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A Study of Routing Protocol for Power Efficient Routing for MANET

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Abstract: *Mobile Ad hoc network (MANET) is a set of two or more nodes that are used for wireless communication and networking capacity. These nodes are formed by the wireless hosts, without using preinstalled infrastructure and do not use centralized administration. Routing protocol define a set of rules which regulates the flow of data packets from source to destination. Distinctive features of MANET makes the routing process complex, therefore the routing protocol is very significant for determining the network performance and its networking capacity. In this paper study of AODV, DSDV, AOMDV and PEGASIS is done and the important issue is Energy consumption as mobile nodes in Ad hoc use battery power for operation.*

Keywords: *MANET, AODV, DSDV, AOMDV, PEGASIS, Energy consumption and NS2.*

1. INTRODUCTION

Mobile Ad hoc networks (MANETs) are combination of mobile nodes without existence of any centralized control or pre-existing infrastructure. Such kind of networks generally use multi-hop paths and wireless radio communication channel. Thus, communication between nodes is established by multi-hop routing. Also, new nodes join or leave the network at any time. Owing to the dynamic nature, topology is often changing. Therefore, performance of network deteriorates rapidly. So, the development of a secure routing protocol [1, 2] is a critical concern. Ad hoc is a kind of special wireless network mode. An ad hoc wireless network is a collection of two or more devices quipped with wireless communications and networking capability. Such devices can communicate with another device that is immediately within their radio range or one that is outside their radio range not relying on access point. A wireless ad hoc network is self-organizing, self-disciplining, and self-adaptive. These networks work without any pre-existing infrastructure.

2. MAJOR FEATURES OF MANETS

- Formed by wireless hosts may containing multiple hosts
- No pre-installed infrastructure
- Routes between hops may contain multiple hops
- Does not use centralized administration
- Application Specific.

Mobile hosts in MANET require battery power for their operation. Therefore, energy efficiency is important metric for sending the data from source to destination. Routing protocol is used for maximizing the energy efficiency of the network. In this research paper the performance of AODV and DSR protocols is compared by varying number of nodes. Basically, there are two types of routing protocol.

The table-driven routing protocol is also named as a proactive routing protocol. In this, each node contains routing information to store network and this information is then used to send data from one node to another node [3]. The on demand driven routing protocol known as a reactive protocol. In this, each node does not contain any information about the route. The route is established when they are required to route data packet [4].

3. PEGASIS PROTOCOL (POWER EFFICIENT GATHERING IN SENSOR INFORMATION SYSTEM)

In wireless sensor network, Data handling is accomplished by data dissemination and data gathering. A

routing protocol is a protocol that determines how routers (Sensor nodes) convey with each other, propagating information that permits them to preferred routes between any two nodes on the network. The prime route being done by applied routing algorithms. Each router has awareness only of the networks attached to it directly. A routing protocol proportion this information first between existing neighbors, and then throughout the network. This way, routers achieve knowledge of the topography of the network.

In data-gathering application, all data from all nodes need to be collected and transmitted to the base station (BS) by a leader node, where the end-user can approach the data. A simple approach to accomplishing this data gathering assignment is for entire nodes to transmit its data directly to the BS. The goal of algorithm which implement data gathering is maximize the numbers of rounds of communication before the nodes die and the networks becomes ruined. This means minimum energy should be exhausted and the transmission should occur with minimum delays, which are incompatible requirement. Hence, the energy x delay metrics used to compare algorithms, since this it measures speedy and energy-decisive data gathering. A PEGASIS protocol that implement data gatherings are discussed below in detail.

4. AODV (AD-HOC ON-DEMAND DISTANCE VECTOR PROTOCOL)

The Ad hoc On Demand Distance Vector (AODV) routing algorithm is a routing protocol designed for ad-hoc mobile networks. AODV is capable of both multicast and uncast routing. It is an on-demand algorithm, means that it routes between nodes only as desired by source nodes. It maintains these routes as long as they are used by the sources. Additionally, AODV designs tree topography which connects multicast group members. The trees are composed of the group members and the nodes required attaching the members. AODV uses sequence numbers to ensure the freshness of routes. It is loop-free, aggressive and extent to broad numbers of mobile nodes. AODV routes using a route request / route reply query cycle. While a source node desires a route to a destination for which it does not already have a route, it disseminates a route request (RREQ) packet across the network. Nodes receiving this packet update their information for the source node and set up rearward pointers to the source node in the route tables. In addition to the current sequence number, source node's IP address, and broadcast ID, the RREQ also contains the most recent sequence number for the destination of which the source node is cognizant.

The main advantage of this protocol is having routes established on require and that destination sequence numbers are applied for find the latest route to the destination. The connection setup detain is lower. One disadvantage of this protocol is that intermediate nodes can lead to inconsistent routes if the source sequence number is very former and the intermediate nodes have a higher but not the latest destination sequence number, thereby having stale entries. Also, more than one Route Reply packets in response to a single Route Request packet can lead to heavy control overhead. Another disadvantage of AODV is unneeded bandwidth consumption due to periodic beaconing.

5. DSDV (DESTINATION SEQUENCE BASED DISTANCE VECTOR PROTOCOL)

Packets are transmitted between the stations of the network by using routing tables which stored at each station of the network. Each routing table, at each of the stations, lists all available destinations, and the number of hops to each. Each route table entry is tagged with a sequence number which is originated by the destination station. To maintain the substance of routing tables in a dynamically varying topology, each station periodically transmits updates, and transmits updates directly when significant new information is available, since we do not pre-assume that the mobile hosts are maintaining any sort of time synchronization, we also make no assumption about the level relationship of the update periods between the mobile hosts. These packets indicate which stations are approachable from the number of hops needed to reach these accessible stations each station, as is often done in distance-vector routing algorithms.

DSDV is an enhancement to distance vector routing for ad-hoc networks. A tag is used by sequence number for each route. A route with higher sequence number is more favourable than a route with lower sequence number. However, if two routes have the same sequence number, the route with fewer hops is more favourable. In case of route failure, its hop number is set to infinity and its sequence number is increased to an odd number of where even numbers are reserved only to connected paths. [10].

6. AOMDV (AD-HOC ON DEMAND MULTIPATH DISTANCE VECTOR ROUTING ALGORITHM)

It is an extension to AODV and also provides two main services i.e. route discovery and maintenance. Unlike AODV, every RREP is being considered by the source node and thus multiple paths discovered in one route discovery. Being the hop-by-hop routing protocol, the intermediate node maintains multiple path entries in their respective routing table. As an optimization measure, by defamation the difference between primary and an alternate path is equal to 1 hop. The route entry table at each node also consist of a series of next hop forward with the analogous hop counts. Every node maintains an advertised hop count for the destination. Advertised hop count defined as the "Maximal hop count for entire paths". Route broadcasts of the destination are sent using this hop count. An alternate path to the destination is accepted by a node if the advertised hop count is more than the hop count for the destination. [11]

7. LITERATURE SURVEY

Researchers proposed variety of technology to reduce energy consumption in MANET. A number of techniques have been proposed on PEGASIS hierarchical routing protocols. A survey of these techniques is given in this section.

Mohsin Raza Jafri, et al. [5] recommended a multi-chain model of PEGASIS along with induction of sink mobility to maximize the network lifetime in this paper. Their considerations are supportive in diminishing the delay in data delivery and distances between the connected nodes through shorter chains. Sink mobility not only decreases load on the chain leaders in opening rounds, but also shorten the stress on unused nodes at the end of network lifetime. They also propose an algorithm for fixed path sink mobility in their design. Sink mobility has major gain on static sink in enhancing the network lifetime.

OuadoudiZytoune and DrissAboutajdine [6] presented a new algorithm for gathering the data in WSN based on chain forming using greedy algorithm. It targets on equally circulate the energy load over the whole network nodes. To advert fast node dying, the leader role is better distributed over nodes. It is based on their required energies to transmit to the sink. Thus, the unified network nodes would have the same lifetime and then as result, the network lifetime would be protracted. The proposed technique allows balancing the transmission energy correctly over the whole network nodes, which leads to network lifetime extension. The simulation results show the improvement provided by this technique compared to the well-known protocol for chaining in wireless sensor networks.

Samia A. Ali and Shreen k. Refaay [7] proposed an efficient routing protocol called CCBRP (Chain-Chain based routing protocol). It achieves both minimum energy consumption and minimum delay. The CCBRP protocol mainly divides a MANET into a number of chains using Greedy algorithm and runs in two steps. In the first step, sensor nodes in each chain transmit data to their chain leader nodes in parallel. In the second step, all chain leader nodes form a chain and randomly choose a leader node then all nodes send their data to this chosen leader node. This chosen leader node fuses the data and forwards it to Base Station (BS). Experimental results demonstrate that the energy consumption of the proposed CCBRP is almost as same as for PEGASIS and 60% less than LEACH and 10% less than CCM for WSN with hundred nodes distributed in 100m x 100m area. The delay of the proposed CCBRP is the same as of LEACH and CCM but 75% less than of PEGASIS.

TarunGulati et. al. [8] proposed this paper on node reliability in Wireless sensor network. Each sensor is defined with limited energy. Wireless sensor node utilized into the network to monitor the physical or environmental condition such as temperature, sound, vibration at distinct location. The protocol play significant roll, which decreases the delay while offering high energy efficiency and long span of network endurance. One of such protocol is PEGASIS, it is placed on the chain architecture, every chain have only one cluster head, this cluster head is in charge with every note's receiving and sending messages who reside to this chain, the cluster head depleted large energy and the times of every round growing. In PEGASIS, it takes the advantage of sending data to it the closet neighbor, it save the battery for WSN and growing the period of the network. The proposed work in this paper is about to select the next neighboring node reliably.

NishaSarwade et. al. [9] presented in this paper some of the major power-efficient hierarchical routing protocols for sensor network used. In a hierarchical structure, bigger energy nodes can be used to process and send the information while low energy nodes can be used to execute the sensing in the adjacency of the destination. This means that creation of clusters and assigning special tasks to cluster heads can greatly contribute to overall system scalability, period, and energy decisive. Hierarchical routing is an efficient way to lower energy consumption within a cluster and by performing data aggregation and fusion in order to decrease the number of transmitted messages to the BS. Hierarchical

routing is mostly two-layer routing, where the selection of cluster heads is done by one layer and the other layer is utilize for routing.

8. CONLUSION

COMPARISON OF ROUTING PROTOCOLS

Many different routing protocols have been proposed forMANET and WSN. These protocols can be based on different parameter like network structure, routing algorithm and protocol operation.

Comparison of routing protocols

Routing Protocol	Routing technique	Data Aggregation	Scalability	Query Based	Overhead	Power Usage	QOS
AODV	Reactive	No	High	Yes	Low	Low	High
DSDV	Proactive	No	Low	No	High	High	Low
AOMDV	Reactive	No	High	Yes	Low	Low	Moderate
PEGASIS	Hierarchical	No	Good	No	Low	Max	No

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