Improving Wireless Ad Hoc Routing Protocol Performance using RMECR Algorithm

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Abstract— The ad hoc network is infrastructure less and it provides self-organization and maintenance as well as shared radio channel and distributed routing. The requirements of ad hoc networks are energy efficiency, reliability and prolonging network life time. These requirements can be fulfilled using two algorithms named RMECR and RMER. RMER is one of the energy efficient routing algorithms which find the routes to minimizing the overall energy needed for end-to-end packet reversal. RMECR provides the energy consumption and therefore the remaining battery energy of nodes yet as quality of links to realize efficient energy and reliable routes that results in increase the operational life time of the network. RMER and RMECR are proposed for network to ensure reliability either by hop- by-hop or end-to-end retransmission. Trust management algorithm is introduced here for security and trust concept and it also decreases the delay in hop-by-hop transmission. In real time application, the packets are transmitted with low energy consumption that leads to scale back the delay within the transmission process.

Key words: wireless ad hoc network, end-to-end and hop-by-hop retransmission, battery aware routing

I. INTRODUCTION

The principle behind ad hoc networking is multi-hop relaying in which messages are sent from the source to the destination by relaying through the intermediate hops (nodes).In multi-hop wireless networks, communication between two end nodes is applied through variety of intermediate nodes whose perform is to relay data from one purpose to a different. Energy potency, dependability and prolonging network life are the three necessities of style of wireless ad-hoc networks [1].

On wireless computer networks, ad-hoc mode may be a technique for wireless device to directly communicate with one another. Operative in ad-hoc mode permits all wireless devices at intervals vary of every alternative to find and communicate in peer- to- peer fashion while not involving central access points (including those inbuilt to broadband wireless router). To line uo associate ad-hoc wireless networks, every wireless network, every wireless adapter must be designed for ad-hoc mode versus the choice infrastructure mode. Additionally, all wireless adapters on the ad-hoc network ought to use a similar SSID and conjointly a similar channel selection.

An ad-hoc network tends to feature a little cluster of devices bushed terribly shut proximity to every alternative. Performance suffers because the variety of devices grows, and an oversized ad-hoc network quickly becomes troublesome to manage. Ad-hoc networks cannot bridge to wired LANs or to the internet whereas not fixing a special purpose entry. Ad-hoc networks are once desperate to build a little, all wireless local area network quickly and pay the minimum quantity of cash on instrumentation. Ad-hoc networks collectively work well as a short disengagement mechanism if usually offered infrastructure mode gear (access points or routers) stop functioning.

The localized nature of wireless ad-hoc networks produce them acceptable for a variety of application where central node cannot be relied on and can improve the measurability of networks compared to wireless managed networks, although theoretical [2] and wise limits [3] to the aptitude of such networks are far-famed. Token configuration and quick preparation produce ad-hoc networks acceptable for emergency things like natural disaster or military conflicts. The presence of dynamic and accommodative routing protocols permits ad-hoc networks to be designed quickly. Wireless ad-hoc networks are additional classified by their application:

A. Mobile Ad Hoc Networks (MANET):

An ad-hoc network is created from multiple “nodes” connected by “link. Link unit influenced by the node’s resources (e.g., transmitter power, computing power and memory) and activity properties any as link properties. Since link is connected or disconnected at any time, a functioning networks ought to be able to modify this dynamic restructuring, ideally in an exceedingly very manner that’s timely, efficient, reliable, robust and scalable. The network should permit any two nodes to speak by relaying the data via alternative nodes.

II. METHODOLOGY

A. Creating the Network Topology:

We style wireless ad hoc networks topology by sing a graph G (V, E), wherever V set of nodes (vertices) and set of nodes links (edges), severally. All node is ready distinctive whole number symbol between one and N=|V|. Node assumed to be battery hopped-up. Cu is that the remaining battery power which is diagrammatical by energy of node U €V. Assume Cth=0 then, node is taken into account to be not living any loss of generality. ðu,vÞ area unit link within the network then causation and receiving nodes area unit U and V severally. We tend to style and represent a path within the network with h hops between 2 nodes as a collection of nodes ρ(n1,nh+1) = {n1,n2,….,nh,nh+1}, where nk€V is the identifier of the node (k= 1,…,h+1) of the trail. It represents the source node and destination node all alternative rest is intermediate nodes which relay packets from the source to destination hop by hop.

B. Energy Consumption for Packet Transmission over Wireless Links:

The energy model of node is a function of reception energy consumption per bit "r and the transmission energy consumption per bit "t [4]. If node si sends a data packet of length l bits, an amount of l ·"t energy will be deducted from sensors' residual energy, Ei.

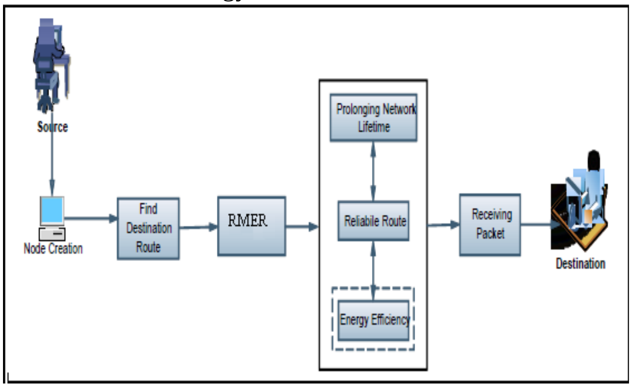

Fig. 1: Architecture of Energy Efficient Wireless Ad Hoc Routing

Hence, residual energy of a node si at the beginning of the th interval can be written as:

Ei(· T_U) = Ei((− 1) · T_U) − up − down,

Where Ei ((− 1) · T_U) is the residual energy at the beginning of the previous update interval.

C. Hop-by-Hop and End-to-End Retransmission Systems:

Wireless links in unintentional networks are typically liable to transmission errors. So, the use of retransmission schemes to make sure the dependableness. They will use either HBH or E2E retransmissions. The HBH system, a lost packet in every hop is retransmitted by the sender to make sure link level dependableness. Associate acknowledgment (ACK) is transmitted by the receiver to the sender once the receiver receives the packet properly. If the sender doesn't receive the ACK (because either the packet or its ACK is lost), the sender retransmits the packet. This continues till the sender receives associate ACK or the utmost allowed variety of transmission tries is reached. If every link is reliable, the E2E path between nodes will be reliable.

In the E2E system, the ACKs are generated solely at the destination and retransmissions happen solely between the nodes. The destination node sends associate E2E ACK to the supply node once it receives the packet properly. If the supply node doesn't receive associate ACK, it retransmits the packet. This could happen either the packet or the ACK is lost. In either case, the supply retransmits the packet till it receives associate ACK for the packet. In each HBH and E2E systems, a retransmission happens once the expiration of a timer.

D. Reliable Minimum Energy Routing (RMER) and Reliable Minimum Energy Cost Routing (RMECR):

RMECR and RMER describe the procedure to find MECP, for which they require complete network topology. This is done with the help of optimized link state routing (OLSR) which help to share its view in network topology. Nodes use becomes to find its neighboring nodes. RMECR & RMER follows the same pattern of Dijkstra's algorithm in order to find the shortest path between the nodes for transferring data [6][7]. We have to calculate link weight and route cost. Using link quality estimation we can find out the PDR packet delivery ratio of the link. Expected number of PDR can be determined by using SNR- to-PDR profile mapping. For data transfer in HBH and E2E ACK may be in different sizes. So their delivery ratio will differ. In order to find reliable packet transmission to neighboring node Pu,v each node send packet to neighboring node to calculate the minimum transmission power required for packet delivery.

E. Trust Management Scheme:

Ad-hoc networks are characterized by dynamically changing their structure; this means nodes join and leave networks very often. While in a roaming process nodes are continuously confronted with other (unknown) nodes, which can be of a great help to them if they can collaborate with each other, collaboration between strange nodes is not fully utilized, due to the fear of not being trusted and the potential risk of such collaboration. Trust relationships in wireless networks are established, evolved, propagated and expired on the fly (no infrastructure) and are very susceptible to attacks, as the whole environment is vulnerable due to the shared wireless medium. In alternative words, there's no a priority sure set of nodes to support the network practically. Trust could solely be developed over time, whereas trust relationships among nodes can also modification [8].

Reputation and trust systems within the context of ad-hoc networks, CONFIDANT and CORE, maintain an applied mathematics illustration of the name by borrowing tools from the realms of Bayesian estimation and scientific theory severally. These systems try and counter egoistic routing misbehavior of nodes by implementing nodes to join forces with one another. The subject entity's observation and recommendation from third party are present in complete trustiness value.

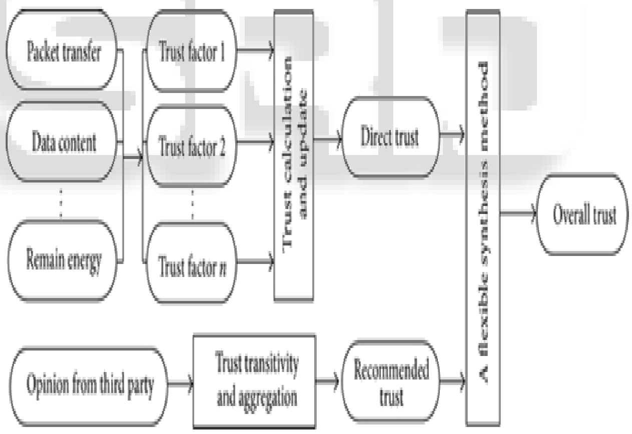

Fig. 2: Structure of TMS Algorithm

The TMS algorithm establishes numerous trust factors supported previous work [9]. Based on trust factor, direct trust is calculated. Then, the recommendation of many neighbor nodes is non-heritable in accordance with the revised D-S rule and therefore the trust distinction between items of proof. Finally, the general trust worth is computed through a versatile synthesis technique that guarantees an honest trust energy consumption balance.

This method is unsuitable to determine the suggested trust value by weighted average within the perspicacity of trust analysis. D-S evidence theory briefly express the vital conceptions, such as "uncertainty," and build right judgments by with efficiently integrating many-sided uncertain information and based on the D-S rule trust value and also the average weight of recommendations can be calculated [10].

III. SYSTEM IMPLEMENTATION

A. Network Creation:

Nodes registered within the info with its name, web protocol Address & Port range and standing and registered within the info [11]. Every node will log to the network through name and port range. Every node maintain the on or off standing this method is to spot whether or not the node is logged in or not. All node details are maintained in Main server the most server permits means that the node will send the data [12]. The most server not in ON standing means that the node unable to send the info. We have a tendency to produce the topology construction (path construction) to send the info via intermediate nodes. For the Topology construction the user need to offer weight to the supply and also the destination to n range of nodes. This method is to speak and intermediate nodes.

B. Minimum Energy Cost Routing:

During route selection, reliableness and energy cost of routes should be thought-about [13]. The key point is energy cost of an expounded to its reliability.

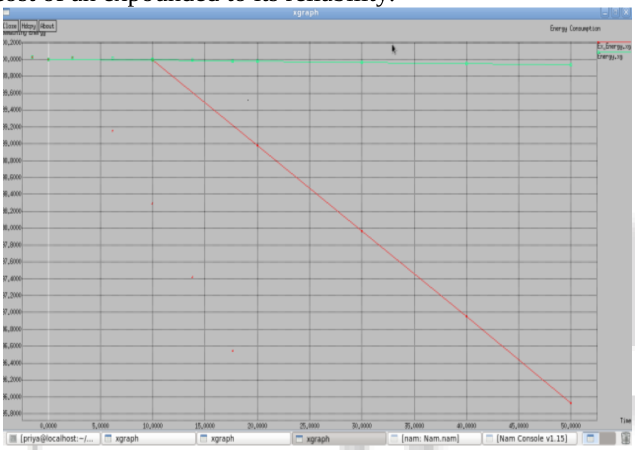

Fig. 3: Average Energy Consumption

If the routes square measure less reliable, the packet retransmission chance will increase. Attributable to retransmission of the packet, the larger quantity of energy are consumed per packet. By the way of method used that during which of computing the energy worth of routes. Vogue sets of energy-aware reliable routing algorithms for HBH and E2E systems.

By process ways that of computing the energy values of routes, styles sets of reliable minimum energy value algorithmic program for HBH and E2E systems.

C. Reliability of Routes:

A hop-by-hop route is a sequence of nodes through which the information is relayed from a source node, s, to a destination node, d, i.e,

Route = (r0; r1; ¢ ¢ ¢ ; rh¡1; rh);

Where, r0 = s, rh = d, and h is the number of hops. We assume the network operates based on a time division protocol under which successive transmissions along a route happen in consecutive transmission slots. Route (s; r1; ¢ ¢ ¢ ; rh¡1; d) is identical to a sequence of h point-to-point links, where for the ith link, relay i ¡ 1 is the transmitter and relay i is the receiver, snrri¡1ri is the transmitted signal-to-noise power, and dri¡1ri is the distance between the nodes. We define the event of successful end-to-end transmission as the event that all h transmissions are successful and the End-to-End Reliability is defined as the probability of this event. We assume that the fading factors for different links are independent and identically distributed Rayleigh random variables. Based on this assumption and using results from [14], the end-to-end reliability can be written as:

$$Reliability^{r0,r1\ldots rh} = \prod_{i=1}^{h} \exp(-d^{k}_{ri-1ri/snr_{ri-1ri}}) \quad (1.1)$$

$$= \exp(-\sum_{i=1}^{h} d^{k}_{ri-1ri/snr_{ri-1ri}}) \quad (1.2)$$

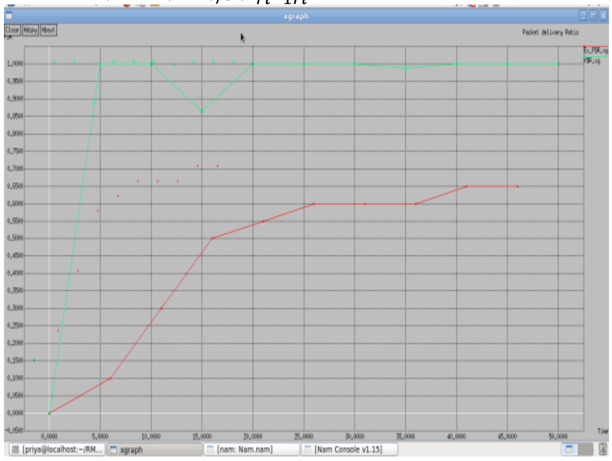

Fig. 4: Packet Delivery Ratio

D. Operational Lifetime of the Network:

RMECR algorithm is the solution to increasing the lifetime of the nodes which minimizes maintenance cost and maximizes the overall performance of the nodes [15]. With adequate analysis, we may observe that the network lifetime after its initial deployment may not be arbitrarily extended by simply increasing the number of nodes initially deployed. Before communication failures due to energy costs, provisions must be made to replenish the network by adding additional nodes on the fly after its initial deployment. Towards extending the lifetime, strategies with respect to such network replenishment due to energy costs. A simple strategy may be that, a minimum number of nodes are deployed initially with new nodes subsequently added to the network according to certain schedules.

IV. CONCLUSION

In this paper, we proposed an extension to the RMECR and RMER algorithm for wireless ad hoc networks. RMECR finds minimum energy routes for reliable packet transmission from a source node to a destination node. By in depth simulation results, we have a tendency to show that RMECR will considerably increase the operational period of ad hoc networks. It also reduces the energy consumption per packet delivery in the entire network, which increases the energy-efficiency. RMER will notice extremely reliable routes to attenuate the overall energy needed for end-to-end transmission. Our results showed that a minimum cost formulation for route selection can balance the load more effectively than a max-min formulation used in other algorithms.

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