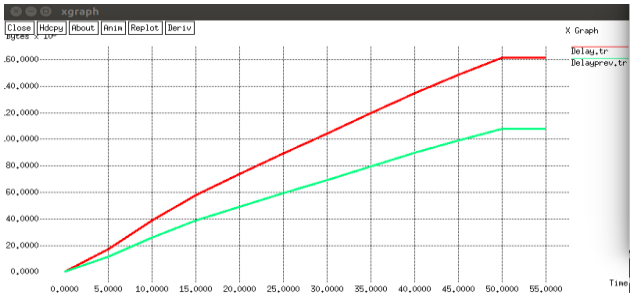

Figure 5.5: Delay

This includes all possible delays caused by buffering during route discovery, latency, and retransmission by intermediate nodes, processing delay and propagation delay. It is calculated as $D = (T_r - T_s)$

Where, T_r is receive time and T_s is sent time of the packet. In this graphical representation Green line represent the previous delay & red line represent the current delay.

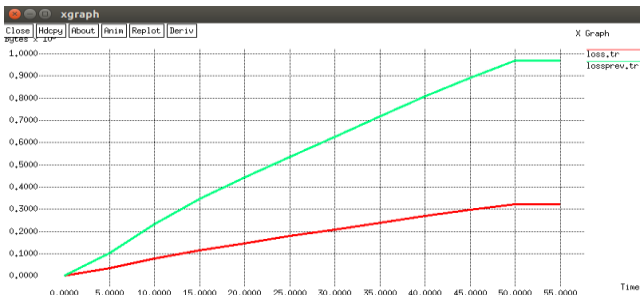

Figure 5.6: Packet Loss

Packet loss occurs when one or more packets of data travelling across a computer network fail to reach their destination. Packet loss is typically caused by network congestion. Packet loss is measured as a percentage of packets lost with respect to packets sent. In this graphical representation Green line represents the previous Packet Loss & red line represents the current Packet Loss.

CONCLUSION AND FUTURE SCOPE

MANET is a field of networking that deals with the mobiles nodes of communication. In the MANET position of nodes get dynamically changed in entire iteration. In MANET process power consumed in sensing, transmission of data from one source to another. Various proactive & reactive protocols are used that provide reliable communication. The major Concern of MANET is energy optimization. To overcome the energy consumption problem dynamic clustering or residual energy concept can be used that reduce the energy consumption in MANET. In last we analyzed various parameters & on the basis of these parameters we conclude that our system gives us better results.

In the future reference mobility based clustering can be purposed in MANET that utilizes handover mechanism for optimization of energy consumption

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