MINIMIZATION OF ENERGY CONSUMPTION USING EPAR-DSR PROTOCOL IN MANET

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Abstract: *A mobile ad hoc network (MANET) is one containing of a set of mobile hosts which can control independently without infrastructure base stations. Power saving is a critical issue for MANET since most mobile hosts will be operated by battery powers. This metric has been used along with a simple power control protocol, which uses the maximum transmit power for the transmission of RTS and CTS and the minimum necessary transmit power for the transmission of DATA and ACK. In this paper, we address the power-saving issue for fully power-aware mobile hosts to achieve energy conservation on all these protocol layers. We propose a new EPAR-DSR protocol algorithm specially designed for MANETs.*

Keywords: MANET, AOTV, DSR, TORA, DSDV, EPAR-DSR PROTOCOL etc.

I. Introduction

Mobile Ad Hoc Network (MANET) is correspondence arrange in which all hubs are versatile and express with each other by means of remote associations. Hubs can join or leave the system whenever and they speak with each other which are instantly inside their radio range and correspondence past this range is built up by utilizing middle hubs to set up a way in a bounce by-jump way. There is no settled foundation. There is no requirement for any settled radio base stations, any wires or settled switches. All hubs are equivalent and there is no brought together control or outline that is it is self-sorting out and versatile. This implies a framed system can be de-shaped on-the-fly without requirement for any framework organization. There are no assigned switches: all hubs can fill in as switches for each other, and information bundles are sent from hub to hub in a multi-jump form. Because of nearness of versatility, steering data should change to reflect changes in connection availability.

A. Routing Mechanism

Directing is the way toward choosing ways in a system along which to send the critical information. Directing is a standout amongst the hugest difficulties in specially appointed systems as to create bolster for steering is basic for the fundamental system operation. A Routing Mechanism determines how switches speak with each other, spreading data that empowers convention to choose courses between any two hubs in the system, the decision of the course being finished by steering calculations. The versatility in portable specially appointed system that is hubs in an impromptu system are permitted to move in an uncontrolled way which brings about a very unique system with fast topological changes creating regular course disappointments.

- Optimum in terms of some criterion (e.g. minimum distance, maximum bandwidth, shortest delay)

- Satisfying some constraints (e.g. limited power of mobile nodes, limited capacity of wireless links)

Routing Mechanisms use several metrics to calculate the best path for routing the packets to its destination. These metrics are a standard measurement that could be number of hops, which is used by the routing algorithm to determine the optimal path for the packet to its destination. The different delivery semantics for the routing in MANET are as follows:

- Unicast: delivers a message to a single specific node within the transmission range

- Broadcast: delivers a message to all nodes in the network within the transmission range.

- Multicast: delivers a message to a group of nodes that have expressed interest in receiving the message within the transmission range

- Any cast: delivers a message to any one out of a group of nodes, typically the one nearest to the source within the transmission range

- Geo-cast: delivers a message to a geographic area within the transmission range.

B. Energy efficiency in MANET

Energy efficiency is a noteworthy issue of worry in remote a specially appointed systems as portable hubs depend on batteries, which are constrained wellsprings of vitality, and, in numerous situations, it is a significant lumbering errand to supplant or energize them. In spite of the advance made in battery innovation, the lifetime of battery controlled gadgets keeps on being key test and requires extra research on productive outline of stages, conventions, and frameworks. Hubs inside a specially appointed system for the most part depend on batteries (or thorough vitality sources) for power. Since these vitality sources have a restricted lifetime, control accessibility is a standout amongst the most critical limitations for the operation of the impromptu system. There are diverse wellsprings of energy utilization in a portable hub.

- Energy consumed while sending a packet
- Energy consumed while receiving a packet
- Energy consumed while in idle mode
- Energy consumed while in sleep mode which occurs when the wireless interface of the mobile node is turned off.

II. Problem statement

The problem of energy efficiency in MANETs can be addressed at different layers. In recent years, many researchers have focused on the optimization of energy consumption of mobile nodes, from different points of view. Some of the proposed solutions try to adjust the transmission power of wireless nodes, other proposals tend to efficiently manage a sleep state for the nodes (these solutions range from pure MAC-layer solutions (as the power management of 802.11) to solutions combining MAC and routing functionality). Finally, there are many proposals which try to define an energy efficient routing protocol, capable of routing data over the network and of saving the battery power of mobile nodes. Such proposals are often completely new, while others aim to add energy-aware functionalities to existing protocols (like AODV, DSR and OLSR). The aim of energy-aware routing protocols is to reduce energy consumption in transmission of packets between a source and a destination, to avoid routing of packets through nodes with low residual energy, to optimize flooding of routing information over the network and to avoid interference and medium collisions.

III. System model

We study EPAR-DSR for instance of the power mindful directing with BASIC-like power control, which chooses the base aggregate transmit control way. EPAR-DSR has 3 center calculations – which are catching, redirection, and course upkeep for versatility.

The catching calculation handles bundles that are gotten by the MAC effectively. At the point when a hub catches a parcel from its neighbor it makes a section in the catch table or revives the passage if the section for the neighbor as of now exists. The passage incorporates the base transmit control important to speak with the neighbor in view of the flag quality of the got bundle and the power level at which the parcel was sent. The data of the last is incorporated inside the parcel by the sender.

Utilizing the catching calculation, the redirection calculation can play out the course streamlining, which prompts discover ways that require less transmit energy to forward a parcel. Once a hub finds a way that devours less transmit vitality the hub turns into a redirector and transmits a divert message to the sender. The divert message incorporates another vitality productive way.

Since just a single middle of the road hub (redirector) can be included a way at any given moment EPAR-DSR streamlines highways slowly and carefully. In this way, the quantity of emphasess required to achieve an ideal course is the same as the quantity of redirectors incorporated into the course.

Dissimilar to a static system, the course support calculation is required for a system where hubs are versatile. In EPAR-DSR, source hubs transmit course upkeep parcels to goal hubs at whatever point there is no information bundle to send for a settled time interim, course timeout. From the course support parcels and information bundles hubs can keep up crisp courses.

C. Vitality Efficiency of EPAR-DSR

We initially demonstrate the execution of EPAR-DSR with a basic situation portrayed in Fig. 2. It is a straightforward chain topology, which comprises of 3 hubs. Hubs are appeared as a circle, and the bolt between two hubs shows an activity stream. For this particular topology, hub A will be a source that transmits parcels to hub C. The separation between adjoining hub sets is 50 m.

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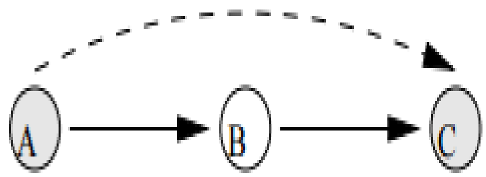

Figure 1: Node A can transmit packets to node C directly, or forward them through an intermediate node B.

In Fig. 1, node A can either send a packet directly to node C using the shortest path routing, or forward them through an intermediate node B using EP-DSR. The dashed line from A to C in Fig. 1 indicates the former case and two other flows, A-B and C-D, indicate the latter case. Fig. 3 shows simulation results of the proposed method. EP-DSR indicates power aware routing with BASIC-like power control. For simulation purpose, PCM (Power Control MAC) [5] is used for BASIC-like power control. In graphs, PCM indicates PCM with shortest path routing and IEEE 802.11 means the IEEE 802.11 MAC without power control using the shortest path routing. All schemes considered in this paper use the shortest path routing protocol except EP-DSR, which uses the power aware routing. Thus, when we say PCM or IEEE 802.11 it will mean the scheme with the shortest path routing.

IV. Proposed method

Power aware schemes plans settle on directing choices to advance execution of energy or vitality related assessment measurements. The course determinations are made exclusively with respect to execution prerequisite strategies, free of the fundamental specially appointed directing conventions conveyed. Along these lines, the power mindful directing plans are transferable from one hidden specially appointed steering convention to another, the watched relative benefits and downsides stay substantial. There are two directing targets for least aggregate transmission vitality and aggregate operational lifetime of the system that can be commonly conflicting.

1. Course revelation and Maintenance in effective power mind-ful DSR

The goal for the proposed DSR is to forward the bundle through those hubs which are having more elevated amount of vitality at a given time. The fundamental point of energy mindful EDSR is to limit the change in the rest of the energies of the considerable number of hubs and in this manner draw out the system lifetime. In the conventional DSR amid course Discovery prepare if any hub gets a Route Request (RREQ) which is not implied for it or if the hub is not the last goal then it keeps the bundle for a specific time interim and picks the way with the base number of bounces. Be that as it may, for proposed DSR, the way picked depends on vitality of hubs alongside way cost.. The thought behind this convention is to present the postponement powerfully for the control parcel like RREQ and RREP (Route answer) on the premise of remaining battery energy of the middle hubs. The more will be the remaining force the less will be the postponement. Following Fig. 2 represents the power-aware routing mechanism with the RREQ and RREP packets in the efficient EPAR protocol.

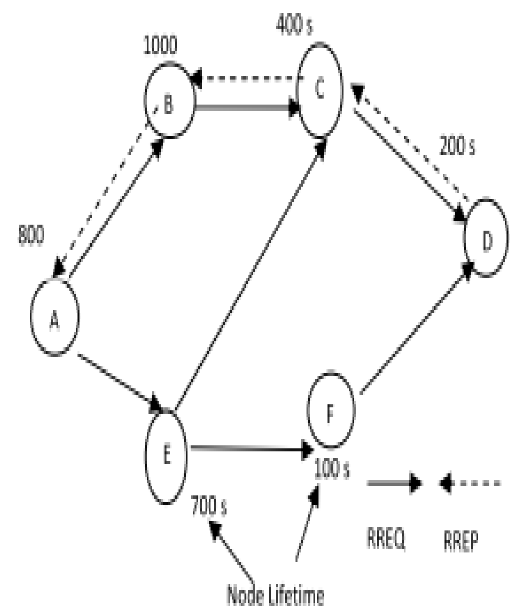

Figure 2: Route discovery and maintenance process in EPAR.

The RREQ broadcast is initiated by the number of sources. The intermediate nodes can reply to the RREQ packet from cache as in the DSR protocol. If there is no cache entry, receiving a new RREQ packet an intermediate node does the following: 1. Node starts the timer. 2. Keeps the path cost in the header as minimum cost. Then it adds its own cost to the path cost in the header and broadcast to the neighboring nodes. 3. On receiving duplicate RREQ packet, an intermediate node re-broadcasts it only if the timer for that RREQ packet has not expired but with the maximum energy level of nodes (i.e. node lifetime). 4. Destination also waits for a specific time after the first RREQ packet arrives. It then replies to the best path consisting of the timer value and maximum energy level, in that period and ignores others. 5. The destination node sends RREP packet along the path consisting of nodes having maximum energy. 6. Finally, the new path cost in the header is less than the minimum cost. The path cost is added to the RREP packet and is stored in cache by all nodes that hear the RREP packets.

V. RESULT and DISCUSSION

Simulation results of EPAR-DSR protocol along with DSR, AODV, and DSDV in MATLAB shows that, EPAR-DSR protocol establishes multiple alternative paths during the path establishment stage. The packet delivery ratio, Network lifetime and the throughput are measured. As nodes in the robust path bear implicit geographic information about the intended path, they could react quickly to the link failure through cooperation. Although EPAR-DSR protocol establishes multiple backup paths to enhance the robustness against path breakage; it is possible that all paths fail simultaneously. As time elapses, paths become invalid. Since all nodes are moving, it is very likely that some links on several discovered paths break shortly.

Table 1: Simulation parameter

Parameters	Value
No of nodes, n	100
N/w size X × Y	100 × 100
Receiver Energy, ERX	50nJ
Transmitter Energy, ETX	50nJ
Free space Energy Consumption, E_{fs}	.01nJ
Multipath Energy Consumption, E_{mp}	.0013pJ
Initial Energy, E_0	0.5J
Data Aggregation Energy, EDA	5nJ
Packet size	1400bits
Percentage of advanced nodes, m	0.1, 0.2& 0.3
Multiple of normal node energy, a	1, 2, 3

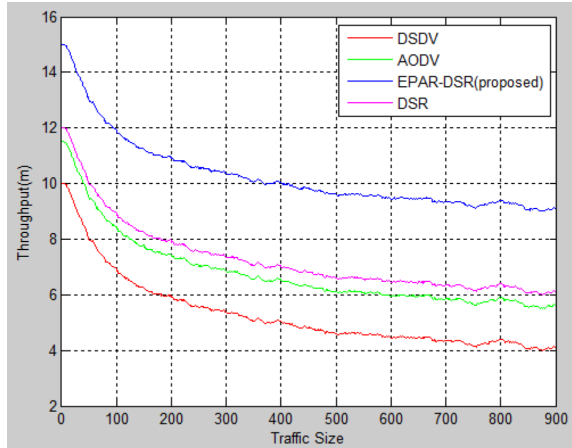

Figure 3: Throughput on No. Traffic size

Figure 3 shows the comparisons of throughput obtained using EPAR-DSR PROTOCOL along with DSR, AODV, and DSDV protocols. Results show that EPAR-DSR PROTOCOL Mobile as a trust protocol similar to DSR, AODV, and DSDV protocols. Throughput refers to the number of packets delivered to the base station by the sink node at any instance of time. When compared to the existing algorithm the throughput is high in the proposed algorithm. It traverses through the shortest path inside the sensing field and collects updated data on time and hence delivers more number of packets at any instance of time to the base station.

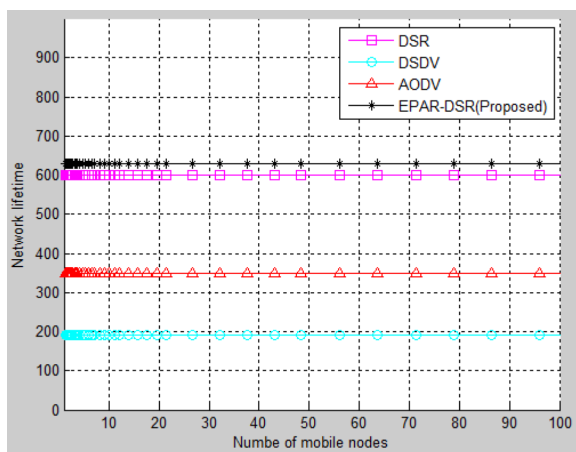

Figure 4: Network lifetime of various protocols on no. of mobile nodes

In the event that the battery power is high in all the energy hubs in the MANET, organize lifetime is expanded. So this considers hub vitality. Expanding the system lifetime of MANET is extremely basic in light of the fact that the vast majority of the gadgets in this system work with the assistance of battery power. On the off chance that the battery control goes down in any of the hubs in this system, the course settled by means of that hub gets influenced and prompts shameful transmission of information parcels. One noteworthy issue is that building up the course and keeping up the course is extremely troublesome in MANET. This issue emerges because of the regular development of hubs and depletion of hubs because of the low battery.

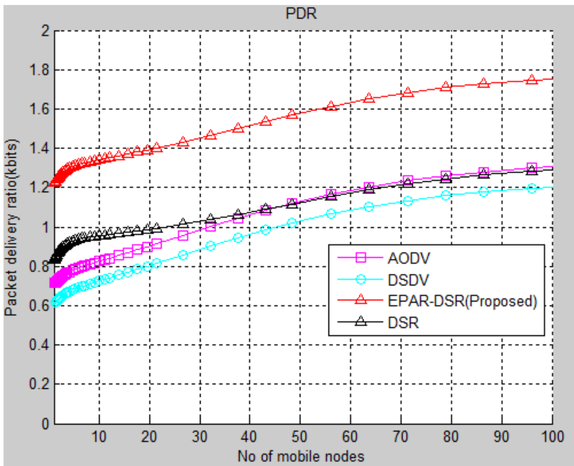

Figure 5: Packet Delivery Ratio on no. of mobile nodes

Figure 5 shows that the good degree of reliability while transmit as a multiple paths are kept in the routing protocol. The routing process in EPAR-DSR Mobile is similar to AODV, DSDV and DSR. It is clear from the figure above that packet delivery ratio of EPAR-DSR achieved more when compared to AODV, DSDV and DSR protocols.

VI. Conclusion

More applicable nodes in ad hoc networks lead to rapid battery discharge and network division; consequently, nodes and network lifetime will be reduced. In this article, an optimal routing algorithm of aware energy has been presented based on demand that causes to increase network lifetime by reducing energy consumption. Also, the proposed method causes distribution of traffic among nodes and divides energy consumption evenly among network nodes, and prevents from division of network into smaller regions. The results of simulation show that the proposed EP-DSR algorithm toward AODV algorithm reduces energy consumption significantly and also increases network lifetime. Considering aware energy strategy and also threshold value, this method reduces the waste time for information about route request packet and routing traffic. Also, due to considering multi-routes causes a balance in energy consumption of nodes; and rerouting is not required in case of route destruction, and data can be transmitted to destination from other routes. In fact, the fault-tolerant in the proposed method will significantly increase.

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