Optimal Multi-Hop Adaptive Link State Enhanced Routing in Wireless Ad-hoc Network

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ABSTRACT

Exploitation of Optimal Multi-Hop Adaptive Link State Routing scheme to accomplish unique routing is recently known as a superior technique. It is the first link-state routing solution with Multi-Hop packet forwarding that minimizes the cost of carrying traffic through packet-switched networks. All previous works improved routing on WSN, there is no strong improvement on QoS and for multipath routing with less traffic over head. The enhancement on routing QoS and multi-destination packet routing are addressed by Using triplet model and link state algorithm in this project. By exploitation of the approach each node, for all diverse node, the algorithm separately and regularly renews the piece of traffic bound to that leaves on each of its outgoing paths. At each Recapitulation, the updates are calculated by applying on the shortest path evaluations to every target which in turns discovered by the in considerable costs of the network's paths. That means the in significant link costs are applied to encounter the shortest paths are in turn acquired from link-state updates that are flooded within the network after each recapitulation. This way of system is also versatile which means it naturally discovers the constant network transforms and captures judgments considering the different convenient means. However, this has accomplished to exclude the trade-off between optimality and comfort to execution and routing, yet it can function properly if we tried to decrease the acknowledgement overhead traffic. This paper project that there is an overcrowding issue due to acknowledgements which is to be decreases by practicing 2ACK system with triplet model and this will have encouraged to decrease traffic and improve link employment for multi-destination routing keeping QoS also it maintains the transmission path log history for future communication.

KEYWORD: - *Packet Switching, Link State Algorithm, Wireless Network, Dijkstra's Algorithm, Optimal Routing, 2Ack Algorithm, QoS, Multiple Routing.*

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1. INTRODUCTION

Routing is the process of selecting best paths in a network. In the past, the term routing was also used to mean forwarding network traffic among networks. However, this latter function is much better described as simply forwarding. Routing is performed for many kinds of networks, including telephone network (circuit switching), electronic data networks (such as the Internet), and transportation networks. This work is concerned primarily with routing in electronic data networks using packet switching technology.

Today's world needed high-speed application to run on various platforms. Particularly wireless network mixed of variety of different standards and protocols. Also, there is lots of limitations on the hardware and software. With this scenario for packet routing we must focus on optimality with QoS in transmission. Also, packet must have destined to multipath destination by consuming less traffic load.

Packet Switching is the routing and transferring of data to the destination address packets so that a channel is occupied during the transmission, and after the completion of the transmission the channel is made available for the other transmission of the data. Packets are defined by a header and payload. Header includes information about the way to direct the packets to its destination by networking hardware and whereas the payload is extracted and used by software applications. Packet switching contains delivery of inconstant bit rate data streams, as sequences of packets over a computer network which allocates available space while transmission resources as required using statistical multiplexing or dynamic bandwidth allocation techniques. While addressing network nodes such as switches and routers, packets are buffered and aligned, resulting in variable latency and throughput depending on the link capacity and the traffic load on the network.

In packet switching networks, routing instructs packet forwarding (the transit of logically addressed network packets from their source toward their ultimate destination) through intermediate nodes. Intermediate nodes are commonly network hardware devices such as routers, bridges, gateways, firewalls, or switches. General-purpose computers can also forward packets and carry out routing, though they are undefined hardware and may suffer from limited performance. The routing procedure generally directs forwarding on the reason of routing tables, which keeps a record of the routes to varied network destinations. Thus, constructing routing tables, which are held in the router's memory, is very essential for effective routing.

Most routing algorithms use only one network path at a time. Multipath routing techniques permit the use of multiple alternative paths. Path selection includes applying a routing metric to multiple routes to select (or predict) the best route. In computer networking, the metric is calculated by a routing algorithm, and can include information such as bandwidth, network delay, hop count, path cost, load, MTU (maximum transmission unit), reliability, and communication cost. The routing table contains only the best possible routes, while link-state or topological databases may store all other information as well.

The intention behind the pervasive dissemination and approval of link-state, multi-hop algorithms has been their simplicity here, in algorithm core impression advocate to centrally assign weights to links based on input traffic measurements, then flood the link weights through the network, and then calculate the shortest paths from the link weights and nearby advancing packets to destinations along these computed shortest paths. Because of rapid growth in our communication networks in size and complexity, this simplicity has helped OSPF to expand the boundaries of optimal routing techniques that are harder to implement. Ultimately this results into lost performance of this trade-off.

End-to-end acknowledgment is used in the TCP protocol. Such acknowledgments are sent by the end-receiver to notify the sender about the reception of data packets. This algorithm uses the ACK scheme for acknowledgement purpose. In which acknowledgement is passed to sender node for each packet received by receiver node. This causes an unwanted traffic of acknowledgements. This paper project that there is a congestion issue due to acknowledgements which is to be reduced by using 2ACK system with triplet model. The 2ACK scheme doesn’t follow end-to-end acknowledgement system. In 2ACK scheme for every 3 nodes i.e. triplet along the route an explicit acknowledgement in the form of 2ACK packet is send to the sender. Using this technique along with HALO scheme has turn out be very helpful to reduce traffic arrived due to unwanted acknowledgements. This will in turn have improved link utilizations.

1.1 Link State Routing

A link-state routing protocol is one of the two main classes of routing protocols used in packet switching networks for computer communications (the other is the distance-vector routing protocol). Examples of link-state routing protocols include open shortest path first (OSPF) and intermediate system to intermediate system (IS-IS).

Idea behind link state routing is simple and can be stated as five parts. Each router must do the following:

1) Discover its neighbors and learn their network addresses.
2) Measure the delay or cost to its neighbors.
3) Construct a packet telling all it has just learned.
4) Send this packet to all other routers.
5) Compute the shortest path to every other router.

1.2 Shortest Path Calculation

A node maintains two data structures: a tree containing nodes which are "done", and a list of candidates. The algorithm starts with both structures empty; it then adds to the first one the node itself. The variant of a Greedy Algorithm then repetitively does the following:

- All neighbor nodes which are directly connected to the node are just added to the tree (excepting any nodes which are already in either the tree or the candidate list). The rest are added to the second (candidate) list.
- Each node in the candidate list is compared to each of the nodes already in the tree. The candidate node which is closest to any of the nodes already in the tree is itself moved into the tree and attached to the appropriate neighbor node. When a node is moved from the candidate list into the tree, it is removed from the candidate list and is not considered in subsequent iterations of the algorithm.

- The above two steps are repeated as long as there are any nodes left in the candidate list. (When there are none, all the nodes in the network will have been added to the tree.) This procedure ends with the tree containing all the nodes in the network, with the node on which the algorithm is running as the root of the tree. The shortest path from that node to any other node is indicated by the list of nodes one traverses to get from the root of the tree, to the desired node in the tree.

2. LITERATURE REVIEW

WSNs are usually distinguished by restricted resources on the part of sensor nodes. Wireless sensor networks have grown increasingly due to their various applications and low installation cost. While data receiving and sending process, the limited energy at each node impacts on network period. In such way to achieve the trade-off between energy consumption and data delivery performance, appropriate architecture is required to determine the set of optimal routes for data dissemination and reduces excessive energy consumption among nodes. In WSN, the main responsibility is to reduce energy consumption among nodes while maintaining timely and reliable data forwarding. However, most of the existing energy aware routing protocols incur unbalanced energy consumption, which results in inefficient load balancing and compromised network lifetime.

2.1 Previous Systems

Walid Krichene [8], proposed two methods to approach this above problem, and analysed their computational complexity and their performance on numerical examples: A greedy method and a local search method based on the adjoint system. He derived the adjoint system equations associated to the Hedge dynamics. Their numerical experiments shed light on the trade-offs and the empirical performance of each method: The one of that the adjoint method has the best performance, but its complexity is quadratic. And the second one is the greedy method, while limited due to its myopic nature, is easy to implement and performs well fairly. While their application was specific to the routing game, the derivation of the Hedge adjoint equations is generic and it can be applied to any optimal control problem where a selfish population is assumed to follow Hedge dynamics. Their experiments show that the adjoint method works well in practice, and advances further investigation into the numerical performance on other applications.

Masato Tsuru [10], they have proposed Adaptive-spray and hop distance-based protocol (A-SnHD), by modifying their previous proposed protocol. A-SnHD switches two phases in each island: the binary-spray transferring is used when a message reaches each island for initial dissipation in that island, and then the hop distance-based forwarding is used in a strict way to prevent unnecessary transmission to wrong islands. Based on the ONE simulator-based evaluation in multiple island scenarios reacting a real situation of Indonesia, it has been shown that, while it is so easy, A- SnHD increases the total size of transferred messages and at the same time minimizes the overhead ratio comparing with EP as a basic protocol and PV2 as an artificial protocol. For the future work, _ending a better copy limit L in the spray phase should be assumed, which can change depending on local information such as island size. We will also investigate a better buffer management by utilizing the information on remaining TTL of each message to modify the buffer full condition, which we tried in an easier scenario in their previous work. Especially in rural areas, a high-speed but high-cost data communication infrastructure is not always available. In such conditions, a store-carry-and-forward-based message carrying over existing vehicle networks is an assuring approach to delivery of large data as delay and disruption tolerant networking (DTN). Agussalim, Masato TsuruIn [10], reacting a real example situation in Indonesia, we consider DTN message delivery scenarios over multiple islands where adjacent islands are connected only by ferry boat. The source and destination nodes of messages are stationary and located marginal islands. Messages are relayed by cars and buses in each island and by ferries between islands. We adapt our previously proposed routing protocol to the multiple-island scenarios with some modification and checkout its electiveness in two cases of delivery direction.

Yunus Sarikaya, Ozgur Ercetin [11] hey access achievable confidential data rate regions of wireless multi-hop networks, where the message is ciphered over long blocks of information. Then, they designed a dynamic control algorithm for a given encoding rate and they prove that our algorithm achieves utility arbitrarily close to the maximum achievable utility. Then, they defined a sub-optimal algorithm for the system, where the messages are ciphered over finite number of blocks. The simulation results verify the efficiency of the algorithms, and they show that the proposed algorithm asymptotically approaches the optimal rates. As a future direction, they will investigate distributed version of their dynamic control algorithms, [11] where the scheduler decision is given as per off to local information. They will also consider the case, where sender only obtain defective channel state information of the links.

Romero, Grecian, Romero, Asdnibal [13] analyzed the optimal routing problem within autonomous systems, with particular emphasis when the objective is the optimal links loads balancing for a greater efficiency in the utilization of resources committed for IP networks. The used model belongs to the MCF (Multicommodity flow) family of networks flow problems and, after characterizing the type of solution yielded by this kind of model, it is discussed the feasibility of its implementation in networks operating under OSPF and MPLS protocols.

Khalid Haseeb, Kamalrulnizam Abu Bakar, Abdul Hanan Abdullah, Tasneem Darwish.Therefore, [12] the main target of this research paper is to present adaptive energy aware cluster-based routing (AECR) protocol for improving energy conservation and data delivery performance. Their proposed AECR protocol differs from other energy efficient routing schemes in some way. Firstly, it produced balance sized clusters based on nodes distribution and avoids random clusters formation. Secondly, it makes perfect both intra- cluster and inter-cluster routing paths for improving data delivery performance while balancing data traffic on constructed forwarding routes and at the end, in order to minimize the overdone energy consumption and improving load distribution, the role of Cluster Head (CH) is changed dynamically among nodes by achieving of network conditions. Simulation results determine that AECR protocol [12] better state of the art in terms of various performance metrics. In this research paper, AECR protocol structures the distributed sensor nodes into uniform sized non-overlapping clusters based on network size. Therefore, random clusters formation is avoided, and the role of CHs is dispersed evenly over the whole network field. In addition, by adopting weighted metrics for CH election process within each cluster region leads to least computational overdoes and energy consumption. Additionally, AECR protocol finds optimal multi-hop data delivery paths that achieve shortest, most energy efficient and reliable data transmissions.

3. PROPOSED SYSTEM

Our aim in this paper is to find optimal rout and comfort of employment in routing. Also, we are aimed to reduce the congestion in the transmission along with maintaining QoS in terms of increasing lifetime of portable nodes. Our paper proposes the different measures of quality of services and reduces the traffic overhead. It provides optimized solution and has a way to send the packets to the different destination i.e., multi-destinations. There are multiple challenges to overcome when designing such a solution. First, we will look the proposed architecture,

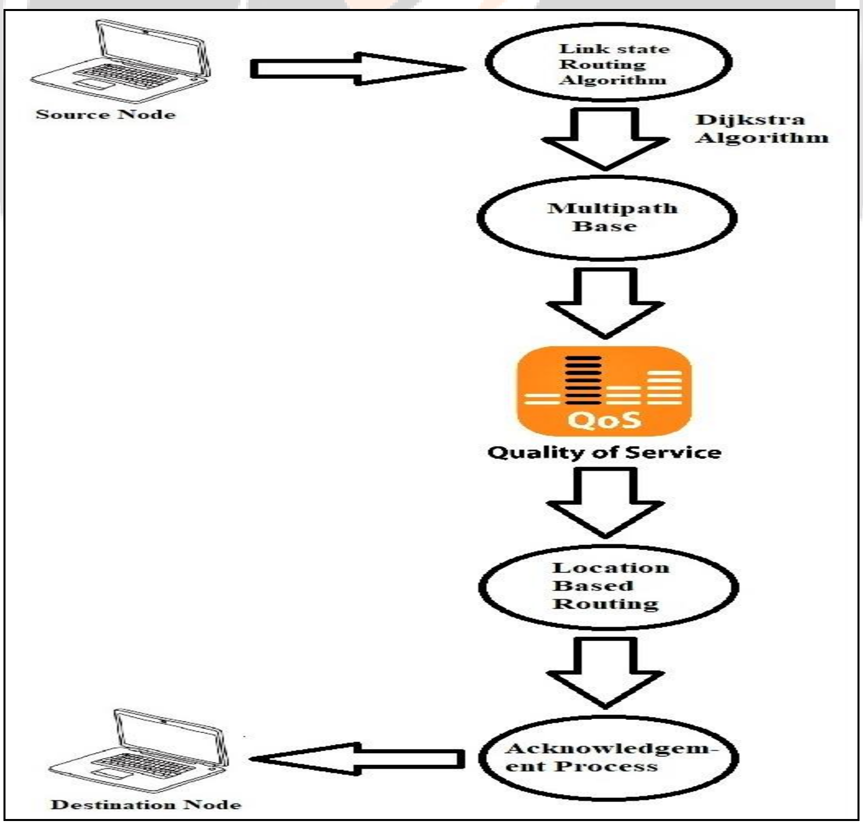

Fig -2: System Architecture

The architectural description consists of following modules which shortly explain below.

3.1 Network Node Configuration

Route request packet is flooded for forming the link between the different nodes. Nodes who got the request messages must reply by route reply messages to the source. Any node who is not replying on the messages are discarded from the network. The source form the route to the destination via intermediate nodes.

3.2 Path Design

For the path design we are using Link state routing protocol along with Dijkstra's algorithm. The link state is routing protocol which is used to get the multiple routes from source to the destination. Among all routes the shortest route is been formed using Dijkstra's shortest path algorithm and path is been finalized.

3.3 Sender and Receiver module

The sender node is used to send the data along the path. The sender must send the data via intermediate nodes and wait for the acknowledgement. Each intermediate node also works as a sender and receiver. The receiver node receives the data packet and sends back the positive acknowledgement to the source.

3.4 Link Management

Adapt split ratios dynamically and incrementally by decreasing along links that belong to non-shortest paths while increasing along the link that is part of the shortest path at every router. If instead split ratios are set to be positive instantaneously only to the links leading to shortest paths, then we get OSPF with weights.

3.5 Multipath Routing

Multipath routing is the routing technique of using multiple alternative paths through a network, which can yield a variety of benefits such as increased bandwidth, or improved security. The multiple paths computed might be overlapped, edge disjointed, or node disjointed with each other. Extensive research has been done on multipath routing techniques.

3.5 Shortest path algorithm

For a given source vertex (node) in the graph, the algorithm finds the path with lowest cost (i.e. the shortest path) between that vertex and every other vertex. It can also be used for finding costs of shortest paths from a single vertex to a single destination vertex by stopping the algorithm once the shortest path to the destination vertex has been determined. For example, if the vertices of the graph represent cities and edge path costs represent driving distances between pairs of cities connected by a direct road, Dijkstra's algorithm can be used to find the shortest route between one city and all other cities. As a result, the shortest path algorithm is widely used in network routing protocols, most notably IS-IS and OSPF (Open Shortest Path First). Function Dijkstra (Graph, source): dist[source]: = 0 // Distance from source to source for each vertex v in Graph // Initializations if v ≠ source dist[v]: = infinity // Unknown distance function from source to v previous[v]:= undefined // Previous node in optimal path from source end if add v to Q // All nodes initially in Q (unvisited nodes) end for while Q is not empty: // The main loop u := vertex in Q with min dist[u] // Source node in first case remove u from Q for each neighbour v of u : // where v has not yet been removed From Q. alt:= dist[u] + length(u, v) if alt < dist[v]: // A shorter path to v has been found dist[v] := alt previous[v] := u end if end for end while return dist[], previous[] end function

3.6 2-ACK algorithm

The 2ACK algorithm form the triplet module on the destination path. The nodes with this triplet are work on the principle of 2ACK scheme. The 2ACK scheme is used to send the data by reducing the congestion by means of reducing unwanted acknowledgement. Also, 2ACK scheme gives surety that the packets are sent successfully.

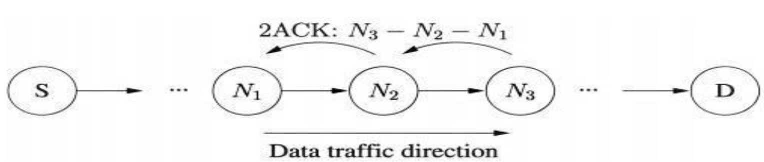

Fig -2: 2Ack Scheme

Figure 2 shows the working of the 2ACK scheme. Here, N1, N2, and N3 are three consecutive nodes (triplet) along a route. Link state routing protocol generates the route from a source node S, to a destination node D in its Route Discovery phase. Here N1 sends a data packet to N2 and N2 forwards it to N3, but N1 is unaware whether N3 receives the data packet successfully or not. Thus, 2ACK scheme requires an explicit acknowledgment to be sent by N3 to notify N1 that data packet is received successfully. Thus, when node N3 receives the data packet successfully, it sends out a 2ACK packet along with the ID of the corresponding data packet over two hops to N1 (i.e., in the opposite direction of the routing path as shown in fig.). To notation purpose, N1 in the triplet [N→N2→N3] is notified as the 2ACK packet receiver and N3 as the 2ACK packet sender. There may be more than one sets of triplets along the route. For every triplet such 2ACK transmission takes place. Thus, only the first router from the source will not serve as a 2ACK packet sender. The last router just before the destination and the destination will not serve as 2ACK receivers.
The triplet N1 → N2 → N3 in Figure 2 illustrate 2ACK's processing. Note that such codes are run on each of the sender/receiver of the 2ACK packets. Following is the algorithm of our proposed system.

1) Start.
2) Sender is S and Destination is D.
3) Compute shortest path tree for destination D using HALO method.
4) Form new triplet N1 → N2 → N3 by taking 3 nodes from shortest path route.
5) N1 is considered as temp sender node and N3 as temp Receiver node and N2 is middle Node.
6) Packet is forwarded from N1 to N3.
7) N3 send acknowledgement to N1 using 2Ack.
8) Check if (N3= = D).
9) If not then repeat Step 4 to 8 for next 3 nodes.
10) If yes then D sends final acknowledgement to S.
11) Stop.

4. CONCLUSIONS

From the analysis we can conclude that the proposed system is faster than the existing system in terms data transmission time. Here, in proposed system transmission time is significantly reduced. The number acknowledgements have been reduced, this is the main advantage our proposed system. This has helped to reduce the unwanted traffic happening due to acknowledgements. In wireless network, reduction in the number of operations will lead to power saving. In the congested network point of view, proposed system is not that much useful for the large file size. It has been only able to reduce to the transmission time for the smaller size data file. So, it can be concluded that the proposed system is helpful to improve the system.

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