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Energy-Efficient Routing Design for Ad Hoc Networks Using Cross-Layer

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Abstract- *Of late, there has been a barrage of cross layer design implementation for wireless adhoc network. A number of researchers have examined at specific exposure of network performance and reaching towards cross layer design via their clarification of what it implies. These proposals involve different layers of protocol stack.in this article, we accomplish by presenting a survey of literature in the domain of cross –layer design. We focused our attention on the reduction of energy consumption by making use of the benefits from cross layer. Energy efficiency is vital in MANET. We will propose energy efficient algorithm called AODV, which gives efficient energy in ad hoc network. This section covers processes that are used to evaluate the energy ingested by computing resources as well as available technology to develop their energy efficiency. Besides, we will discuss about the standard protocols and also see how these are revised to make these protocols energy efficient and what the shortcomings that have been resolved.*

Keywords: *Mobile ad hoc network (MANET), energy consumption, adhoc on demand distance vector, cross layer design, routing protocol, quality of service (QOS).*

I. INTRODUCTION

International Standard Organization developed an architecture which would serve as a framework. The OSI layer consist of seven layers which are Physical layer, Data link layer, Network layer, Transport layer, Session layer, Presentation layer, Application layer. These layers have to communicate with the later above it and the layer below it. The functions of these layers are:

Physical Layer: The physical layer focus on transmission media and physical devices. In addition, coding and change plots similarly the effect of adaptability constitute key setup variables of the physical layer.

Data Link Layer: This layer is in charge of blunder recovery, retransmission and the line administration function.it has two sub layers 1) Media Access Control (MAC), 2) Logical Link Control (LLC)

Network Layer: The network layer is for neighbor discovery, routing and asset allotment functions. Routing is the fundamental capacity of the system layer. Numerous directing conventions have been proposed taking into account the IP convention for fulfilling the prerequisites of the remote specially appointed system

Transport Layer: The transport layer is in charge of mistake recovery, flow control, congestion control and for end-to-end association setup. It additionally go to by observing the end-to-end information transmission and in maintaining a strategic distance from the system blockage.

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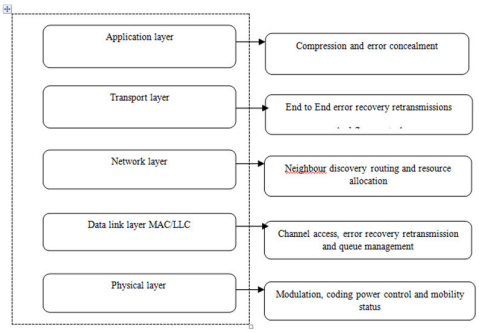
Application Layer: The application layer is in charge of constituting the interface. Depending upon the necessities of the end user, it separates the client administration, for example, for instance, real time and non continuous service, Constant bit rate and Variable piece rate and so forth.



MANET is systems without having an altered base or concentrated administrator. Which comprises of gathering of remote portable hubs that can switch information. Such systems have various forthcoming executions, counting defence, disaster mitigation, health care and business. The term MANET remains for Mobile Adhoc system that permits the cell phones to design the fleeting group with no arranging or human involvement. It is portrayed by quick changing topology, confined battery control and compelled resources. MANET empowers simple game plan as they don't require any base like base station. MANET is a shared system which allows live correspondence between any two hubs just if both the hubs are availanle inside of their radio range. A MANET is not a brought together framework which comprise of free nodes. Sometimes it is called as versatile cross section system.

Energy consumption has always been a key design agent in certain systems such as sensor networks, battery- constrained devices and so on. Through the years it has also become a major responsibility in other systems including super computers and data centers where research and development had been mainly driven by execution. The energy that a system consumes consists, in general two parts:

- A static part that is based on system size and component type; this consumption is exposed by leakage currents available in any powered system.
- A dynamic part that results from the habit of computing, storage and network resources; caused by system activity and modifications in clock rates.

Improving the energy efficiency by minimizing the static part and providing more performance proportional to the dynamic consumption has become a very active in research and development area. Few reasons for the requirement of energy management in MANETs are:

- The Ad hoc networks have been improved to stipulate communication for an environment. In these network, fixed infrastructure cant be deployed. Moreover the mobile nodes in adhoc networks have very restricted energy resources as they are battery powered.
- It is almost impossible to restore the battery or recharge it

The characteristics of adhoc network imposes a numerous problems which constitute challenges for the protocol design. Cross layer design is used for improving the normalized energy consumption and end-to-end throughput.

II. Review of Literature

In this we will discuss about the various types of the protocol and their works .In this we will study about the research work of different authors, how they make use of the protocol to answer the problems and what are their future works. Still now there are so many contributions which try to improve energy efficient network planning and routing in adhoc networks.

Classification of Protocols

MANET can be classified into three major categories such as Reactive protocol, Proactive protocol and Hybrid protocol.

Reactive Protocol

Reactive protocol is also known as on-Demand routing protocol. This protocol depends upon some sort of Query –reply dialogue. This is better than proactive protocol. Most of the time, everyone can go for reactive protocol because, it is a on-demand routing protocol. For Example (AODV, DSR, DYMO etc….)

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Proactive Protocol

In the proactive protocol, all the mobile nodes keep ups the information about the neighbour node. This nodes send the packet of the data from one node to another node after mutual understanding. Therefore, the entire mobile nodes constantly update their positions. For Example (DSDV, OLSR)

Hybrid Protocol

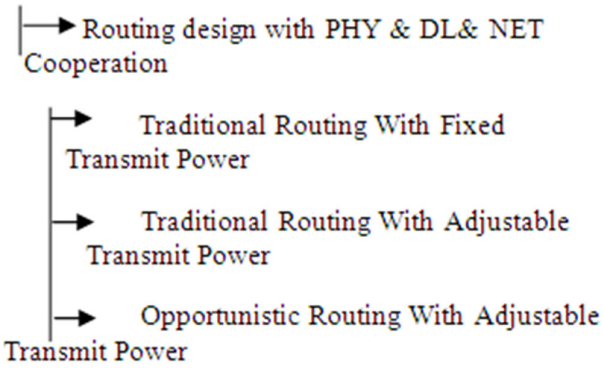
Hybrid protocol depends upon Distance Vector Routing Protocol but contains many features and advantages of Linkstate Protocol. For Example (ZRP)

a. Review of Cross- Layer Aided Routing Protocols

This formal exposition is mainly devoted to cross-layer operation aided routing design in ad hoc networks, hence we list the major part to the literature of cross-layer aided routing protocols considered for adhoc networks in Table I.

Likewise, this cross layer aided routing protocols may be divided into several categories based on their different application requirements. They might be fashioned for minimizing the energy consumption [1],[2],[3], the end-to-end delay[4],for developing the network's throughput[5],[6],for outstanding ductile tradeoff between any two of them[7] ,and even for multiple-constrait optimization .

Cross-layer aided routing design



b. Review of Energy- Efficient Routing Protocols

As mentioned above, cross -layer design may be practiced depends upon diverse application requirements. This paper concentrates on cross-layer design techniques developed for reducing the energy consumption. Since energy saving in wireless ad hoc networks is of prominent importance in the interest of mitigating the problem of restricted battery supply at each node .In ad hoc networks, the nodes actively and voluntarily involve in developing a network and act as relays for other nodes. As the result of this node mobility, the Channel State Information (CSI) changes and hence a significant amount of control messages have to be exchanged across the network to keep up dependable communications between certain pair of nodes, which potentially enforces a high energy consumption. Therefore, reducing the energy consumption is an important one.

Many power aware routing protocols were suggested in [5], for developing energy efficiency fron a multi-user networking view. A consolidated review of energy efficient single layer routing design in Table II.

Moreover, cross layer minimized power control has been widely employed [8]-[13] for maintaining required the required target-unity at a low power in realistic extension environments. A physical-layer-oriented routing protocol subsidize by distributed power control was proposed in [8] and shadow faded scenario, where the approximated BER of a multi-hop path was utilized as the route selection metric.

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Table – I Major contributions of cross layer aided routing protocals in - Ad Hoc Network

Year	Authors	Contribution
2005	Lee et al.[1]	Combined power-aware routing with MAC layer algoritham for minimizing the total consumed power
2009	Li et al.[2]	Proposed a combined multi-rate power controlled MAC Protoacol and routing, protocol relying on effective transport capacity as the routing merit
2011	Tavi and heinzelman [3]	Presented real time multi casting based routing
2009	Abdrabou And Zhuang[[4]	Proposed a routing scheme based on a geographical on-demand routing protocol , which is capable of guaranteeing a certain maximum end-to-end delay
2006	Johansson and Xiao [5]	Jointly optimized the end-to-end communication rates, routing, Power allocation and transmission scheduling of a network
2010	Ding et l.[6]	Proposed a routing and dynamic spectrum-allocation (ROSA) Algorithm Aiming for maximizing the networks throughput by performing joint routing, dynamic spectrum allocation , scheduling and transmit power control
2013	Uddin et al.[7]	Studied cross layer design in random access-based fixed wireless multihop networks under a physical interference

Table – II Major contribution of single layer energy-efficient routing protocal in Ad HOC Network

Year	Author	Contribution
2008	G.Ferrai, S.A Malvassori and O.K Tonguz [8]	On physical layeroriented routing with power controlle in As-hoc Wireless networks
2008	J.C.Fricke ,M.M.Butt and P.A. Hoeher [9]	Quality – oriented adaptive forwarding for wireless relaying
2005	M.Haenggi and D.puccinelli[10]	Routing in Ad-hoc networks: A case for long hops
2006	M.Sikora,J.N.Laneman, M.Haenggi, D.J.costella and T.E.Fuja [11]	Bandwidth and power efficient routing in linear wireless networks
2009	C.Bae and W.E.Sterk[12]	End-to-end energy and bandwidth trade off in multi hop wirleless networks
2014	J.Niu,L.Cheng, Y.Gu,L.Shu and S.K.Das	R3E:reliable reactive routing enhancement for wirless sensor networks

III. Proposed Methodology

Energy efficient wireless network design has pull in general research attention. For achieving the low Bit Error Ratio (BER) at near-capacity SNR values Diverse error-resilient Forward Error Correction schemes were suggested.

The development of cross-layer assisted routing protocol designs was depicted. Our attention on the decrease of the energy consumption by tapping the benefits from the coordination between the data link layer and the network layer. The basic essence of cross-layer design involves crossing the clearly characterized boundaries of a well defined architecture. Sharing of cross layer information is a sensitive issue. The options become endless when the layer boundary is crossed.

Another vital aspect of any cross layer design is its compatability with the inherited designs. Achievement of performance gain is playing a primary role if the design cannot practically exist and approximation of a signaling delays results in the possible handoffs to each of the stations is calculated beforehand.

So far we have discussed about cross layer design that utilize information from some other layers. This type of approach is suitable to application areas which have a peculiar usage. For instance, [14] L. Song and D. Hatzinakos proposes such a cross layer design for target tracking in wireless network, which surely serves a very specific purpose. Another example of this category is[15] B. Raman, P. Bhagawat and S. Seshan were compared the performances of different possible cross layer approaches and demonstrate that the best performance is achieved by merging of all the layers into a single one.

Proactive protocols have the advantage of having an available route always ready to the destination. But the cost of consuming is a big part of the bamnd width resources. Many of them may not be used. Thus the suitable routing protocol for MANET must indicate a reasonable overhead in accordance save the limited bandwidth. The complexity of message should be very low. On the other hand the

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reactive protocol reduces the overhead traffic by developing a route only when it is required. When a route is no longer in a reactive protocols, it is scratched from the routing table. For these reasons reactive protocols are of more importance in the MANET community.

AODV uses an on demand approach for finding routes. As a result a route is originated only when it is required by a source node for transmitting packets. It uses destination sequence numbers to find the recent paths.

IV. Conclusion

The best way to deal with spare vitality in remote systems is cross layering. Efficiency in vitality can be enhanced at different layers. The information of Physical MAC and Network layer ought to be imparted to each other. This traditional layered methodology has different downsides in framework design. In this rundown it might be presumed that this dynamic plan gives a decent execution when a portion of the source hubs participate by sending parcels when these sorts of source hubs are very much dispersed in the network. A set number of retransmission has an effect to the end-to-end throughput.

After analyze minutely the studies and models for assessing vitality utilization of these assets we displayed a grouping of existing arrangements and exploration work. Hence our proposition save vitality and it likewise concentrate on the throughput and delay. In future we expect to affirm reality of proposed arrangement handle tentatively.

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