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Research Article

Bwiee Protocol For Route Discovery And Energy Efficiency In Manet

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Abstract: MANET is categorized by nodes that do not require any predefined or fixed infrastructure to connect with each other, and perform data exchange. In MANET each device is free to move independently in any direction and can change their transfer links to other device frequently. The nodes need high bandwidth and they have to be within the range of each other to perform efficient routing. For effective routing MANET face many challenges such as packet loss, traffic occurrence, low throughput, rote discovery and less delivery ratio. This paper analyzes the routing problem and proposed a BWIEE protocol to provide better data transfer. Our approach is based on data delivery mechanisms with respect to the reduction of energy consumption and route permanence by improving the bandwidth. It found multiple route between the source and destination and also it uses alternate route if route failure occurs. So the transfer of data will have done frequently without packet loss. Our proposed scheme will provide the high throughput with improved QOS in MANET.

Keywords: Mobile Ad hoc Network, Routing protocol, Route Discovery, Bandwidth and data transfer.

I. INTRODUCTION

Mobile Ad hoc Network (MANET) is an application of the Wireless Ad hoc Network (WANET) that connects mobile nodes to each other. MANET is a self-configured network of mobile nodes connected by wireless links. In MANET, nodes do not rely on a central node to coordinate the communication or to carry data between them; instead of that, they work together to carry data between nodes that cannot reach each other directly. In other words, nodes may work as a bridge between the sender and the receiver node when sender and receiver are not in the same coverage [1].

Routing

It provides several challenges like packet loss, high dynamic topology, limited throughput, limited bandwidth, etc... In this scenarios, it is to be manage the mobility, packets routing with the minimal time and energy consumption. Hence, routing protocol plays a crucial role while forwarding the packet in the network. Moreover, it is necessary to reduce the number of failed transmissions, data redundancies and traffic overhead of mobile nodes, which results in the reduction of energy consumption substantially. Therefore, routing protocol to be established here to send the packet in MANET hence it provides mobility of nodes which leads a dynamic change in network topology. So, MANET routing protocols are designed to be adaptive to any dynamic topology changes. In dynamic network topology, MANET nodes rely on multihop communication. That is, nodes within each other's transmission range can communicate directly through radio channels, whereas those outside the radio range must rely on intermediate nodes to forward messages toward their destinations. Whenever Mobile nodes want they can move, leave, and join the network whenever they want, and routes need to be updated frequently [2].

Mobility

Mobile nodes play the role of host as well as routers and also support the multi-hop communication between the nodes. By the help of routing protocols, mobile nodes can send the data packets to each other in mobile ad hoc networks. Some characteristics of MANETs are communication via wireless links, resource constraints (bandwidth and battery power), cooperativeness between the nodes and dynamic topology.

It is the act of moving information from a source to a destination in an inter-network. During this process, at least one intermediate node within the inter-network is encountered. The routing concept basically involves, two activities: firstly, determining optimal routing paths and secondly, transferring the information groups (called packets) through an internetwork. The later concept is called as packet switching which is straight forward, and the path determination could be very complex. Routing protocols use several metrics to calculate the best path for routing the packets to its destination. The process of path determination is that, routing algorithms initialize and maintain routing tables, which contain the total route information for the packet [3].

In MANET, the communication with the nodes may be absence of any fixed infrastructure, that may be provide a communication through any nodes which consists of multiple hops through other hops in a network. The duty of analyzing and maintaining routes in MANET is an important factor because of host mobility that frequently affects unpredictable topology changes [4]. For this route discovery is an important property in routing protocol

mainly in mobility portent. Mobility Model allows the nodes or objects, how they behave in the system, their movement and the way they move. QoS is the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow [5].

While MANET is used in many applications like, military, secret data transfer, online gaming, natural disaster recovery by monitoring the changes of the nature. These applications need a quality of services (QOS), Energy efficiency, bandwidth improvement, throughput and proper reliable data transfer. There are many researchers provide many methods for analyzing the QOS for the effective data transfer in MANET, but in some constrains it failed like packet transfer, data loss, bandwidth and route discovery. This paper analyst the problem which is faced by the MANET and implement the BWIEE protocol to provide a better transfer of data. BWIEE routing protocol finds multiple link reliable energy efficient bandwidth aware paths from any source to destination pair for data transmission using the metrics such as path length, novel energy efficient and available bandwidth.

II. LITERATURE REVIEW

Lei Chen and Wendi B. Heinzelman [6], propose a QoS-aware routing protocol that incorporates an admission control scheme and a feedback scheme to meet the QoS requirements of real-time applications. The novel part of this QoS-aware routing protocol is the use of the approximate bandwidth estimation to react to network traffic. Our approach implements these schemes by using two bandwidth estimation methods to find the residual bandwidth available at each node to support new streams. In their protocol it is not incorporated any predictive way to foresee a route break, which causes a performance degradation in mobile topologies. Therefore, some methods such as pre-emptive maintenance routing and route maintenance based on signal strength.

Thiagarajan, R., M. Rajesh Babu, and M. Moorthi [7] focus their research is evaluating the multipath routing protocol for QoS. For better delivering of data, the Ad hoc On-demand Multipath Distance Vector (AOMDV) has improved methods. This maintains the QoS in terms of factors like MANET end-to-end delay, hop count and bandwidth. This work explores the evolutionary computation schemes for optimizing the routing. The discovery of QoS route in multi-constrained network is a complex problem, this is solved optimally using heuristic algorithms. In that, specifically used for intrusion detection programs in such challenging set ups would be Grammatical Evolution (GE). For finding out familiar threats in MANETs, the natural evolution-motivated GE scheme has been applied. The outcomes have shown that in MANETs, the proposed AOMDV-QoS schemes fulfill the Quality of Service requirements along with lesser delay and high reliability.

Ching-Wen Chen; Chuan-Chi Weng [8] propose a power-aware routing protocol with low route requests that finds a path with high path bandwidth. To have low routing requests, mobile nodes help to broadcast the routing request only when they first receive the routing requests. In addition, based on the receipt of the routing requests from the neighbouring nodes, a mobile node records the location information of its one-hop neighbouring nodes. In the path-reply phase, to have high path bandwidth, mobile nodes in the found path use the collected location information of their neighbours and our proposed relay model to modify the found path with high bandwidth. In simulation, this paper compares the proposed routing protocol with AODV, DSR, and MMBCR in terms of average path bandwidth, power consumed during data transmission, and overall power consumption. As a result, the overall power consumption of our proposed routing protocol is better by about 51% to 58% than that of the other three routing protocols.

Neeraja, Y., and V. Sumalatha [9] find wide range of research is carrying out in the field of Ad hoc networks. Routing is one of the major point to concentrate on the research, however, collisions among the nodes also creates a major problem. Hence it is required to create efficient channel allocation mechanisms for Ad hoc networks in MAC. In this paper, we propose a new priority based QoS design for the Mobile Ad hoc Networks (MANETs) to achieve the better performance in terms of efficient bandwidth utilization, less collision rate with prioritized data transmission among the nodes.

Wenli Zhou et al [10] propose a Topological Change Adaptive Ad hoc On-demand Multipath Distance Vector (TA-AOMDV) routing protocol, which can adapt to high-speed node movement to support QoS. In this protocol, a stable path selection algorithm is designed, which not only takes node resources (residual energy, available bandwidth and queue length) as the path selection parameters, but also considers the link stability probability between nodes. Furthermore, in order to adapt to the rapid change of topology, link interrupt prediction mechanism is integrated into the protocol, which updates the routing strategy based on periodic probabilistic estimates of link stability. Different scenarios with node speed in the range of 10-50m/s, data rate in the range of 4-40kbps and number of nodes in the range of 10-100 are simulated on NS2 platform. Our results show that the QoS metrics (packet delivery rate, end-to-end delay, and throughput) of the proposed protocol are significantly improved when the node speed is higher than 30m/s although it is slightly better when the node speed is lower than 30m/s.

III. PROBLEM STATEMENT

This paper analyse the problem of MANET for data transfer. In many article the researchers consider minimal nodal residual energy and hop count as metrics for route selection [11]. When the minimal nodal residual energy of the path does not meet the energy required for data transmission, a node failure occurs during data transmission [12]. All routing protocols use Link Expiration Time for measuring link stability. When a link is alive but it is not within the transmission range, with fails to transmit data. And another one is bandwidth improvement, while sending the packets caches have not yet updated their bandwidth consumption when the new RREQ arrives and no available bandwidth also found, since it has not released the bandwidth used by the broken route. More energy consumption occurs because of bandwidth problems. Therefore, we should integrate a required cache update in the route maintenance structure so that QoS will improve for an effective data transfer.

IV. PROPOSED WORK

Routing protocols have attracted a great deal of attention from the beginning of MANET research until the present time. Early work focused on finding feasible routes without considering energy costs or QoS. This paper proposes a BWIEE protocol and it is used as a reactive protocol here it is to discover a route to some destination when it has a packet to route to that destination and does not already know a route. Here if a packets want to send means a source node broadcast a route request (RREQ) to a specific node. And then each node in a network receives the RREQ data then check it must be reaches the destination or not. This is gathered by sending an acknowledgement from the destination node which is RREP (route reply) else it rebroadcast the RREQ to the nodes in network. Our approach finds the intermediate node between the source and destination and create a routing table and note the ID of the node which is the RREQ packets of the nodes then it unicast the RREP to the neighbour node and it will send to the source node [13]. If the node didn't provide any acknowledgement for a particular period of time, then it will delete the neighbour from its cache and defined the consistent routes as invalid.

BWIEE protocol

Route Discovery is determining the resources available at any particular node. BWIEE protocol using a Guided Route Discovery (GRD) to find a suitable route in the network. If the route is found the routing protocol either it must fall-back the resources for a flow else, it may use that route for the best determination. After determining the route establishment, a source node use the route till routine reduces to an undesirable level, at which point it would re-initiate GRD. Otherwise, a protocol may let a path formation and resource arrangement protocol, in which a source founds a flow along that path by sending an CREATE STREAM packet along that path. Each node along the path receiving the CREATE STREAM packet reserves the resources needed by the flow and forwards the CREATE STREAM packet to the next node on the path. When a node that has been forwarding traffic for a flow is no longer able to meet the QoS requirements of the flow, it sends a STREAM ERROR packet to the source of the flow.

Algorithm: BWIEE

Input: RP-Routing Path, D-Discovery ACK- Acknowledgement
Step 1: Initialize (RP = Ø).
Step 2: For each RP node D do available min [node]= count [1];
Step 3: For each RP node D do available max [node]= count [n];
Step 4: Find the nearest node to transfer the packets
Step 5: Establish the route between the source to destination
Step 6: IF found, Assign the route update = TRUE.
Step 7: establish the next route from the neighbour node
Step 8: Neighbour node update = TRUE
Step 9: Check the destination node reach
Step 10: IF YES
Step 11: check the packets is Send
Step 12: IF YES Do send ACK to source
Step 13: For each RP node D the ACK
Step 14: Release the node for another transaction
Step 15: Stop

Bandwidth Estimation

To offer bandwidth-guaranteed QoS, the available end-to-end bandwidth along a route from the source to the destination must be known. The end-to-end throughput is a hollow parameter, which is firm by the bottleneck bandwidth of the intermediate hosts in the route. Therefore, estimating the end-to-end throughput can be simplified into finding the minimal residual bandwidth available among the hosts in that route [14, 15]. We use two methods for estimating bandwidth in this paper. One is for hosts to Heed to the channel and estimate the available bandwidth based on the ratio of free and busy times ("Heed" bandwidth estimation). The other is for every host to disseminate

information about the bandwidth it is currently using in the "Hello" messages, and for a host to estimate its available bandwidth based on the bandwidth consumption indicated in the "Hello" messages from its two-hop neighbours ("Hello" bandwidth estimation).

- "Heed" Bandwidth Estimation: To estimate the available bandwidth, intuitively, each host can listen to the channel to track the traffic state and determine how much free bandwidth it has available every second.
- "Hello" Bandwidth Estimation: Each host estimates its available bandwidth based on the information provided in the "Hello" messages and knowledge of the frequency reuse pattern.

From this each host determines its consumed bandwidth by monitoring the packets it feeds into the network. This value is recorded in a bandwidth-consumption register at the host and is updated periodically.

Route discovery

In Mobile Ad hoc networks (MANET), the active node structure triggered by node movement which indicates an unfortunate route strength and consequently consumes a negative impression on network routines. In MANET the current inclination in routing is to achieve routing information, once the routes are conventional only if it is essential [16, 17]. Subsequently one-hop neighbour node which has recent table with updated time stamp route map which is dependent on the link layer, the particular node circumstance will come across to ensure the condition depending up on sequential node search[20][21]. It is to focus once a source node is ready to establish a connection to destination then the route calculation is adopted and it is essential to examine the network until it discovers both the destination and alternative node which takes a path to the destination [18][19]. The route discovery approach from source node as follows

1. ***Source node*** → *Sequential node search* → *path discovery* → *recent time stamp* →

Connected node → *Quick request responds (QRR)*

2. ***Neighboring node*** → *Updated table* → *recent route discovery* → *shortest path* →

Recent route request (RRREQ)

3. ***Destination node*** → *Frequent responds delivery* → *delay frequency* →

Delay ratio

4. ***Node life time*** → *Enduring energy* → *past history* → *data transmission*

Consumed → *Energy exhaustion*

Where destination node D findings are basically from initialized source S which activates the neighbouring nodes.

Route Maintenance

BWIEE detects a broken route by monitoring the messages. If a host does not receive a message from a specific neighbour node within a predefined interval, it marks the routes using that neighbour host as invalid and sends a corresponding "Error" message to the upstream hosts. Only the source host reinitiates a routing discovery procedure, once receiving the "Error" message. Thus, using caches to respond to a route break in the intermediate host is not utilized. When using QoS-aware routing with "Listen" bandwidth estimation, our route maintenance scheme is used, because releasing bandwidth from the bandwidth consumption registers is impossible without knowing how much bandwidth is consumed by each host in the route.

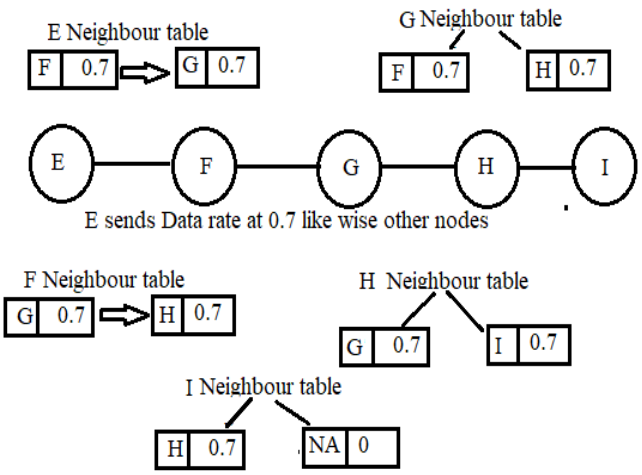

Fig 1: BWIEE Route maintenance in MANET

Therefore, no change in our route maintenance scheme is needed to address the bandwidth releasing issue. However, we cannot directly use our route maintenance scheme in the QoS-aware routing protocol with bandwidth estimation.

V. EXPERIMENTAL RESULTS

This section shows the experimental results of our proposed approach. QoS based routing becomes challenging in MANETs, as nodes should keep an up to-date information about link status. Also, due to the dynamic nature of MANETs, maintaining the precise link state information is very difficult. Finally, the reserved resource may not be guaranteed because of the mobility caused path breakage or power depletion of the mobile hosts. QoS routing should rapidly find a feasible new route to recover the service. In this paper we improve the performance of the routing protocol by applying BWIEE to improves QoS of MANET. Our experimental results show that it provides better throughput, accuracy of route discovery, less data loss. Our approach is implemented using NS2 simulator and results shown below.

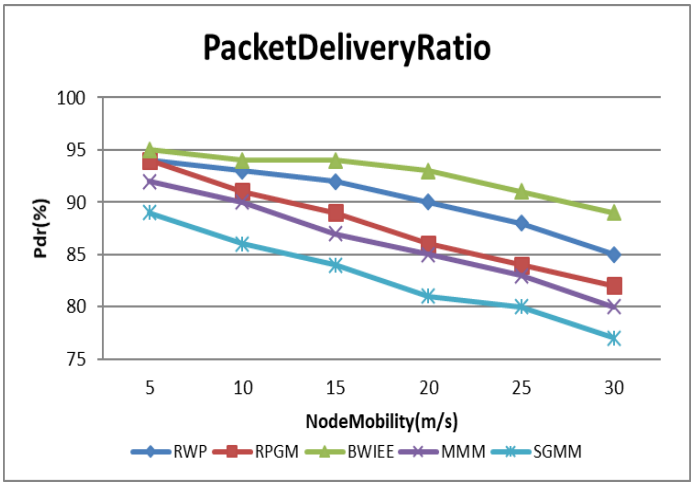

Chart 1: Packet delivery ratio

The packet delivery ratio improvement also brings side benefits such as decreased delay and energy consumption, due to congestion avoidance and the control nature inherited in the QoS-aware routing protocol. In chart 1 shows the performance improvement of our proposed approach with some other existing method. From chart 1 we got better packet delivery ration from our proposed BWIEE approach. And also each node calculates

its rate variation and keep it in cache. The source node sends a RREQ to find destination.

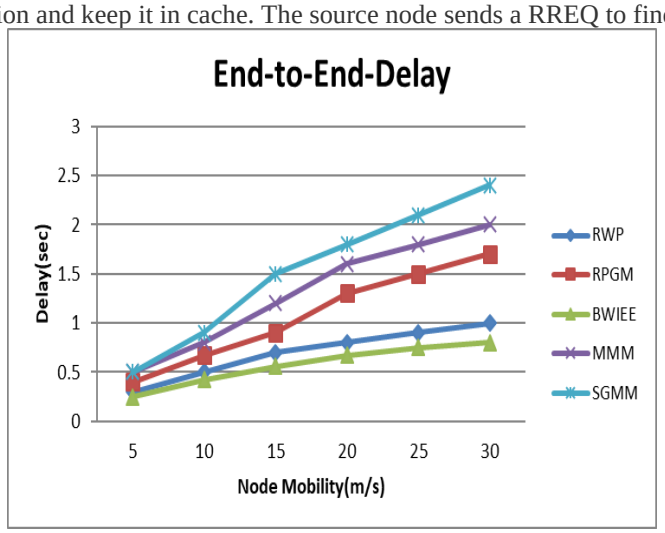

Chart 2: End- to- End Delay analysis

The time used waiting in the packet queue and contending for the channel decreases, and the energy used on transmitting packets which will ultimately be dropped is saved. Therefore, delay is decreased in our proposed approach that were shown in chart 2.

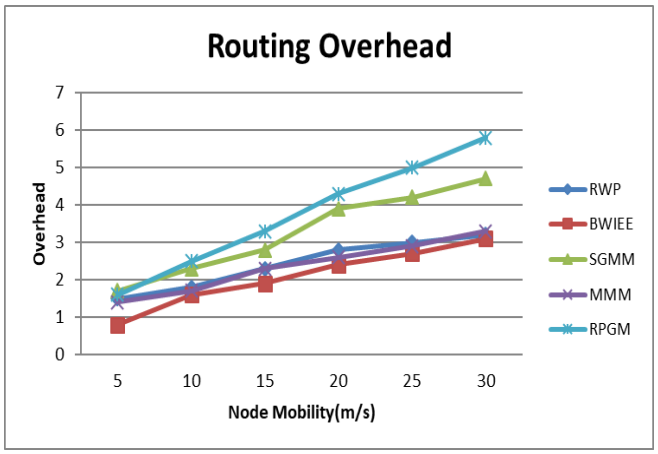

Chart 3: Route overhead

Minimizing the control message overhead for route discovery is a high priority in protocol design. Routing overhead is introduced in terms of additional energy consumption and computational complexity. The overhead can affect the performance of those applications that require a certain delay and a bandwidth. In chart 3 shows that less overhead is produced from our approach. Hence it uses low overhead with a guaranteed delivery rate.

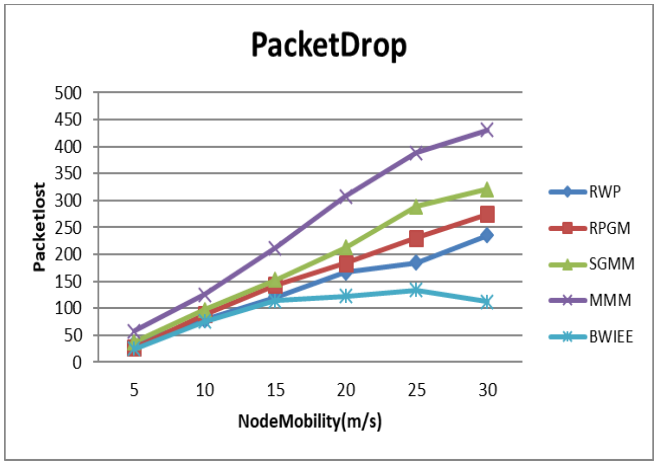

Chart 4: Packet drop analysis

Packet drop provide a data loss in the transmission. In the term of power problem or system problem it may occur. But our approach provides a better improvement for the packet send to the destination node is achieved. In chart 4 shows the packet loss difference.

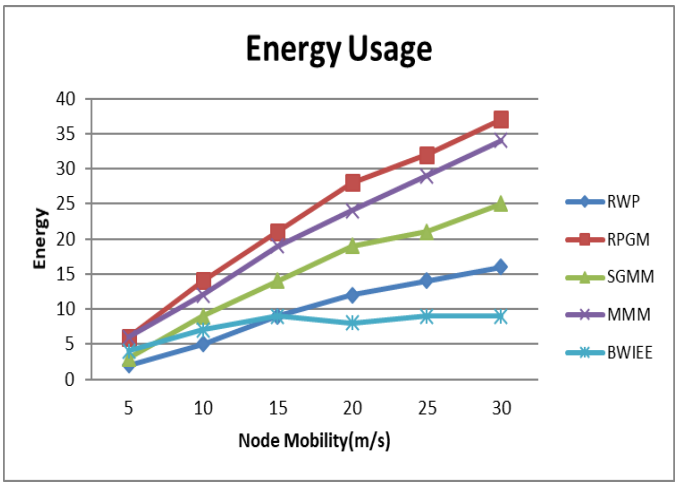

Chart 5:Energy usage analysis

The node keeps in cache its energy rate variation. The node will notify its neighbours constantly about its energy rate variation. When the RREQ, RREP arrives to neighbours. And comparison of energy variation is shown in chart 5.

In the end, the intermediate node adds it energy variation rate to the packet and continue the packet forwarding. The packet is forwarded until it reaches the destination. The destination reply with a RREP. When intermediate nodes receive the route reply packet, it will repeat the same procedure.

IV. CONCLUSION

We proposed a BWIEE protocol for efficient routing in MANET and provide advantages for node mobility. We introduced the concept of neighbour selection and secure mechanism for the data packets while transferring. In this approach it establishes the neighbour node between the source and the destination from that established node it transfers is it as an intermediate node. Though we focused on routing between peer nodes and establish a communication between them. While in route discovery phase it validate the route then only it establishes the communication between them so secure transmission is done by our approach. From our proposed work the QoS measure in improved in terms of throughput, data transfer, energy consumption, less packet drops and routing overhead.

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