Load Balanced And Optimized Position Update Scheme For Geographic Routing In Mobile Ad-hoc Networks

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***Abstract*--In Adaptive position update (APU) for geographic routing the missing and false neighbor increased and create hole in the geographic routing path. In addition neighbor nodes gets overload and paths are over utilized or under utilized at the same time. It Reduces data delivery ratio and routing performance. In my Proposal present Load Balanced Optimal Position Update strategy use the beaconing of geographic routing in MANET, to Load balance is arrived by removing holes in the neighbor nodes. Optimal position update is done based on the transmission ranges of the neighbor nodes. In their when remaining load of a detour node is reaching a predefined threshold value of load-critical, release it from routing activities and establish new detour paths, when all the existing detour paths are load-critical .It also calculate packet delivery ratio and average end-to-end delay ,localization error, network node density per area .NS2 simulations is conducted by using Ad-hoc On Demand Distance Vector Routing (AODV) with Load balance optimal geographic routing protocol against existing scheme of APU in different node density per square region, node transmission ranges of MANET topology.**

***Index Terms*--Wireless Communication, Algorithm/Protocol Design and Analysis, and Routing Protocols.**

I. INTRODUCTION

The past decade has seen many advances in physical-layer wireless communication theory and their implementation in wireless systems. Wireless communication is one of the most vibrant areas in the communication field today. There are two fundamental aspects of wireless communication that make the problem challenging and interesting. These aspects are by and large not as significant in wire line communication. Unlike in the wired world where each transmitter–receiver pair can often be thought of as an isolated point-to-point link, wireless users communicate over the air and there is significant interference between them. Geographic routing protocols are becoming an attractive choice for use in mobile ad hoc networks.

The underlying principle used in these protocols involves selecting the next routing hop from amongst a node's neighbors, which is geographically closest to the destination. Since the forwarding decision is based entirely on local knowledge, it obviates the need to create and maintain routes for each destination. The forwarding strategy employed in the aforementioned geographic routing protocols requires the following information: (i) the position of the final destination of the packet and (ii) the position of a node's neighbors. The former can be obtained by querying a location service such as the Grid Location System (GLS) or Quorum. We generalize and unify a range of recent results in quantized control systems (QCS) and networked control systems (NCS) literature and provide a unified framework for controller design for control systems with quantization and time scheduling via an emulation-like approach.

Position updates are costly in many ways. Each update consumes node energy, wireless bandwidth, and increases the risk of packet collision at the medium access control (MAC) layer. Packet collisions cause packet loss which in turn affects the routing performance due to decreased accuracy in determining the correct local topology. A lost data packet does get retransmitted, but at the expense of increased end-to-end delay. Internet commerce and online commodity exchanges suffer from distrust among sellers and buyers, who are often strangers to each other. The authors present a new P2P reputation system based on fuzzy logic inferences, which can better handle uncertainty, fuzziness, and incomplete information in peer trust reports.

Due to dynamic nature of mobile ad-hoc network (MANETs) which results in link breaks and repeatedly changing topology the aim of scheduling algorithm becomes more complex. A routing protocol specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network, the choice of the route being done by routing algorithms. Each router has a prior knowledge only of networks attached to it directly. A routing protocol shares this information first among immediate neighbors, and then throughout the network.

This way, routers gain knowledge of the topology of the network. For a discussion of the concepts behind routing protocols.

A routing protocol is a standardized process by which routers learn and communicate connectivity information, called routes, each of which describes how to reach a destination host and network. Routers that wish to exchange routing information must use the same routing protocol to communicate routing information.

II. RELATED WORK

Greedy Perimeter Stateless Routing (GPSR), a novel routing protocol for wireless datagram networks that uses the positions of routers and a packet's destination to make packet forwarding decisions. GPSR makes greedy forwarding decisions using only information about a router's immediate neighbors in the network topology [1]. Using location information to help routing is often proposed as a means to achieve scalability in large mobile ad hoc networks. However, location-based routing is difficult when there are holes in the network topology and nodes are mobile or frequently disconnected to save battery. Terminode routing, presented here, addresses these issues. It uses a combination of location-based routing (Terminode Remote Routing, TRR), used when the destination is far, and link state routing (Terminode Local Routing, TLR), used when the destination is close [2].

An approach to utilize location information to improve performance of routing protocols for ad hoc networks. By using location information, the proposed Location-Aided Routing (M) protocols limit the search for anew route to a smaller "request zone" of the ad hoc network. This results in a significant reduction in the number of routing messages. We present two algorithms to determine the request zone, and also suggest potential Optimizations to our algorithms [3]. An ad hoc network is the cooperative engagement of a collection of mobile nodes without the required intervention of any centralized access point or existing infrastructure. In this paper we present Ad hoc On Demand Distance Vector Routing (AODV) a novel algorithm for the operation of such ad hoc networks [4].

GLS is a new distributed location service which tracks mobile node locations. GLS combined with geographic forwarding allows the construction of ad hoc mobile networks that scale to a larger number of nodes than possible with previous work. GLS is decentralized and runs on the mobile nodes themselves, requiring no fixed infrastructure. Each mobile node periodically updates a small set of other nodes with its current location [5]. Scalable routing for wireless communication systems was a compelling but elusive goal. Recently, several routing algorithms that exploit geographic information have been proposed to achieve this goal [6]. Coupled with the local next hop decision in geographic routing, NADV enables an adaptive and efficient cost-aware routing strategy. Depending on the objective or message priority, applications can use the NADV framework to minimize various types of link cost [7].

In geographic routing, nodes need to maintain up-to-date positions of their immediate neighbours for making effective forwarding decisions. Periodic broadcasting of beacon packets that contain the geographic location coordinates of the nodes is a popular method used by most geographic routing protocols to maintain neighbour positions [8]. In position-based routing protocols, each node periodically transmits a short hello message (called beacon) to announce its presence and position. Receiving nodes list all known neighbor nodes with their position in the neighbor table and remove entries after they have failed to receive a beacon for a certain time from the corresponding node. In highly dynamic networks, the information stored in the neighbor table is often outdated and does no longer reflect the actual topology of the network causing retransmissions and rerouting that consume bandwidth and increase latency [9].

GOAFR is the first ad-hoc algorithm to be both asymptotically optimal and average-case efficient. For our simulations we identify a network density range critical for any routing algorithm [10]. Routing of packets in mobile ad-hoc networks with a large number of nodes or with high mobility is a very difficult task and current routing protocols do not really scale well with these scenarios. The Beacon-Less Routing Algorithm (BLR) presented in this paper is a routing protocol that makes use of location information to reduce routing overhead [11]. The random waypoint model is a commonly used mobility model for simulations of wireless communication networks. By giving a formal description of this model in terms of a discrete time stochastic process, we investigate some of its fundamental stochastic properties with respect [12].

III. LOAD BALANCED AND OPTIMIZED POSITION UPDATE SCHEME

Present a Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol. Optimized position update scheme involves a strategy procedure which evolves optimality of beaconing packet updates to be done. Optimal threshold is arrived to attain neighbor node position with evaluation of transmission range of nodes in vicinity. Load balance among neighbor nodes based on boundary of hole arrived due to over shedding or under utilization. Nodes on single detour path increases load in a particular neighbor node due to the heavy routing efforts around a hole. Construct multiple detour paths for a hole. For packet routing around the whole suitable path is dynamically determined from the set of detour paths.

Load is fairly distributed with more nodes on extra detour paths. Nodes on detour paths are optimally load balanced. To prevent the over shedding of load on detour nodes arrive a threshold of remaining load of detour nodes. When remaining load of a detour node is reaching a predefined threshold value of load-critical, release it from routing activities. Establish new detour paths, when all the existing detour paths are load-critical. Performance metric for evaluation are Update over head, Optimal load threshold, Holes of neighbor nodes, Routing performance in terms of packet delivery ratio and average end-to-end delay localization error radio propagation range network node density per area

The phases involved in the proposed scheme are

- MANET Geographic Routing
- Adaptive Position Update
- Mobile Prediction and On-Demand Learning Rule
- Optimized Position Update
- Load Balancing

3.1. MANET Geographic Routing

MANET select next routing hop from node's neighbors geographically closest to the destination. Forwarding decision is based entirely on local knowledge create and maintain routes for each destination. Position-based routing protocols are highly scalable robust to frequent changes in network topology. Forwarding decision is made on the fly each node selects optimal next hop based on most current topology. Forwarding strategy employed in geographic routing protocols need position of final destination of the packet and position of a node's neighbors. Each node exchanges its own location information with its neighboring nodes. Each node builds a local map of the nodes. Location update packets are usually referred to as beacons. Beacons are broadcast periodically to maintain accurate neighbor list at each node.

3.2. Adaptive Position Update

All nodes aware of their own position and velocity and links are bi-directional. Beacon updates include current location and velocity of the nodes. Data packets piggyback position and velocity updates. All one-hop neighbors operate in promiscuous mode overhear data packets. Initialization each node broadcasts beacon inform its neighbors about its presence, current location and velocity. In geographic routing protocols each node periodically broadcasts its current location information. Position information received from neighboring beacons is stored at each node.

Based on the position updates received from its neighbors each node continuously updates its local topology represented as neighbor list. Nodes from neighbor list are considered for data forwarding. Beacons maintain accurate representation of local topology. APU adapts beacon update intervals to mobility dynamics of the nodes and amount of data being forwarded in neighborhood of nodes. APU employs two mutually exclusive beacon triggering rules.

3.3. Mobile Prediction and On-Demand Learning Rule

Mobile Prediction (MP) location prediction is based on the physics of motion to estimate a node's current location. Nodes are located in two-dimensional coordinate system location indicated by the x and y coordinates. Deviation threshold is Acceptable Error Range (AER) acts as trigger for node to broadcast its current location and velocity as a new beacon. MP rule tries to maximize effective duration of each beacon by broadcasting a beacon only when predicted position information based on previous beacon becomes inaccurate. This extends effective duration of the beacon for nodes with low mobility reducing number of beacons. Highly mobile nodes broadcast frequent beacons to ensure, neighbors are aware of rapidly changing topology.

On-Demand Learning (ODL) maintains more accurate local topology in the regions of network where significant data forwarding activities are on-going. Node broadcasts beacons on-demand in response to data forwarding activities occur in the vicinity of that node. Whenever a node overhears a data transmission from a new neighbor it broadcasts a beacon as a response. By a new neighbor, imply a neighbor who is not contained in neighbor list of this node.

3.4. Optimized Position Update

Optimized position update scheme formulate a strategic procedure. Identify optimal value of beacon packet update state. Location of the beacon originated node is transmitted along. Velocity of the beacon measured to know the latency to reach destined neighbor node. Optimal threshold arrived must identify neighbor node position. Evaluate transmission range of nodes in vicinity of neighbor list.

3.5. Load Balancing

Load balance among neighbor nodes is based on boundary of hole arrived due to over shedding or under utilization. Nodes on single detour path increase the load in a particular neighbor node due to the heavy routing efforts around a hole. Construct multiple detour paths for a hole. For packet routing around the hole a suitable path is dynamically determined from the set of detour paths. Load balance of the neighbor node with its location update status improves the recent update node location which minimizes location update latency and reduce beacon loss rate. Load is optimally distributed to more nodes on extra detour paths. Nodes on detour paths are optimally load balanced. To prevent the over shedding of load on detour nodes arrive a threshold of remaining load of detour nodes. When remaining load of a detour node is reaching predefined threshold value of load-critical is issued from routing activities. Generate new detour paths when all the existing detour paths are load-critical.

IV. RESULTS AND DISCUSSIONS

In this section we evaluate performance of Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol through NS2 simulation. Proposed Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol has been compared to Existing beaconing strategy for geographic routing protocols that is very latest and the most similar to our proposed model.

In order to construct performance evaluations and comparisons, we have simulated proposed Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol and existing beaconing strategy for geographic routing protocols using the NS2 simulator. In order to compare these methods in the similar conditions, we have considered the identical simulation scenarios as described. The simulation is conducted with a NS2 simulator which simulates several broadcast algorithms on random ad hoc networks. To generate a random ad hoc network, n hosts are randomly placed in a restricted 1000 m × 1000 m area.

The performance of proposed Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol has been compared to existing beaconing strategy for geographic routing protocols is evaluated by the following metrics.

- Average end-to-end delay
- Packet delivery ratio
- Network node density per area.

4.1. Average end to end delay**:**

Average end-to-end delay is the latency for packets to reach destined location. Results show that the proposed Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol is higher than that of the Existing beaconing strategy for geographic routing protocols. We notice that for the uppermost curve in Performance of Proposed Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol in terms of end-to-end delay attains 2-8 % lower than the existing beaconing strategy for geographic routing protocols.

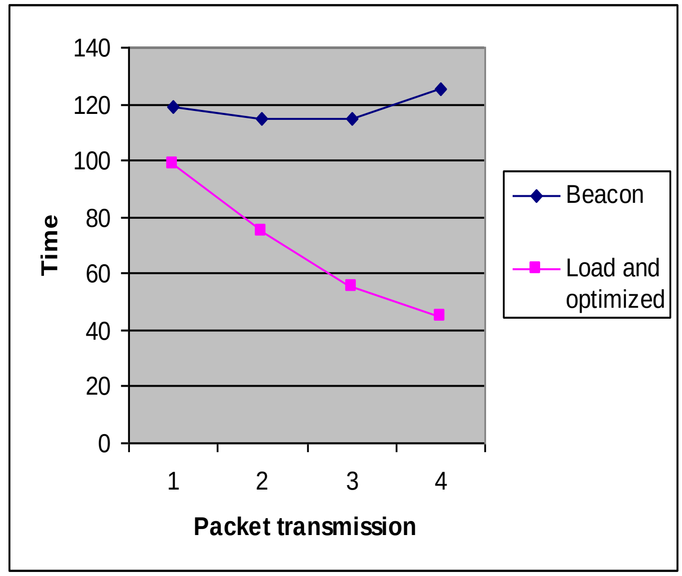

Fig.1 End-to-end delay

4.2. Packet delivery ratio

Packet delivery ratio is the number of beacon packets broadcasted

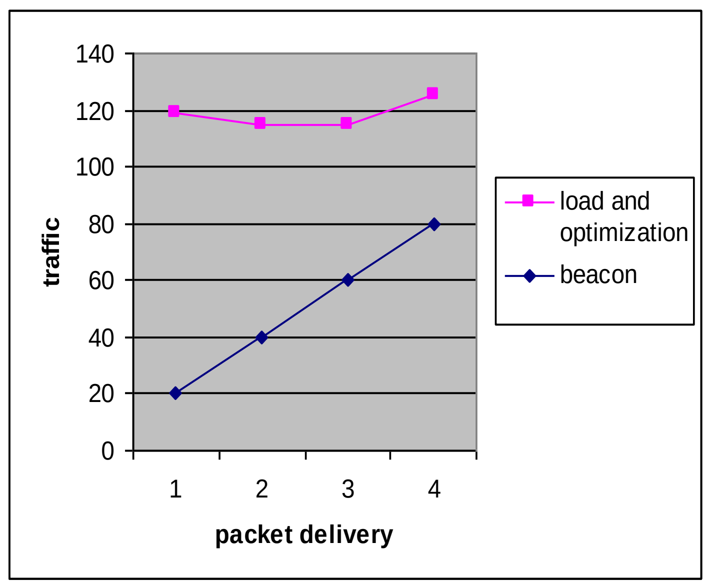

Fig.2 Packet delivery

Results show that the proposed Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol is higher than that of the Existing beaconing strategy for geographic routing protocols.

We notice that for the uppermost curve in Performance of Proposed Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol in terms of delivery ratio attains 20% to 60% higher than existing beaconing strategy for geographic routing protocols.

4.3. Network node density per area

Network node density per area is the number of nodes in specific area of the network.

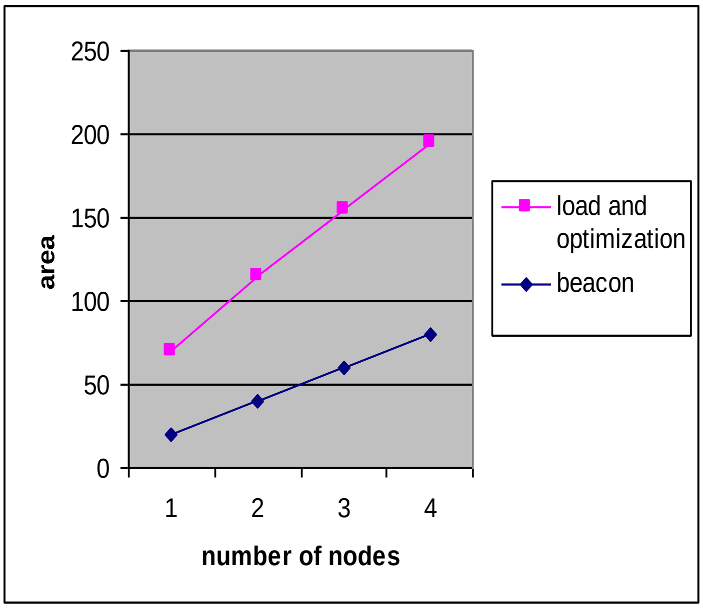

Fig.3 Network node density.

Results show that the proposed Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol is higher than that of the Existing beaconing strategy for geographic routing protocols. We notice that for the uppermost curve in Performance of Proposed Load Balanced and Optimized Position Update scheme for beaconing of geographic routing protocol in terms of node density is 2-6 % higher than the existing beaconing strategy for geographic routing protocols.

V. CONCLUSION

We have identified the need to adapt the beacon update policy employed in geographic routing protocols to the node mobility dynamics and the traffic load. We proposed the Adaptive Position Update (APU) strategy to address these problems. The APU scheme employs two mutually exclusive rules. The MP rule uses mobility prediction to estimate the accuracy of the location estimate and adapts the beacon update interval accordingly, instead of using periodic beaconing. The ODL rule allows nodes along the data forwarding path to maintain an accurate view of the local topology by exchanging beacons in response to data packets that are overheard from new neighbors.

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