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Reliable Data Delivery For Dynamically Mobile Ad Hoc Sensor Networks

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Abstract Wireless sensor networks (WSNs) are in many aspects quite similar to Mobile Ad Hoc Networks (MANETs) and Wireless Mesh Networks (WMNs); however, two distinct characteristics call for a different approach. First, the need for energy-efficient operation severely constrains the capabilities of individual sensor nodes such as processing, memory, and communication are limited resources. Second, deployment scenarios of WSN highly structure the communication topology between sensor nodes in the network; in particular, communication between two arbitrary sensor nodes in the network, being part of many ad hoc and mesh scenarios, does not occur in WSNs where most information is relayed either between neighbors or to/from the base station. In this paper, a novel Position-based Opportunistic Routing (POR) protocol is proposed, in which several forwarding candidates cache the packet that has been received using MAC interception. If the best forwarder does not forward the packet in certain time slots, suboptimal candidates will take turn to forward the packet according to a locally formed order. In this way, as long as one of the candidates succeeds in receiving and forwarding the packet, the data transmission will not be interrupted. Potential multi paths are exploited on the fly on a per packet basis, leading to POR’s excellent robustness.

I. INTRODUCTION

To provide peer-to-peer communication over MANETs, mobile nodes have to cooperate each other in order to process network function like packet routing. These nodes may roam freely with various mobility patterns. At this point of view, it is a very important subject to design the scalable packet routing protocol that supports such nodes' mobility. Recent researches for geographical Ad-Hoc routing protocol use benefits of similarity among physical and topological adjacency to process the problem of protocol's scalability. The general concept is that each node has to aware the location of a target node and its neighbor node only to make a transmission decision. The self-description nature of location information is essential to accomplish such stateless property. Location based routing protocol includes Location-Aided Routing (LAR), Greedy Perimeter Stateless Routing (GPSR), DREAM, and GRID. In LAR, mobile nodes are flooding location query messages reactively over the entire networks when nodes eager to find the location information of a target node.

In DREAM, each node needs to construct complete location databases for entire networks. Mobile nodes are flooding their location information in advance to all over the networks. Even though their basic functions, these two methods cannot extent to large-scale networks. Scalable location management is a very difficult subject : First, if one node requests the location information of another node, it really does not have any prior knowledge for that requested node except its identification. It is impossible to maintain the static relationship between identification of a node and its actual location because of the node's mobility. Second, location information service itself has to be operated by using only geographical Ad-Hoc routing protocol in order to distribute the location information.

Two quantities of fundamental interest in a delay-tolerant mobile ad hoc network: the network capacity and the minimum energy function. Frequent location update specifics do influence the energy scales of the sending and forwarding nodes. Using a cell-partitioned model of the network, we obtained exact expressions for both these quantities in terms of the network parameters (number of nodes N and number of cells C) and the steady state location distribution of the mobility process. Our results hold for general mobility processes (possibly non uniform) and our analytical technique can be extended to other models with additional scheduling constraints. We also proposed two simple scheduling strategies that can achieve these bounds arbitrarily closely at the cost of an increased delay. Both these schemes restrict packets to at most 2 hops and make scheduling decisions purely based on the current user locations and independent of the actual queue backlogs. For both schemes, we computed bounds on the average packet delay using a Lyapunov drift technique.

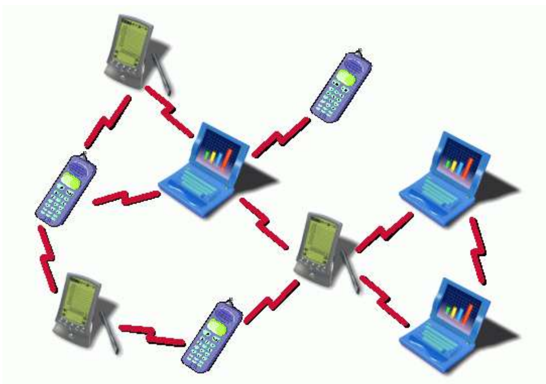

Figure 1 An Example Ad-hoc Network

In this paper, we have focused on location update specifics algorithms that operate according to the network structure. We assumed that the packets themselves are kept intact and are not combined or network coded. Determining and implementing the GLS which is a future scope of this paper has also been achieved in this context.

Wireless networks have been in use since 1980s. We have seen their evolutions to first, second and third generation's wireless systems. Wireless systems operate with the aid of a centralized supporting structure such as an access point. These access points assist the wireless users to keep connected with the wireless system, when they roam from one place to the other.

The presence of a fixed supporting structure limits the adaptability of wireless systems. In other words, the technology cannot work effectively in places where there is no fixed infrastructure. Recent advancements such as Bluetooth introduced a new type of wireless systems known as mobile ad-hoc networks. Mobile ad-hoc networks or "short live" networks operate in the absence of fixed infrastructure. They offer quick and easy network deployment in situations where it is not possible otherwise. Ad-hoc is a Latin word, which means "for this or for this only." Mobile ad-hoc network is an autonomous system of mobile nodes connected by wireless links; each node operates as an end system and a router for all other nodes in the network.

In this paper, a novel Position-based Opportunistic Routing (POR) protocol is proposed, in which several forwarding candidates cache the packet that has been received using MAC interception. If the best forwarder does not forward the packet in certain time slots, suboptimal candidates will take turn to forward the packet according to a locally formed order. In this way, as long as one of the candidates succeeds in receiving and forwarding the packet, the data transmission will not be interrupted. Potential multipaths are exploited on the fly on a per packet basis, leading to POR's excellent robustness.

The main aspects of this paper can be summarized as follows:

- We propose a position-based opportunistic routing mechanism which can be deployed without complex modification to MAC protocol and achieve multiple reception without losing the benefit of collision avoidance provided by 802.11. . The concept of in-the-air backup significantly enhances the robustness of the routing protocol and reduces the latency and duplicate forwarding caused by local route repair.
- In the case of communication hole, we propose a Virtual Destination-based Void Handling (VDVH) scheme in which the advantages of greedy forwarding
- (e.g., large progress per hop) and opportunistic routing can still be achieved while handling communication voids.
- We analyze the effect of node mobility on packet delivery and explain the improvement brought about by the participation of forwarding candidates.

II. EXISTING SYSTEMS

Multipath Routing

Multipath routing, which is typically proposed to increase the reliability of data transmission in wireless ad hoc networks, allows the establishment of multiple paths between the source and the destination.

Existing multipath routing protocols are broadly classified into the following three types:

1) Using alternate paths as backup
2) Packet replication along multiple paths
3) Split, multipath delivery, reconstruction using some coding techniques.

It may be difficult to find suitable number of independent paths. More importantly, in the face of high node mobility, all paths may be broken with considerably high probability due to constantly changing topology, especially when the end-to-end path length is long, making multipath routing still incapable of providing satisfactory performance.

PRO

An opportunistic retransmission protocol PRO is proposed to cope with the unreliable wireless channel. Implemented at the link layer, PRO leverages on the path loss information Receiver Signal Strength Indicator (RSSI) to select and prioritize relay nodes. By assigning the higher priority relay a smaller contention window size, the node that has higher packet delivery ratio to the destination will be preferred in relaying.

Geographic routing

Geographic routing (GR) uses location information to forward data packets, in a hop-by-hop routing fashion. Greedy forwarding is used to select next hop forwarder with the largest positive progress towards the destination while void handling mechanism is triggered to route around communication voids. No end-to end routes need to be maintained, leading to GR's high efficiency and scalability.

Drawbacks Of Existing System

- GR is very sensitive to the inaccuracy of location information.
- If the node moves out of the sender's coverage area, the transmission will fail.

III.PROPOSED SYSTEM

In this paper we propose a position-based opportunistic routing mechanism which can be deployed without complex modification to MAC protocol and achieve multiple receptions without losing the benefit of collision avoidance.

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We analyze the effect of node mobility on packet delivery and explain the improvement brought about by the participation of forwarding candidates.

Network Formation

In this module we can construct a topology to provide communication paths for wireless adhoc network. Here the node will give the own details such as Node ID through which the transmission is done and similarly give the neighbor nodes details.

Packet Transmission

In this module the node has transmit the packet from source to destination. Transmission stage occurs at time in which node transmits if it has a packet.

Acknowledgement Module

In this module the nodes send acknowledgement details. Set of nodes that have received the packet transmitted by node. In this module nodes send acknowledgement packet who received the packet from the source. In the reception and acknowledgment stage, successful reception of the packet transmitted by node is acknowledged to it by all the nodes. We assume that the delay for the acknowledgment stage is small enough (not more than the duration of the time slot) such that node infers by time. The acknowledgment packet of node includes a control message known as estimated best score (EBS).

Relay Module

In this module the node select the routing action according to the randomized rule. Node transmits FO (forwarding), a control packet that contains information about routing decision at some time strictly between times.

Update Module

In this module the node update the following details. After finishing the transmission and relay the node will update the score Vector. The node updates EBS Message for future acknowledgements.

Architecture flow

Below architecture diagram represents mainly flow of requests between clients and server/monitoring nodes. In this scenario overall system is designed in two tires separately. For two layers called presentation layer using java swings, business logic layers using java sources This project was developed using 2-tire architecture without the need for repository. In this scenario nodes are validated by a server in order to join network.

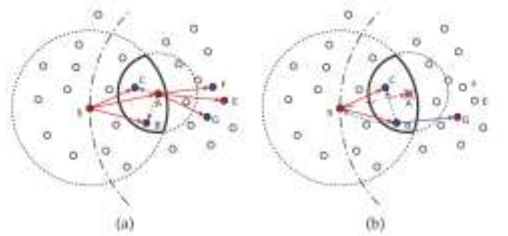

Figure 2 System Architecture

Performance is measured in terms of the output provided by the application. Requirement specification plays an important part in the analysis of a system. Only when the requirement specifications are properly given, it is possible to design a system, which will fit into required environment. It rests largely with the users of the existing system to give the requirement specifications because they are the people who finally use the system. This is because the requirements have to be known during the initial stages so that the system can be designed according to those requirements. It is very difficult to change the system once it has been designed and on the other hand designing a system, which does not cater to the requirements of the user, is of no use.

The requirement specification for any system can be broadly stated as given below:

- The system should be able to interface with the existing system
- The system should be accurate
- The system should be better than the existing system

The existing system is completely dependent on the user to perform all the duties.

Implementation is the stage of the project when the theoretical design is turned out into a working system. Thus it can be considered to be the most critical stage in achieving a successful new system and in giving the user, confidence that the new system will work and be effective.

The implementation stage involves careful planning, investigation of the existing system and it's constraints on implementation, designing of methods to achieve changeover and evaluation of changeover methods.

Implementation is the process of converting a new system design into operation. It is the phase that focuses on user training, site preparation and file conversion for installing a candidate system. The important factor that should be considered here is that the conversion should not disrupt the functioning of the organization.

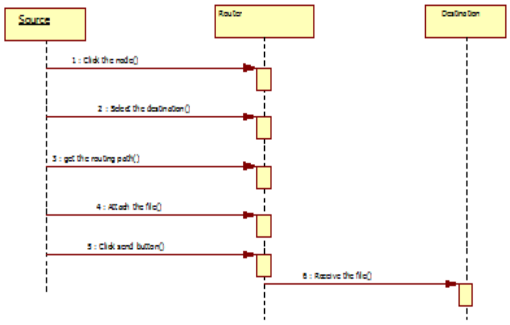

Figure 3 Sequence Diagram

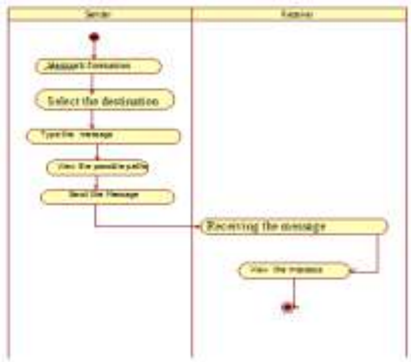

Figure 4 Activity Diagram

IV. Results and Discussions

Testing can be performed starting from smallest and lowest level modules and proceeding one at a time. For each module in bottom up testing a short program executes the module and provides the needed data so that the module is asked to perform the way it will when embedded within the larger system.

Since the detailed activities usually performed in the lower level routines are not provided stubs are written. A stub is a module shell called by upper level module and that when reached properly will return a message to the calling module indicating that proper interaction occurred. No attempt is made to verify the correctness of the lower level module.

In this paper, a reliable load-balancing routing (RLBR) protocol was proposed based on a per-hop load balancing mechanism of the routing layer. It leverages recent advancements over the standard network layer components provided by the TinyOS2.x implementation of MultihopLQI. RLBR consumes less energy while reducing topology repair latency and supports various aggregation weights by redistributing packet relaying loads. It also allows for adapting the amount of traffic to the fluctuations in network connectivity and energy expenditure.

Overall, RLBR performs well with a high success rate of packet delivery and moderate energy consumption. While the experiments conducted here have highlighted the substantial performance gains of RLBR, the ongoing work aims to improve the performance of RLBR by extending the experiments to simulations on large-scale WSN.

Test Case No	Input	Expected Result	Actual Result	Result
1	If we press enter button by entering the wrong search name.	Warning message of “enter correct search name”	Warning message of “node not found”.	Pass
2	Without entering the source name if we press enter button.	Warning message of “enter source name.”	Warning message of “enter a send from node name.”	Pass
3	Without entering the message press send button.	Warning message of “The please enter message”	Warning message of “enter a message” .	Pass
4	Without entering the destination name if we press send button	Warning message of “please enter the destination name”	Warning message of “enter one or more valid sent to names.”	Pass
5	If destination node is out of range for existing	Warning message of “then an error has occurred due to out of range”	Warning message of “error due to node is out of range”	Pass
6	If destination node is out of range for proposed	Warning message of “then an error has occurred due to out of range”	Didn’t get any waning message	Fail

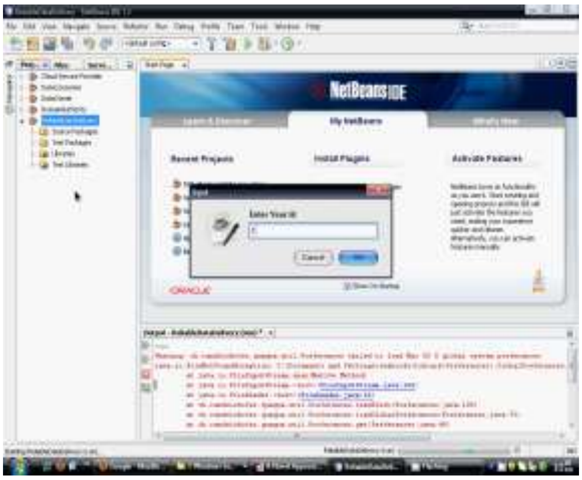

Figure 5 Implemented System Screen Shot

Figure 6 Node manager Screen Shot

Figure 7 Node Manager Screen Shoy-2

On the other hand, inherited from geographic routing, the problem of communication void is also investigated. To work with the multicast forwarding style, a virtual destination-based void handling scheme is proposed. By temporarily adjusting the direction of data flow, the advantage of greedy forwarding as well as the robustness brought about by opportunistic routing can still be achieved when handling communication voids. Traditional void handling method performs poorly in mobile environments while VDVH works quite well.

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Biography

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