International Journal of Research in Computer Engineering and Electronics. 1
VOl : 2 ISSUE :1 (Feb 2013)
ISSN 2319-376X

Secured Data Delivery for Mobile Adhoc Networks

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Abstract— Mobile Ad-hoc Network is an infrastructure less and decentralized network which needs a robust dynamic routing protocol. To accommodate the needs of communications for Mobile Ad hoc Network many routing protocols have been proposed. In this project, there is problem in delivering data packets for highly dynamic mobile ad hoc networks in a reliable and timely manner. The existing ad hoc routing protocols are susceptible to node mobility for the large scale networks. An efficient Position-based Opportunistic routing protocol was introduced for this issue. It takes advantage of the stateless property of geographic routing and the broadcast nature of wireless medium. Some of the neighbor nodes that have overheard the transmission will serve as forwarding candidates when a data packet is sent out and forward the packet if it is not relayed by the specific best forwarder within a certain period of time.

Index Terms— Mobile ad hoc network, geographic routing, stateless property, node mobility, forwarding candidates, data delivery, opportunistic routing..

1 INTRODUCTION

A mobile ad-hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless. Since each device in a MANET is free to move independently in any direction the MANETs change its links to other devices frequently. It can be known as router since each must forward traffic unrelated to its own use. Equipping each device to continuously maintain the information required to properly route traffic is the primary challenge in building a MANET. Such networks may operate by themselves or may be connected to the larger Internet. MANETs are a kind of networks that usually has a routable networking environment on top of a Link Layer ad hoc network.

In this paper we proposed a novel Position-based Opportunistic Routing (POR) protocol in which several forwarding candidates cache the packet that has been received. If the best forwarder does not forward the packet in a particular time slots, then the suboptimal candidates will take turn to forward the packet according to a locally formed order. The effect of node mobility on packet delivery can be analyzed and explain the improvement brought about by the participation of forwarding candidates.

Since there is high mobility of the independent mobile nodes the topology of the MANET may change uncertainly and rapidly, and because of the network decentralization, each node in the MANET will act as a router to discover the topology and maintain the network connectivity.

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The set of applications for MANETs is ranging from large-scale to small, static networks that are constrained by power sources. Moreover the legacy applications that move from traditional infrastructure environment into the ad hoc context, a great deal of new services will be generated for the new environment.

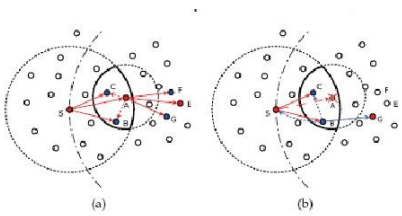


Figure 1 (a) The operation of POR in normal situation. (b) The operation of POR when the next hop fails to receive the packet.

A lot of research was done in the past but the most significant contributions were the PGP (Pretty Good Privacy) and the trust based security but none of the protocols made a decent trade off between security and performance. To enhance the security in MANETs many researchers have suggested and implemented new improvements to the protocols and some of them have suggested new protocols.

2. ANALYSIS

In the existing system the data can be delivered from source to destination node at any time. But we may not be sure that it can be delivered in a reliable and timely manner. In the multi-

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

Paper [2] suggested that the path breakage occurs frequently due to node mobility, node failure and channel impairments in the wireless sensor networks. It is challenging to combat path breakage with minimal control overhead in adapting to rapid topological changes. All nodes inside the transmission range of a single transmitting node may receive the packet due to the Wireless Broadcast Advantage (WBA); hence naturally they can serve as cooperative caching and backup nodes if the intended receiver fails to receive the packet. In this paper, a distributed robust routing protocol in which nodes work cooperatively to enhance the robustness of routing against path breakage can be presented. The energy efficiency of cooperative routing with noncooperative routing is compared and shows that our robust routing protocol can significantly improve robustness while achieving considerable energy efficiency.

MANETs can be used for facilitating the collection of sensor data for data mining for a variety of applications such as air pollution monitoring and different types of architectures can be used for such applications. A key characteristic of such applications is that nearby sensor nodes monitoring an environmental feature typically register similar values should be noted. Due to the spatial correlation between sensor observations inspires the techniques for in-network data aggregation and mining. A wide class of specialized algorithms can be developed to develop more efficient spatial data mining algorithms as well as more efficient routing strategies by measuring the spatial correlation between data sampled by different sensors. The performance models for MANET by applying Queueing Theory were developed by the researches.

Paper [3] suggested that the geographic routing has been introduced in mobile ad hoc networks and sensor networks. It has been proven to provide drastic performance improvement over strictly address-centric routing schemes under ideal settings. Its performance in the face of location errors is not well understood while geographic routing has been shown to be correct and efficient when location information is accurate. We study the effect of inaccurate location information caused by node mobility under a rich set of scenarios and mobility models. The two main problems, named LLNK and LOOP, which are caused by mobility-induced location errors were identifeid. We propose two mobility prediction schemes namely neighbor location prediction (NLP) and destination location prediction (DLP) to mitigate these problems based on analysis via ns-2 simulations. The noticeable improvement under all mobility models used in our study was shown in Simulation results. Our schemes achieve up to 27 percent improvement in packet delivery and 37 percent reduction in network resource wastage without incurring any additional communication or intense computation on average under the settings we examine.

In paper [4] the routing in multihop wireless networks is challenging due to unreliable wireless channels. Geographic opportunistic routing (GOR) was proposed to cope with the unreliable transmissions by exploiting the broadcast nature of the wireless medium and the spatial diversity of the network topology. We can focus on networks with a single channel rate previous studies on GOR. The capability of supporting multiple channel rates in wireless systems has not been studied for GOR. We carry out a study on the impacts of multiple rates, candidate selection, and prioritization on the performance of GOR.

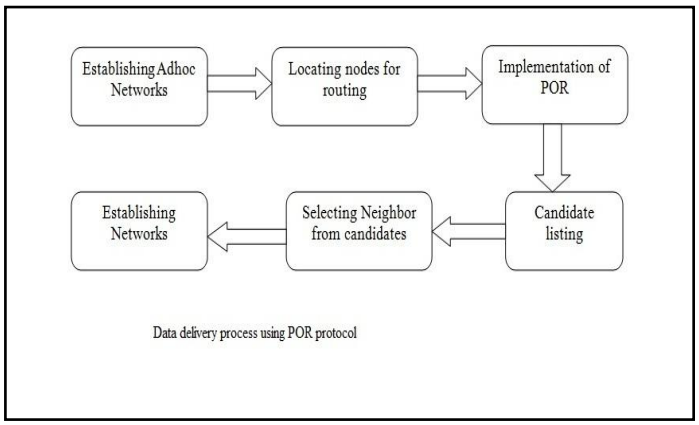
Traditional topology based MANET's routing protocols are quite susceptible to node mobility. It is very difficult to maintain a deterministic route due to the constantly and even fast changing network topology. The discovery procedure and recovery procedure are also time and energy consuming. The data packets will get lost or be delayed for a long time until the reconstruction of the route, causing transmission interruption once the path breaks. The leading to high efficiency and scalability no end-to-end routes need to be maintained. The neighbor which is located away from the sender is chosen as the next hop. The transmission will fail if the node moves out of the network. If the best candidate does not forward the packet in certain time slots the suboptimal Candidates will take turn to forward the packet according to a locally formed order as there will be n number of candidates among the network.

From paper [5] we can identify that the multihop wireless mesh networks are becoming a new attractive communication paradigm ease of deployment and owing to their low cost. Routing protocols are critical to the performance and reliability of wireless mesh networks. The traffic along predetermined paths send by traditional routing protocols and face difficulties in coping with unreliable and unpredictable wireless medium. We propose a Simple Opportunistic Adaptive Routing protocol (SOAR) to explicitly support multiple simultaneous flows in wireless mesh networks. SOAR incorporates the four major components to achieve high throughput and fairness: i) to leverage path diversity while minimizing duplicate transmissions we can use adaptive forwarding path selection, ii) to let only the best forwarding node forward the packet using priority timer-based forwarding, iii) to efficiently detect and retransmit lost packets there is local loss recovery, and iv) to determine an appropriate sending rate we use adaptive rate control according to the current network conditions.

3. PERFORMANCE EVOLUTION

Based on geographic routing and opportunistic forwarding we can design the Position based Opportunistic routing protocol. The nodes are assumed to be aware of their own location and

the positions of their direct neighbors. The source node gets the file location of the destination when it wants to transmit a packet and attaches it to the packet header. The multihop path



may diverge from the location of the destination and a packet would be dropped even if it has already been delivered into the neighborhood of the destination due to destination node's movement.

3.1 FORWARDING CANDIDATES SELECTION AND PRIORITY

The selection and prioritization of forwarding candidates is one of the key problems in POR The nodes located in the forwarding area would get the chance to be backup nodes. The sender and the next hop node can be used to determine the forwarding area. A node located in the forwarding area satisfies the following two conditions: 1) it makes positive progress toward the destination; and 2) its distance to the next hop node should not exceed half of the transmission range of a wireless node so that ideally all the forwarding candidates can hear from one another. The following algorithm shows how to select and prioritize the forwarding candidates.

Every node that maintains a forwarding table which is used for the packets of each flow (which can be identified as source-destination pair) that it has sent or forwarded. During the data packet transmissions the forwarding table is constructed and its maintenance is much easier than a routing table. Only the current active flows were recorded in the table. There are more resources can be rebuilt for the requirement of the decrease in the route expire time in the conventional protocols.

Algorithm: Selection of Candidates

```
LN : Neighbor List
LC : Candidate List, initialized as an empty list
ND : Destination Node
base : Distance between current node and ND

if find (LN,ND) then
next hop ←ND
return
   end if
   for i ←0 to length (LN) do
LN[i].dist ← dist(LN[i],ND)
   end for
   LN.sort ()
   next hop ← LN[0]
   for i ← 1 to length(LN) do
if dist(LN[i],ND) >= base or length(LC) = N
then
break
else if dist(LN[i], LN[0]) < R/2 then
LC.add(LN[i])
end if
   end for
```

4. CONCLUSION AND FUTURE WORK

We describe the problem of reliable data delivery in highly dynamic mobile ad hoc networks in this paper. Due to node mobility in the face of frequent link the substantial data packets would get lost or experience long latency before restoration of connectivity. We propose a novel MANET routing protocol POR which takes the advantage of stateless property of geographic routing and broadcast nature of wireless medium inspired by the opportunistic routing

In future we confirmed that the effectiveness and efficiency of POR can be achieved through simulation. Here we can achieve the high packet delivery ratio and also the delay and duplication are the lowest.

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