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`PERFORMANCE COMPARISON OF ENERGY EFFICIENT AODV PROTOCOLS

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Abstract:
A recent trend in ad hoc network routing is the reactive on-demand philosophy where routes are established only when required. Most of the protocols in this category, however, use single route and do not utilize multiple alternate paths. Routing in MANET is a critical task due to highly dynamic environment**.** Major hurdle in communication via Ad hoc networks is their power limitations. As most of them use battery power and also are moving so there is always a limitation of battery power. This research paper provides an overview of existing extensions of AODV protocol by presenting their characteristics, functionality, benefits and limitations and then makes their comparative analysis so to analyze their performance**.**

KEY WORDS: Ad Hoc networks, Alternate path, Routing Protocol, Power Consumption, Power Factor

1. Introduction:

A network is a series of nodes interconnected by communication paths and Wireless networking is an emerging technology that allows users to access information and services electronically, regardless of their geographic position.

There are two types of wireless networks: Infrastructure and Infrastructure less. In infrastructure network or in Ad Hoc Network, wireless devices can communicate with each other or can communicate with a wired network and wireless network [1] is a collection of mobile nodes which forms a temporary network without the aid of centralized administration or standard support devices regularly available in conventional networks. A mobile Ad hoc network (MANET) is an autonomous system of mobile hosts which are free to move around randomly and organize themselves arbitrarily. MANET is viewed as suitable systems which can support some specific applications as virtual classrooms, military communications, emergency search and rescue operations, data acquisition in hostile environments, communications set up in Exhibitions, conferences and meetings, in battle field among soldiers to coordinate defense or attack, at airport terminals for workers to share files etc. In Ad hoc networks nodes can change position quite frequently. The nodes in an ad hoc network can be Laptops, PDA (personal digital Assistant) or palm tops etc. These are often limited in resources such as CPU capacity, storage capacity, Battery Power, Bandwidth. Each node participating in the network acts both as a router and as a host and must therefore be willing to transfer packets to other nodes. For this purpose a routing protocol should try to minimize control traffic. There is limitation of Battery life and in an Ad hoc environment battery is most commonly used. The concept of Power as one of the deciding factor in route selection can be crucial in root discovery and root repair phase.

2.0 Routing Protocols:

Broadly, Routing protocols can be classified into two categories as (a) Table Driven Protocols and (b) On-Demand Protocols.

Table Driven Protocols are proactive in nature. Each node maintains one or more tables containing routing information to every other node in the network. In this, tables need to be

consistent and have to maintain up-to-date view of the network. Some of the existing table driven or proactive protocols are: DSDV [2], [3], DBF [4], GSR [5], WRP [6] and ZRP [7], [8].

On Demand Protocols are reactive in nature. Routes are created on demand basis that is when it is desired by source node. When there is a transmission between source to destination, a route is initiated by discovery process and Route is maintained until destination becomes unreachable, or source no longer is interested in destination. Some of the existing on demand routing protocols are: DSR [9], [10], AODV [2], [11] and TORA [12], [13].

Parameters	**Reactive**	**Proactive**
Availability of routing Information	Available as and when needed	Always available
Periodic updating of messages	Not required	Required
Coping with mobility	Use localized route discovery	Inform other nodes to achieve a consistent routing table
Delay	High as routes are calculated on demand basis.	Small as routes are predetermined

The emphasis in this research paper is concentrated on the survey and comparison of various extension of AODV.

3.0 Recent Studies:

In this section, recent developments related to energy on AODV protocol have been discussed. AODV [11] is an improvement on DSDV [2] which aims at reducing system wide broadcasts. In

this protocol routes are discovered on- demand basis and maintain these routes only when these are in use.

In [14], author proposes two energy efficient algorithms based on AODV as: AODVE and AODVM. In AODVE, to increase the lifetime routing is based on the minimum remaining energy metric and that route is selected in which there is a maximum of minimum remaining energy (MIN_RE) and this field is added in RREQ as well as in the RREP. Others parameters are same as in AODV. Similar to AODVE, the latter AODVM also considers the residual energy but it also consider the hop count value. It increases the lifetime of a network by arranging almost all nodes to involve in data transfer. It also shows improvement in delay and energy consumption of node.

In [15] New-AODV protocol has been proposed. The energy state of each node as well as of the entire network has been considered. New field is added to the RREQ message which carries the collected remaining energy of nodes participating between source and the destination. In this, Destination node does not give an immediate reply to the request but waits for some time and in the mean time, calculate the mean energy of the network and is stored in each node. In case of a new route, this Mean energy is then compared with the energy remaining in the node and if it is less, then RREQ message is delayed by some time and by this the entire lifetime is extended.

In [16] Energy aware protocol has been Proposed in which routing is done in the similar to ADOV but link breakage is detected by signal-to-interference ratio (SIR).Cross layer interaction is also used by which physical layer can give information about link state to the network layer. Directional antennas are also used in EA-AODV to improve the communication Range and hence reducing interference.

While [17] proposes an algorithm which selects the nodes on the basis of their energy status, which help in discovering alternate paths and to solve the problem of asymmetric links. In this, neighboring nodes (Backbone nodes) of active route having energy above than some threshold value are selected for route establishment between source and destination.

Some modifications [18] has been done to improve the performance of AODV. It controls the transmission power consumption of nodes by listening to only their messages, this is done by

adding two fields to RREQ and RREP packets. It also increases the lifetime of a network by judging about the duplicity of broadcast.

4. Protocols Comparison chart:

Same metrics have been used to calculate the performance evaluation of all AODV extended protocols. Based on this a table has been presented here.

Name	Delay n Overhead	Maintaince	Periodic message	Denser Medium	Summary
AODVM[14]	Average delay more than AODV And consume more energy than AODV. Causes overhead But increases the network lifetime	No EA Route maintaince	Hello message are used.	Perform better in less denser medium	Consider Residual energy of nodes n hop count
NEW-AODV[15]	Delay are more than AODV	No EA in Route maintaince	Hello message are used.	Perform better in denser medium	Consider energy state of each node and of entire network.
EA-AODV[16]	Overhead increases. And latency is also increased	EA-Route maintaince	Hello message has been removed.	Perform better in less denser medium	Directional antennas are used by Physical layer for routing. Consider SIR ratio for link quality

EA-AODV[17]	Delay in the starting.	EA-Route maintaince	Hello message are used.	Perform better in denser medium	Consider energy only n suggests alternate paths
Improved AODV[18]	Only for low mobile network	No EA in Route maintaince	Hello message are used.	Performance is poor in denser medium	Passive rote refreshment of RREQ is used to increase lifetime n controlled the transmission power.

The critical analysis of all schemes reveal that the major emphasis has been to increase the life time of the network. A new scheme has been proposed here to make AODV energy efficient keeping in mind all the other schemes.

5.0 Proposed Protocol:

Each route table of a node has an entry for its power status (which is measured in terms of Critical, Danger and Active state). Whenever need for a new route arises, active nodes status is checked and a route is established

Assumptions

Battery status is further divided into 3 categories:

1) If (Battery Status < 20%) It is called Danger state.

2) If (20% > Battery Status < 50%) it is Critical State

3) If (Battery Status > 50%) It is Active mode

Step1: Those nodes who are not participating in route, goes to sleep mode from the start.

Step 2: Source node S broadcasts an active request to the destination D. [This request is same as RREQ, as used in AODV]

Step 3: Check Reply phase and set active path [only nodes with status greater than Critical level are selected.]

Step 4: In case of link failure,

Check Backbone nodes (one hop) for the link failure path.

This is carried out using Local repair scheme.
In the route table, Energy factor is added.

Efforts are on to simulate the proposed scheme and compare with other studied schemes.

Conclusion:

A new model has been proposed which takes care of energy features. The new scheme will be incorporated on AODV and the results will be compared with existing AODV extensions with embedded energy module. The results are expected to be better than the other ones. The graphical notation will be used for representation. The metrics used will be Packet delivery ratio, the end to end delay and throughput.

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