Power Heterogeneous MANET Using LVC Algorithm

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Abstract
A mobile ad hoc network (MANET) is a self-configuring, infrastructure-less network of mobile devices which is connected without any wires. In MANET the node can move in any direction independently. The main challenge in building a MANET is equipping each device to continuously maintain the information needed and to properly route traffic. So, these networks may operate by themselves or may be connected to the larger Internet. They may contain one or multiple and different transceivers between the nodes. Finally in a highly dynamic, autonomous topology. Vehicular Ad-hoc Networks (VANETs) are used cars and cars and roadside equipment. MANETS can be used for facilitating the collection of sensor data for data mining for a variety of applications such as air pollution monitoring and different types of architectures can be used for such applications.

Keywords: LVC, LRPH, MANET, RREQ, VANET.

I. INTRODUCTION
MANET is one of the wireless adhoc network which is in top of link layer in networking environment. It is a self forming, point to point network. Through the development of various technologies like laptops and 802.11 wifi wireless networking MANET become more famous. It will deliver good service, quality and best connectivity to the user. When mobility is added with time varying connectivity without affecting the users quality of service then it will become difficult for the developers.

Networking is also known as MANET, or Mobile Ad hoc Networking systems. A MANET system is a set of mobile devices which need to provide the functions like streaming voice, sending data and video between pairs of devices which are used as relays to avoid the need for infrastructure [1]. The Figure1 specifies workings of MANET.

II. Types of MANET
Vehicular Ad-hoc Networks (VANETs) are used for vehicles and roadside equipment like cars, vans, busses. For example, a college bus system, if the buses are connected. The buses of altered locations of city-limits to aces up or head off students, and accomplish ad-hoc network.

Able vehicular ad-hoc networks (In VANETs) are useful for vehicles and its intelligence will helps cars to behave in an able address during vehicle-to-vehicle collisions, accidents, bashed active etc. Internet Based Adaptable Ad-hoc Networks (iMANET) are ad-hoc networks that has hotlink adaptable nodes and anchored Internet-gateway nodes. In these networks ad hoc acquisition algorithms don't affect the specified person.[5]. Types of manet is shown in Figure.1 AND Figure.3
III. Characteristics of MANET

In MANET, each and every node will act as both host and router. This is autonomous in behavior.

Multi-hop radio relaying: When a source node and destination node for a message or data is out of the radio range, the MANETs are capable of multi-hop routing. There is distributed nature of operation for routing, host configuration and specially for security. Here a centralized firewall is absent. These nodes can join or leave the network anytime, it will make the network topology more dynamic in nature. Mobile nodes are characterized with less memory, power and light weight features. The stability, reliability, efficiency and capacity of wireless links are often inferior when compared to wired links. This shows the link between the bandwidth of wireless links. Mobile and spontaneous behavior will result in demanding minimum human intervention to configure the network. All nodes have unique features with similar responsibilities and capabilities and so it forms a completely symmetric environment. High user density and large level of user mobility. Nodal connectivity is intermittent [2].

IV. ADVANTAGES AND DISADVANTAGES OF MANET:

- **Self-governing Behavior**: Each mobile node in MANET acts as both router and host. The mobile nodes can also achieve switching task as a router. So terminals and switches are indistinguishable in MANET.

- **Dynamic topologies**: As all the nodes in the network are mobile they are freely moving with dissimilar speed, which result in the difference of network. The topology in the network may change randomly at uncertain time. All the mobile nodes present in the network establish routing among themselves dynamically, creating their own network.

- **Multi-hop routing**: When any nodes wants to put up communication with other nodes which are out of range, then the packet is transmitted through one or more intermediate nodes. Two types of ad-hoc routing i.e. single-hop and multi-hop routing. Single-hop is simpler than multi-hop regarding cost, structure and implementation.

- **Distributed operation**: The control of the network is distributed among the mobile nodes of the network as there is no background network for the main control of the network operation.

- **Light weight terminal**: In most of the cases, the MANET is mobile nodes with less memory size, low power storage and low CPU capability. Optimized algorithm and process that perform computing and communication functions.

- **Limited Bandwidth**: today in the modern electronic world all the devices completely depend on the batteries. The purpose of the network is to be optimized to preserve the energy utilize of the mobiles. Wireless network has a very limited bandwidth and the network is to be optimized to achieve with the utmost competence within the limited bandwidth.

Manet environment has to overcome certain issues. They are as follows:

- **The wireless link characteristics are time-varying in nature**: There are transmission obstacles like fading, path loss, blockage and intrusion that adds to the vulnerable
performance of wireless channels. The reliability of wireless transmission is resisted by different factors.

- **Limited range of wireless transmission**: The limited radio band results in reduced data rates compared to the wireless networks. So optimal usage of bandwidth is required by keeping low overhead as possible.

- **Packet losses due to errors in transmission**: MANETs practice to have higher packet loss due to factors such as hidden terminals that results in collisions, wireless channel issues high bit error rate (BER), interruption frequent break in paths caused by mobility of nodes, increased collisions due to the presence of hidden terminals and unidirectional links.

- **Route changes due to mobility**: The dynamic nature of network topology results in many path breaks.

- **Frequent network partitions**: The random movement of nodes often leads to partition of the network. This mostly affects the intermediate nodes [3].

V. RELATED WORK

The design and construction of algorithms for a mobile ad hoc network should be more dynamic. Comparing to the performance of the following routing protocols AODV, CBRP, DSR, and DSDV are studied and compared based on mobility, load and size of the ad hoc network [10]. Here are some examples of routing protocols for heterogeneous MANETs are MC (Multiclass) which is a position aided routing protocol for power varied MANETs. MC routing uses the powerful nodes as backbone nodes. Here the routing area is divided into many small, equal-sized cells and a B-node is maintained in each cell. Most of the activities like packet forwarding are among B-nodes so, there is reduction in routing hop count and makes the routing more efficient and reliable, since B-nodes transmission range is large, and are more reliable. Then, a new MAC protocol, i.e hybrid MAC (HMAC), is designed for cooperating with the routing layer. HMAC, MC achieves better performance. Based on the cell structure.

VI. LRPH MOBILE Ad Hoc NETWORKS

To get the best network performance and to address the issues of high-power nodes, proposed an LRPH MANETs. There are two core components they are first and second core components. The first component (Component A) is the LVC algorithm that is used to find the unidirectional link and to build the hierarchical structure [6]. The second component (Component B) is mainly for routing, including the route discovery and maintenance. Here first list the network model and definitions. Then present the two components in detail.

**Network Model**

In network model there are basically two types of nodes in the networks: B-nodes and general nodes (G-nodes). B-nodes means the high power nodes and a transmission range is large. When the nodes is with low power and a small transmission range it is Gnodes. [4] The numbers of B-nodes and G-nodes are denoted as NB and NG, respectively. Because of the complexity and high-cost of B-nodes, we assume that NB < NG. We assume that each node is equipped with one IEEE802.11b radio using a single channel.

![MANET Gateway Node](image)

**Definition 1**—Gisolated: G isolated is represented as a G-node that is not covered by any B-node.
Definition 2–Gmember: G member is represented as a G-node whose bidirectional neighbors (BNs) are covered by its cluster head.[15]

Definition 3–Ggateway: G gateway is represented as a G-node whose BNs are not covered by its cluster head.

VII.LVC Algorithm

Unidirectional links that exist between two neighboring nodes (B-node or Gnode) is the failure of MANETS. BN discovery methodology is mainly used in LVC. Loose Virtual Coupling so unidirectional links in the network can be discovered using a BN discovery methodology. Bidirectional links are discovered by sending a neighbor discovery packet (BND from end to end a node to all its neighbors. This packet is used by nodes to create a bidirectional neighbor table BN

The following are the steps to discover Bidirectional links [9]
Step 1: From the Single hop each node sends BND packet to all its neighboring nodes.
Step 2: Using these packets it will create an aware node (AN) table AN = NBRB(gi) \cap NGRG(gi) and Wait for some time and collect all BND packets from neighbor nodes.
Step 3: Next, again send the BND table to all neighboring nodes, now with node’s AN table as well.
Step 4: The nodes check whether its own information is present in the BND packet from neighbor node. If yes the node is added to the BN table.

2) LVC : Design of a novel LVC algorithm for making the most of the benefits of B-nodes,
In LVC, a B-node is chosen as the cluster head and establishes a loose coupling relationship with G-nodes. There are two features come into view in LVC. The loose clustering avoids heavy transparency caused by modernizing and maintaining the cluster when the density of B-nodes is small it is the first feature of LVC. LRPH protocol can be adaptive to the compactness of B-nodes, even when all G-nodes are in the Gisolated state, local aware topology (LAT) were built by all the nodes and control packets during building LVC by exchanging the table[7]. The basic step is building a local aware topology table (LAT).

Step 1: G-nodes send G-node initialization packets (GI) to all B-nodes in its AN table. The packet will have the information on its Bidirectional links. [14]
Step 2: Each B-node once receiving the GI packets will add the BN to LAT. The B-node then sends B-node initialization (BI) packets to all G-nodes in its coverage area.

Step 3: Once G-node receives the BI packet, it updates the LAT table.
Step 4: A G-node will declare it as a member to cluster head by sending cluster member, register (CMR) packet to cluster head.
Step 5: Cluster head declare (CHD) packet and updates it in LAT, Cluster head replies using CHD. Cluster head maintains the LAT for each member G-node. 3) Cluster Head selection Each G-node, Gi selects the B-node which has the shortest distance (by any shortest path algorithms) to node Gi Using LAT table G-nodes can easily find out the B-node nearest to it. B node is shown in Figure 5

Figure 5 Backbone Node

Routing Components in LRPH
To find the best route with less interference and reducing the chance of failure during transmission. It is discussed how to communicate and how a route is found between two nodes [9]. In route cache all the routes will be there if the route has already been used in previous communications, so there is no need to discover the new route. If the destination node D is in LAT table, the route can be directly obtained from the table. In the discovered route ,B-NODES will be avoided. If the destination node D is not in the LAT table the source node S sends Route Request Packet (RREQ). The destination node D sends back the route response packet (RREP). Steps in Route Discovery
Step 1: It is avoided when the RREQ packet is a duplicate packet. If its is false proceed to step 2.
Step 2: If the destination node, ni is available in route cache or LAT table, then the path is discovered, If its is false proceed to step 3.
Step 3 : The sequence of nodes discovered is appended and broadcast when the node is a B-node.
Step 4: If the node is a G-node and in its next hop cluster head is present, it forwards the packet to the cluster head. The cluster head replaces B-nodes present in the discovered route with an alternate route avoiding B-nodes. Also, the G-nodes are replaced to improve the average Link duration.
Step 5: The next beginning broadcasts the packet to Gateway nodes that are under transmission ranges of other nodes.[10]
Step 6: If G-node, except gateway node, receives a RREQ packet from the cluster head it discards the packet. RREQ is shown in Figure.6

![Figure 6 RREQ](image)

**VIII. LVC Maintenance:**

If a route detects a link failure for the node then the node sends a route error packet, RERR in the direction of the source node. [12] It will remove the link from the local cache when all the nodes receive the packet. Then, the source node starts a new route discovery procedure.

**IX. CONCLUSION**

Ad hoc networks can be implemented using various techniques like Bluetooth or WLAN. The definition itself does not imply any restrictions to the implementing devices. Ad Hoc networks need very specialized security methods.[13] There is no approach fitting all networks, because the nodes can be any devices. The computer security in the nodes depends on the type of node, and no assumptions on security can be made. In this paper the computer security issues have not been discussed, because the emphasis has been on network security. But with the current MAC layer and routing solutions the true and working ad hoc network is just a dream for now. However, it can be used with relatively small networks and potentially some very nice applications can be realized. Although some peer-to-peer type of solutions work nicely already today, it would be nice to see that some new and innovative solutions would be seen in the arena of ad hoc networks since it is not hard for one to imagine a countless number of nice ad hoc based applications that would make the world at least a bit better place.[11] As the engineering tradeoffs are many and challenging for MANETS, a diverse set of performance issues requires new protocols for network control. To help out researchers to measure the goodness of the network performance, proposed in this paper an outline of protocol performance issues that highlight performance parameters that will help to promote meaningful assessments of protocol performance. Here developed an LVC-based routing protocol named LRPH for power heterogeneous MANETs.

**REFERENCES**


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