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CROSS LAYER OPTIMIZATION BASED ON ENERGY AWARE ROUTING PROTOCOL FOR MANET

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Abstract: Mobile ad hoc network is a network in which nodes are connected with each other with wireless link. They made logical connection whenever the nodes want to communicate each other. As the mobility increase in the ad hoc network the topology changes frequently and network overhead increased. Which results into the Dropping of Packets or may cause the network failure? This survey paper present the different approaches of routing protocol that provide the stable path from source to destination with consume less energy and maximize the network life time.
Keyword: Threshold, maximize the network lifetime, stable path, energy saving, RSSI, Battery Capacity.

I. INTRODUCTION

A Mobile Ad Hoc Network is called a MANET; it is a dynamic arrangement of mobile nodes to create a wireless network. in MANET each node act as host and router and forward the packet to the node which is in the range. MANET is the decentralized type of the network. A MANET provides a way to build a decentralized network in an area where there is no existing infrastructure or where temporary connectivity needs to be implemented, for example emergency situations, disaster relief, and military purpose.

A Mobile Ad-Hoc Network (MANET) is a group of mobile nodes interconnected in such a way that they have the capability of changing their interconnections with each other dynamically. Mobile Ad-Hoc networks are self-organizing networks which are growing rapidly.

Mobile Ad-hoc Networks (MANETs) are self-configuring and self-healing wireless networks, where the mobile nodes communicate without the existence of infrastructure or centralized station [9]. Such networks are suitable for scenarios requiring rapid deployment such as battlefield, conference and disaster recovery. Each wireless node can directly communicate with all the nodes located within its transmission range. When the destination is beyond the source node coverage, multi-hop communication takes place to successfully relay the data traffic through a set of intermediate nodes that act as routers. Numerous protocols have been developed to enhance the routing efficiency in MANETs.

II. RELATED WORK

It is important to consider energy limitations while designing any mechanism for Wireless network. Majority of current energy-aware routing protocols determine efficient use of energy. Such mechanisms may increase the life time of Wireless network. Routing packets from source to destination is one of the important operations in Wireless network. Many Routing protocols have been proposed in the literature [1–12]. Most of these protocols are either application specific or used for providing path from source to destination that consumes less energy. Research community is paying special attention to propose various routing protocol that provide the stable path from source to destination that consume less energy. Energy plays a vital role in communication in wireless network. The proposed work is aimed at developing energy Efficient AODV routing protocol that provides stable path from source to destination and consume less energy. The routing protocol proposed [10] is based on the battery capacity of neighboring node when sender send the RREQ to neighboring node it sends RREP with the value of the Battery capacity of the node based on the route to destination is selected. The proposed algorithm is based on the values of the RSSI and battery capacity of the neighboring node which reply to the sender node when Sender Sends the RREQ packet to the neighboring node.

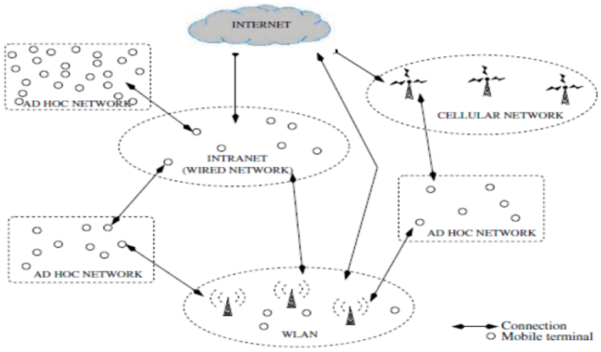

Fig. 1: Architecture of MANET [8]

III. AODV Algorithm for MANET

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 unicast and multicast routing. It is an on demand algorithm, meaning that it builds routes between nodes only as desired by source nodes. It maintains these routes as long as they are needed by the sources. AODV builds routes using a route request / route reply query cycle. When a source node desires a route to a destination for which it does not already have a route, it broadcasts a route request (RREQ) packet across the network [13]. Nodes receiving this packet update their information for the source node and set up backwards pointers to the source node in the route tables [10]. In addition to the source node's IP address, current sequence number, and broadcast ID, the RREQ also contains the most recent sequence number for the destination of which the source node is aware. A node receiving the RREQ may send a route reply (RREP) if it is either the destination or if it has a route to the destination with corresponding sequence number greater than or equal to that contained in the RREQ. As the RREP propagates back to the source, nodes set up forward pointers to the destination. Once the source node receives the RREP, it may begin to forward data packets to the destination. If the source later receives a RREP containing a greater sequence number or contains the same sequence number with a smaller hop count, it may update its routing information for that destination and begin using the better route. As long as the route remains active, it will continue to be maintained. If the data packet is travelling from source to destination periodically then that route considered as active route [10]. Once the source stops sending data packets, the links will time out and eventually be deleted from the intermediate node routing tables. If a link break occurs while the route is active, the node upstream of the break propagates a route error (RERR) message to the source node to inform it of the now unreachable destination(s). After receiving the RERR, if the source node still desires the route, it can reinitiate route discovery from source to destination. One disadvantage of this protocol is that intermediate nodes can lead to inconsistent routes if the source sequence number is very old and the intermediate nodes have a higher but not the latest destination sequence number, thereby having stale entries. Also, multiple Route Reply packets in response to a single Route Request packet can lead to heavy control overhead. Another disadvantage of AODV is unnecessary bandwidth consumption due to periodic beaconing. To Overcome this problem of the unnecessary route discovery to intermediate route we design the optimized AODV algorithm that discover the route based on the THESHOLD value(base on RSSI,Battery capacity) ,so the discovery of the unnecessary route is limited and performance of the network is increased.

IV. OPTIMIZED AODV ALGORITHM FOR MANET

The working of the proposed AODV algorithm for MANET is described below.

Step 1: sender broadcast the RREQ message for made logical connection to its neighboring node.

(a) When the RREQ request coming from sender the neighboring node find out the RSSI (received signal strength indicator) value.

(b) Then the neighboring node finds out the battery capacity of the node.

(c) After finding the battery capacity of node the neighboring node find out the SINR (Signal to noise ratio) for the node.

Step 2: Set the Intensity level

Intensity= {RSSI, Battery capacity, SINR)

Step 3: Set the threshold value.

Threshold = {assuming the value}

Step 4: after assuming threshold value check following condition

If (threshold < our assuming value)

Discard the route request

Else

Compare the Threshold value (select Minimum)

Step 5: After selecting the threshold values select the maximum among them

Select from threshold min = {select Maximum value}

Step 6: The route has been discovered from source to destination.

In our proposed protocol, when sender send the route request to its neighboring nodes the neighboring nodes sends route reply which include the RSSI value, battery capacity and SINR value. After that these value are compare to the threshold value if the values (RSSI, SINR, BATTERY CAPICITY) >= threshold then route discover is done on that route. Figure shows the working of the proposed algorithm as follow.

V. CROSS LAYER OPTIMIZATION

Cross-layer optimization is an effective mechanism to improve wireless network performance and efficiency 5][6][7]. It can be applied effectively to different wireless technologies to handle different problems while still conforming to the wireless standards. In our approach the cross layer optimization mechanism is used to fetch the values of parameter such as RSSI, BATTERY CAPICITY value.

A. Received signal strength indicator

This is the indicator of signal strength received by the node.

Received signal strength indicator (RSSI) is a measurement of the power present in a received radio signal

$$\text{friis}(d) = P_r(d) = P_t \frac{G_t G_r \lambda^2}{(4\pi)^2 d^2}$$

Where d is the transmitter-receiver distance, Pr is the signal strength at the receiver antenna, Pt is the signal strength at the transmitter antenna, Gt is the antenna gain of the transmitter antenna, Gr is the antenna gain of the receiver antenna and λ is the wavelength of the radio RSSI value is defined at Mac layer so I fetch RSSI value from wireless-phy.cc file by using sendup() function which send RSSI value to upper layer i.e. network layer.

B. Battery capacity

Battery capacity determines the energy level of the node. it is a measure typically in Amp-hr. The remaining battery is the ratio of remaining energy of nodes in the wireless network.

Energy = inode-> energy model->energy ();

Where inode is a pointer of mobile class, Energy model is class, Energy is function call by energy model. It fetches energy value utilized during in transmission mode, energy consumption in RECV mode, energy consumption in IDLE mode from energymodel.cc file.

VI. RESULTS

It evaluated the performance of our scheme by NS2 simulation. Network Simulator with 2.34 versions is used on fedora 17 operating system for the simulations. In our simulations, the transmission range is set to 250 m. The evaluations are conducted with a total of 100 nodes that are randomly distributed in an area of 500m x 500m. it use Random Waypoint to model node mobility. In each test, the simulation lasts for 200 seconds while the minimum speed of 5 and maximum speed of 20 m/s were chosen. The size of each Constant Bit Rate (CBR) packet is 512 byte. Simulation of optimized AODV algorithm is done using NS2. In this section, simulation results and compare optimized AODV with AODV is presented. In figure shows the end to end delay for AODV and optimized AODV algorithm. Graph shows that performance of optimized AODV is better than AODV.

A. End to end delay versus number of nodes

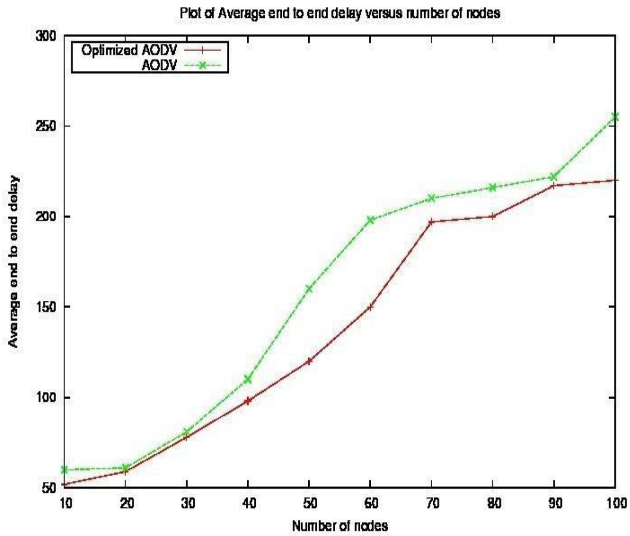

Fig. 2: End to End delay

The above figure shows the end to end delay for the nodes in the network. The figure shows that the end to end delay for the conventional AODV algorithm (green line) is more then optimized AODV algorithm (red line). The average delay for conventional AODV algorithm is 252 ms (100 nodes) and average delay for optimized AODV algorithm is 220 (100 nodes) compare to the conventional AODV with our Optimized AODV algorithm decreases the average delay in the network.

B. Remaining energy versus number of nodes

The below figure shows the remaining energy of the nodes in the network. The remaining energy for the normal AODV algorithm is less then the optimized energy. The remaining energy for the AODV is 71 % and remaining energy for optimized AODV is 82 % which shows that the energy consumption in optimized AODV is less than the conventional AODV. The saving in battery capacity will overall, increases the performance of the network by consuming the less battery during the route discovery from source to destination.

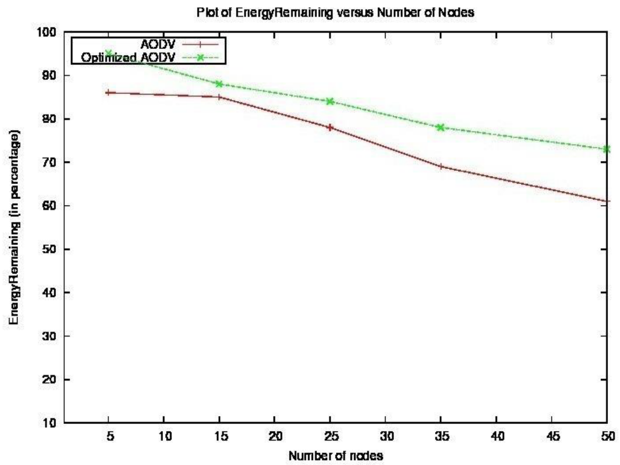

Fig. 3: Remaining Battery Capacity

C. Throughput

The figure 4 shows the throughput versus number of nodes. The throughput of the conviencenal AODV algorithm is 72 % and optimized AODV algorithm is 78 %. Which shows that he proposed algorithm is perform better then the conviencenal algorithm. The simulation results shows that the proposed algorithm perform better then the conviencenal algorithm which gives high throughput , end to end delay is decreased , the remaining battery capacity is increased as compare to the conviencenal algorithm which result in to the stable path from source to destination which consume less energy that overall increases the performance of the network.

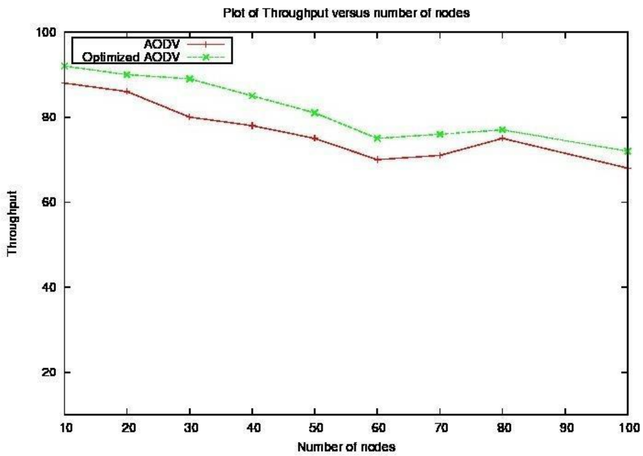

Fig. 4: Throughput

VII. CONCLUSION

We will apply our proposed scheme to AODV that works on a reactive approach and make use of stable paths by satisfying a set of signal strength and energy level and SINR based on threshold area. So we can achieve the following:

- Providing Stable path fro source to destination.
- Improvement in the lifetime of entire network.
- Minimizing the energy consumption.

In further, some new parameters such as SINR and Error correction can be added into computation of nodes so as to give even better performance.

REFERRNCES

[1] Antonio Junior, Rute Sofia, António Costa : Energy-efficient Routing 2011
[2] BOUDHIR Anouar and BOUHORMA Mohamed: ―New Routing Protocol―Dicho-AODV‖ for Energy Optimization in MANETS.2012
[3] JT.Poongkuzhali, V.Bharathi, P.Vijayakumar: An Optimized Power Reactive Routing based on AODV Protocol for Mobile Ad-hoc Network 2011
[4] Kemal Akkaya and Mohamed Younis: ―An Energy-Aware QoS Routing Protocol for Wireless Sensor Networks‖ 2008
[5] Shi Yuhe and Xu Jie : A New Cross-Layer Interface for MANET
[6] Yuecheng Zhang1 and Liang Cheng : Cross-Layer Optimization for Sensor Networks 2009
[7] Jimmy Jessen Nielsen†, Jesper Grønbæk†, Thibault Renier†, Hans-Peter Schwefel†‡, Thomas Toftegaard_ : Cross-Layer Optimization of Multipoint Message Broadcast in MANETs 2009
[8] Zhiyuan LIU 1,2, Shejie LU 1, Jun YAN : Secure Routing Protocol based Trust for Ad Hoc Networks 2007
[9] T.C. Huang, S.C. Chen and L. Tang, ―Energy-Aware Gossip Routing for Mobile Ad Hoc Networks‖, IEEE International Conference on High Performance Computing and Communications,2011.
[10] Soian Hamad, Hadi Noureddine and Hamed Al-Raweshidy, "EnergyLSEA: Link Stability and Energy Aware for Efficient Routing in Mobile Ad Hoc Network 2011 43
[11] Tathagata Das, Sarbani Roy, Nandini Mukherjee: Capability Aware AODV Algorithm in ns-2 Environment 2011
[12] Arun Avudainayagam, Wenjing Lou, and Fang: DEAR: A Device and Energy Aware Routing protocol for heterogeneous ad hoc networks 2009.
[13] F.D. Rango, ―Link-Stability and Energy Aware Routing Protocol in Distributed Wireless Networks‖,IEEE Transactions on Parallel and Distributed Systems, Vol. 23, no. 4, April 2012
[14] The Network Simulator –ns Available: http://www.isi.edu/nsnam/ns/
[15] http://www.tcl.tk/software/tcltk/
[16] http://www.isi.edu/nsnam/
[17] http://www.isi.edu/nsnam/ns/tutorial/index.html
[18] http://en.wikipedia.org/wiki/MANET

