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A Literature Survey for Energy Consumption in Unipath and Multipath MANET Routing Protocols

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***Abstract*—**A Mobile Ad hoc Networks (MANET) is a system of wireless mobile nodes that can easily and dynamically organize itself in to arbitrary and temporary network topologies, that allow people and devices to communicate without any pre-existing communication architecture. One of the main issues in MANET routing protocols is development of energy efficient protocols due to limited bandwidth and battery life. There are various protocols developed and analyzed under Constant Bit Rate (CBR) traffic by many authors. In many papers energy consumption is compared using unipath routing protocols under CBR traffic model. This proposal is an attempt to find facts to establish a base for identification of factors for energy consumption in unipath and multipath MANET routing protocols mainly using AODV and AOMDV under VBR traffic.

***Keywords*—** MANET, CBR, AODV, AOMDV, VBR.

1. INTRODUCTION

A mobile ad hoc network (MANET) [1] is a collection of wireless mobile nodes dynamically forming a network Topology without the use of any existing network infrastructure or centralized administration. Such infrastructure less networks are usually needed in battlefields, disaster areas, and meetings, because of their capability of handling node failures and fast topology changes. One important aspect of ad-hoc networks is energy efficiency since only a simple battery provides nodes autonomy. Thus, minimizing energy consumption is a major challenge in these networks.

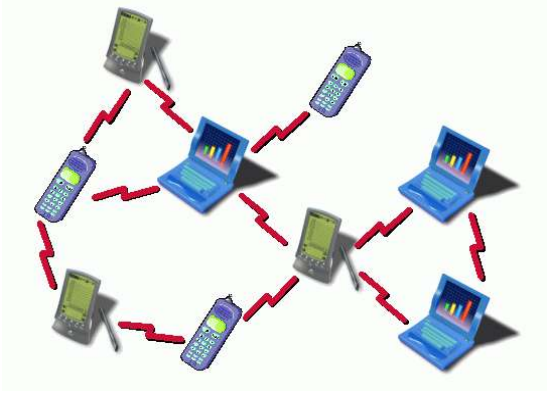

Figure 1: MANET Network

This paper is organized in five sections. Section 2 gives brief description of unipath and multipath routing protocols. Section 3 describes literature survey. Section 4 explains about traffic models and energy evaluation model. Section 5 describes our conclusion and future scope.

2. DESCRIPTION OF MANET ROUTING PROTOCOLS

Description of routing protocols AODV and AOMDV in brief are as follows:

2.1. AODV (Ad-hoc On demand Distance Vector)

AODV [2] is a unipath reactive protocol which basically performs Route Discovery by using control messages route request (RREQ) and route reply (RREP) whenever a node wants to send packets to destination. To control network wide broadcasts of RREQs, the source node uses an expanding ring search technique. The forward path sets up an intermediate node in its route table with a lifetime association RREP. When either destination or intermediate node using moves, a route error (RERR) is sent to the affected source node. When source node receives the (RERR), it can reinitiate route if the route is still needed. Neighborhood information is obtained from broadcast Hello packet. As AODV protocol is a flat routing protocol it does not need any central administrative system to handle the routing process.

AODV tends to reduce the control traffic messages overhead at the cost of increased latency in finding new routes. The AODV has great advantage in having less overhead over simple protocols which need to keep the entire route from the source host to the destination host in their messages. The RREQ and RREP messages, which are responsible for the route discovery, do not increase significantly the overhead from these control messages. AODV reacts relatively quickly to the topological changes in the network and updating only the hosts that may be affected by the change, using the RRER message.

The Hello messages, which are responsible for the route maintenance, are also limited so that they do not create unnecessary overhead in the network. The AODV protocol is a loop free and avoids the counting to infinity problem, which were typical to the classical distance vector routing protocols, by the usage of the sequence numbers [3].

2.2. AOMDV (Ad-hoc On demand Multipath Distance Vector)

The main idea in AOMDV [2] is to compute multiple paths (multipath) during route discovery. It consists of two components: A route update rule to establish and maintain node and a distributed protocol to find link-disjoint paths.

In AOMDV each RREQ, respectively RREP arriving at a node potentially defines an alternate path to the source or destination. Just accepting all such copies will lead to the formation of routing loops. In order to eliminate any possibility of loops, the "advertised hopcount" is introduced. The advertised hopcount of a node i for a destination d represents the maximum hopcount of the multiple paths for d available at i.

The protocol only accepts alternate routes with hopcount lower than the advertised hopcount, alternate routes with higher or the same hopcount are discarded. The advertised hopcount mechanism establishes multiple loop-free paths at every node. These paths still need to be disjoint. When a node S floods a RREQ packet in the network, each RREQ arriving at node I via a different neighbor of S, or S itself, defines a nodedisjoint path from I to S.

In AOMDV this is used at the intermediate nodes. Duplicate copies of a RREQ are not immediately discarded. Each packet is examined to see if it provides a node-disjoint path to the source. For node disjoint paths all RREQs need to arrive via different neighbors of the source. This is verified with the firsthop field in the RREQ packet and the firsthop list for the RREQ packets at the node. At the destination a slightly different approach is used, the paths determined there are linkd

is joint, not node-disjoint. In order to do this, the destination replies up to k copies of the RREQ, regardless of the first hops.

The RREQs only need to arrive via unique neighbors. The core of the AOMDV protocol lies in ensuring that multiple paths discovered are loop-free and disjoint, and in efficiently finding such paths using a flood-based route discovery. AOMDV route update rules, applied locally at each node, play a key role in maintaining loop-freedom and disjointness properties.

3. LITERATURE SURVEY

Many advanced Routing protocols for wireless sensor networks have been implemented for the effective routing of data. Energy awareness is an essential design issue and almost all of these routing protocols are considered as energy efficient and its ultimate objective is to maximize the whole network lifetime.

The design of energy-efficient routing algorithms is a fundamental problem in a mobile ad-hoc network (MANET) where battery energy is a limited resource. Cano and Manzoni [4] evaluate a power-conserving algorithm, based on the RTS/ CTS dialogue of the IEEE 802.11 standard which dynamically switches off the radio network interface card of nodes when they are neither transmitting nor receiving a packet. They evaluate the algorithm through simulations over four well-known routing algorithms: ad-hoc on demand distance vector (AODV), temporally-ordered routing algorithm (TORA), and destination-sequenced distance-vector routing (DSDV). The obtained results indicate that for all the evaluated routing protocols, the power savings are similar and range between 25 per cent and 60 per cent of the total energy.

Researches around wireless sensor network (WSN) were very prolific recently. However, traffic modeling related WSN research was poorly less. Wang and Zang [5] presented a paper, in which source traffic dynamics in a simulated target tracking WSN scenario are explored. They find the source traffic arrival process doesn't follow the usually considered Poisson model. Instead, an ON/OFF model is found to be capable of capturing the burst nature of source traffic arrival. Further, they measured ON/OFF periods follow the generalized Pareto distribution perfectly. All ON / OFF period distributions in the experiment exhibit short-tail property, this is a nice property that could be exploited by applications such as anomaly detection and node failure detection.

M. K. Jayakumar [6] measured the performance of the energy-aware QoS routing Protocol are analyzed in different performance metrics like average lifetime of a node, average delay per packet and network throughput. The parameters considered in this study are end-to-end delay, real time data generation/capture rates, packet drop probability and buffer size. The network throughput for realtime and non-realtime data was also has been analyzed. The simulation has been done in NS2 simulation environment and the simulation results were analyzed with respect to different metrics.

Multipath routing is a common variation of traditional routing protocols for effective balancing of load and to provide aggregated bandwidth and fault-tolerance. In a mobile ad hoc network, consumption of energy is a critical factor since wireless nodes are typically battery-limited. The use of multipath schemes could exploit multiple disjoint routes between any pair of nodes which could lead to variation in energy consumption behavior. In the investigation by Malini et. al. [7], a predefined MANET topology was created and the impact of traffic flow on energy consumption of AOMDV was analyzed in comparison with AODV. The performance metrics such as throughput, number of

packets lost and end-to-end delay was also measured.

Raghuvanshi and Patel [8] try to identify the type of control packets which consumes more energy with increasing number of nodes using AODV and DSDV protocols. They identified that AODV consume more energy than DSDV with increasing number of nodes, number of sources, average speed and pause time with both CBR and Exponential traffic. They also identified that increasing number of nodes also increases energy consumption due to routing control packets, so energy consumption can be reduced by reducing the number of routing control packets to increase the lifetime of network.
Kafhali And Haqiq [9] aims to see the impact of mobility and traffic model on the energy consume by the control packet deployed in the Ad-Hoc network so it is observered that AODV consume more energy compared to DSR and DSDV with CBR traffic While it consume less energy compared to DSR and DSDV with pareto and exponential traffics

4. TRAFFIC MODEL AND ENERGY

4.1. CBR Traffic Model

CBR generates traffic at a deterministic rate. It is not an ON/OFF traffic.

4.2. VBR Traffic Model

These are ON/OFF traffic with exponential distribution. It generates traffic during ON period (burst time) and OFF (idle time) times.

4.3. Energy Evaluation Model

Manzoni and Cano Energy model [4], considered parameters are 2400 MHz Wave Length of IEEE 802.11. The Radio Frequency (RF) value is set at 281.8 mW which is equivalent to a radio range of 250 m. Energy is converted in joules by multiplying power with time. The following equations are used to convert energy in joules:

Transmitted Energy: *Tx Energy = (Tx Power* Packet Size)/2×10*^{6}

Receiving Energy: *Rx Energy = (RxPower* PacketSize)/2×10*^{6}
Total energy consumed by each node is calculated as sum of transmitted and received energy for all control packets.

5. CONCLUSION AND FUTURE SCOPE

From the above study and literature survey, we obtained that energy consumption is an important issue in MANET. Most of the researchers studied about unipath routing protocols with CBR traffic.

In future we will try to evaluate and measure performance of unipath as well as multipath routing protocols under energy evaluation model.

We will also try to identify the packet types which consume more energy with increase in number of nodes.

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