Optimal Velocity control based energy charging model to Disaster aware mobile AdHoc Network

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Abstract

Mobile ad hoc networks (MANETs) have tremendous advantages over regular wireless networks. In MANETs, nodes usually cooperate and forward each other's packets in order to enable out of range communication. However, in hostile environments, some nodes may do so, either for saving their own resources or for intentionally disrupting their regular communications. This type of misbehaviour is generally referred to as packet dropping attack or black hole attack, which is considered as one of the most destructive attacks that leads to the network collapse. In this paper, we propose a disaster aware optimal velocity control routing protocol. The special network characteristics, such as limited battery power and mobility, make the prevention techniques based on cryptographic primitives that are ineffective to cope with such attack. Rather, a more proactive method is required to ensure the safety of the forwarding function by staving off malicious nodes from being involved in routing paths. Once such scheme fails, some economic-based approaches can be adopted to alleviate the attack consequences by motivating the nodes cooperation. As a backup, detection and reaction schemes remain as the final defense line to identify the misbehaving nodes and punish them. Here, we experimental the proposed system with throughput and end to end to delay to challenges that state of approaches for constructing an in-depth defense against such a complicated attack.

Keywords: Location Preserving, DSR Routing, MANET, DDOS Attack, Eavesdropping Attack, packet dropping.

1. Introduction

Rapid Development of the Mobile ad hoc networks (MANETs) are usually formed by a group of mobile nodes, interconnected via wireless links with features of self-organizing and independent infrastructure, which agree to cooperate and forward each other's packets. One of the basic assumptions for the design of routing protocols in MANETs is that every node is honest and cooperative. That means, if a node claims it can reach another node by a certain path or distance, the claim is trusted/true; similarly, if a node reports a link break, the link will no longer be used. While this assumption can fundamentally facilitate the design and implementation of routing protocols, it meanwhile introduces a vulnerability to several types of Denial of Service (DoS) attacks, eaves dropping attack particularly packet dropping attack. To launch such attack, a malicious node can stealthily drop some or all data or routing packets passing through it. Due to the lack of physical protection and reliable medium access mechanism, packet dropping attack represents a serious threat to the routing function in MANETs[12][13].

On other hand limited attack resource can easily join the network and compromise a legitimate node then subsequently start dropping packets that are expected to be relayed in order to disrupt the regular communications. Consequently, all the routes passing through this node fail to establish a correct routing path between the source and destination nodes. DSR is an on demand routing protocol [3], [4]. In DSR the network is completely self-organizing and self-configuring, without the need for any existing network infrastructure. The protocol is composed of the two mechanisms: route discovery and route maintenance, which allows nodes to discover and maintain source routes to arbitrary destinations in the ad hoc network [3]. DSR maintains a route cache which keeps track of all the routes. When a node needs to send a packet to a destination it first checks its cache if it already knows a route to the destination. If the route to destination is not available in the route cache then route discovery mechanism is initiated. Route Discovery allows any host in the ad hoc network to dynamically discover a route to any other host in the ad hoc network [3]. A route reply is sent back either if the RREQ packet reaches the destination node itself, or if the

RREQ reaches an intermediate node which has an active route to the destination in its route cache. The Route Maintenance procedure keeps check on the operation of the routes and informs the sender of any routing errors. Due to very high probability of routes being lost, Proactive protocols are traditionally classified as either distance-vector or link-state protocols.

The former are based on the distributed Bellman-Ford (DBP) algorithm [22], which is known for slow convergence because of the "counting-to-infinity" problem. To address the problem, ALERT an Anonymous routing protocol ,the Destination-Sequenced Distance-Vector routing (DSDV) [4] protocol was proposed for ad-hoc networks. On the other hand, link-state protocols, as represented by OSPF [3], have become standard in wired IP networks. They converge more rapidly, but require significantly more control traffic. Since ad-hoc networks are bandwidth limited and their topology changes often, an Optimized Link-State Protocol (OLSR) [5] has been proposed. While being suitable for small networks, some scalability problems can be seen on larger networks. The need to improve convergence and reduce traffic has led to algorithms that combine features of distance-vector and link-state schemes. Such a protocol is the wireless routing protocol (WRP) [6], which eliminates the counting-to-infinity problem and avoids temporary loop without increasing the amount of control traffic. [1] [10].To complement those efforts, this work studies the packet dropping attack, which is known as one of the most destructive threats in MANETs, and illustrates in depth the different schemes used by adversaries targeting on both reactive and proactive protocols.

Furthermore, we conduct an up-to-date survey of the most valuable contributions aiming to avoid the packet droppers. The careful examination and analysis has allowed us to carry out a comparative study of the existing security schemes in terms of specific design rationale and objectives. The ultimate goal is to identify the strengths and weaknesses of each scheme in order to devise a more effective and practical solution which can achieve a better trade-off between security and network performance. The remainder of the paper is

structured as follows. In section 2, we discuss related works of the Routing protocols in MANETs. Section 3 describes the proposed location preserving routing Technique .Experimental evaluation of the proposed system is presented in the Section 4. Finally, section 5 concludes the work and points out future research directions.

2. Related Work

DSR protocol

Dynamic Source Routing is a protocol developed for routing in mobile ad-hoc networks and was proposed for MANET [6]. In a nutshell, it works as follows: Nodes send out a ROUTE REQUEST message, all nodes that receive this message put themselves into the source route and forward it to their neighbours, unless they have received the same request before. If a receiving node is the destination, or has a route to the destination, it does not forward the request, but sends a REPLY message containing the full source route. It may send that reply along the source route in reverse order or issue a ROUTE REQUEST including the route to get back to the source, if the former is not possible due to asymmetric links. ROUTE REPLY messages can be triggered by ROUTE REQUEST messages or are gratuitous. After receiving one or several routes, the source selects the best (by default the shortest), stores it and sends mess ages along that path. The better the route metrics (number of hops, delay, bandwidth, or other criteria) and the sooner the REPLY arrives at the source, the higher the preference given to the route and the longer it will stay in the cache. When a ROUTE REPLY arrives very quickly after a ROUTE REQUEST has been sent out this is an indication of a short path, since the nodes are required to wait for a time corresponding to the length of the route they can advertise, before sending it. This is done in order to avoid a storm of replies. In case of a link failure, the node that cannot forward the packet to the next node sends an error message towards the source. Routes that contain a failed link can be `salvaged' by taking an alternate partial route that does not contain the bad link. Since DSR has no security mechanism they are vulnerable to much type of attacks. It assumes all nodes cooperate in the network so in its present status cannot defend itself from attacks.

Reactive Routing Protocols

Reactive Routing Protocols are also called on demand routing. It is more efficient than proactive routing. The main idea behind this type of routing is to find a route between a source and destination whenever that route is needed which helps to avoid routing overhead[20], whereas in proactive protocols we were maintaining all routes without knowing its state of use. So in reactive protocols it is not needed to maintain the routes which are not being used currently. This type of routing is on demand. On demand routing protocols [17], [18], [19] avoids the cost of maintaining routes that are not being used.

3. Proposed Solution - Overview

3.1 Network Model

We construct and Mobile Ad hoc Networks with several node. Each node in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet. Because of the infrastructure-less architecture of MANET, our risk-aware response system is distributed, which means each node in this system makes its own response decisions based on the evidences and its own individual benefits. Therefore, some nodes in MANET may isolate the malicious node, but others may still keep in cooperation with due to high dependency relationships.

3.2 Attack Models

Packet dropping attacks

Before analyzing the packet dropping attack in details, let us first summarize the different motives that incite some nodes to drop a packet rather than sending or relaying it. In general, a packet can be dropped at either MAC or network layers due to the following reasons:

• The size of packets' transmission buffer at MAC level is limited; therefore whenever the buffer is full any new packet arriving from higher layers will be dropped (buffer overflow).

• IEEE 802.11 protocol's [4] rules: a data packet is dropped if its retransmission attempts or the one of its corresponding RTS (Request To Send) frame has reached the maximum allowed number, owing to node's movement or collision (a lot of contending nodes).

• A data packet may be dropped or lost if it is corrupted during transmission due to some phenomenon specific to radio transmissions such as interference, hidden nodes and high bit error rate.

Black Hole Attacks in MANET

The black hole attack in MANETs can be classified into several categories in terms of the strategy adopted by the malicious node to launch the attack. In particular the malicious node can intentionally drop all the forwarded packets going through it (black hole), or it can selectively drop the packets originated from or destined to certain nodes that it dislikes. In order to launch a black hole attack, the first step for a malicious node is to find a way that allows it to get involved in the routing/forwarding path of data/control packets.

To do so, it exploits the vulnerabilities of the underlying routing protocols which are generally designed with strong assumption of trustworthiness of all the nodes participating in the network. Thus in fig.1 any node can easily misbehave and provoke a severe harm to the network by targeting both data and control packets. Dropping data packets leads to suspend the ongoing communication between the source and the destination node. More seriously, an attacker capturing the incoming control packets can prevent the associated nodes from establishing routes between them. To facilitate understanding, we illustrate them using representative routing protocol in MANETs.

3.3 Partitioning of the Zones based on the various network factors (PANEL)

Partitioning is carried out with help of the routing table. Routing table recovery includes local routing table recovery and global routing recovery. Local routing recovery is performed by victim nodes that detect the attack and automatically recover its own routing table. Global routing recovery involves with sending recovered routing messages by victim nodes and updating their routing table based on corrected routing information in real time by other nodes in MANET. Routing table recovery is an indispensable response and should serve as the first response method after successful detection of attacks.

3.4. Location Preserving Technique (AB-DSR)

Our adaptive Strategies for packet preserving to insertion attack and timing attack is established as follows, the response level is additionally divided into multiple bands. Each band is associated with an isolation degree, which presents a different time period of the isolation action. The response action and band boundaries are all determined in accordance with risk tolerance and can be changed when risk tolerance threshold changes. The risk tolerance thresholds could also be dynamically adjusted by another factor, such as attack frequency. If the attack frequency is high, more severe response action should be taken to counter this attack. Our risk-aware response module could achieve this objective by reducing the values of risk tolerance threshold and narrowing the range between two risk tolerance thresholds.

In order to evaluate our schemes, we performed simulations using network simulator version 2 (NS-2). NS-2 is a very popular network simulation tool. It uses C language for protocol definition and TCL scripting for building the simulation scenarios.

Construction of MANET Network with

distributed routing protocol
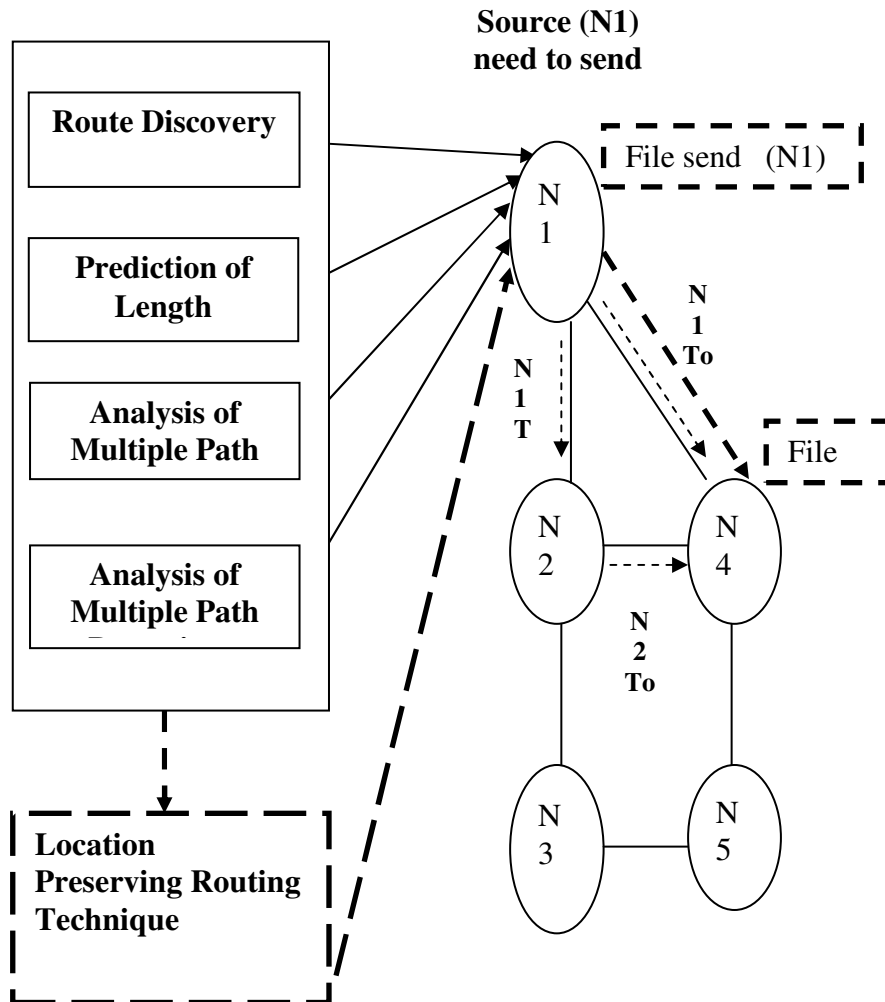
3.5 End-to-end Delay:

It is the average time taken by a data packet to arrive in the destination. It also includes the delay caused by route discovery process and the queue in data packet transmission. Only the data packets that successfully delivered to destinations that counted. Σ (arrive time – send time) / Σ Number of connections. The lower value of end to end delay means the better performance of the protocol.
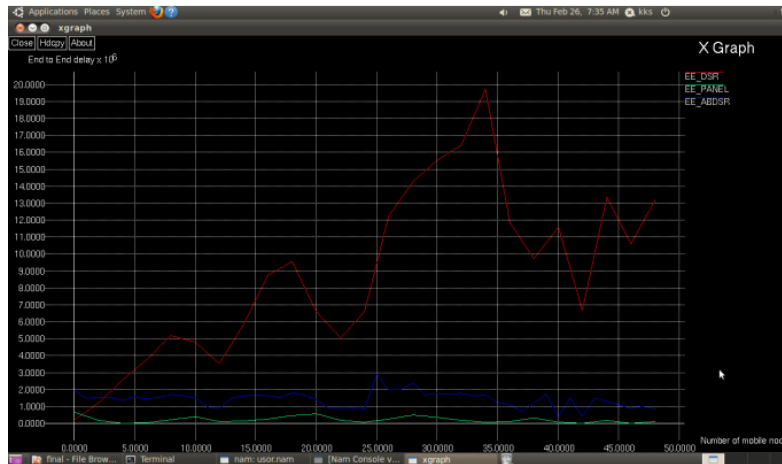
Figure1: End To End Delay of the Packet Transferring

Proposed system has performed against the security attacks and produces the network properties of throughput and latency.

Technique (Algorithm)	File Size in kb	No. of Packets (segments)	Packet loss ratio
DSR	500	500	2.5
ABDSR	500	500	1.58
PANEL	500	500	1.8

Table 1: Performance of the Technique against packet classification attack

Attack Detection rate = 10-(Actual Characteristics of the nodes – Attack models).

Characteristics of the nodes ---▯ attack Models + monitoring system w.r.t dynamic changes.

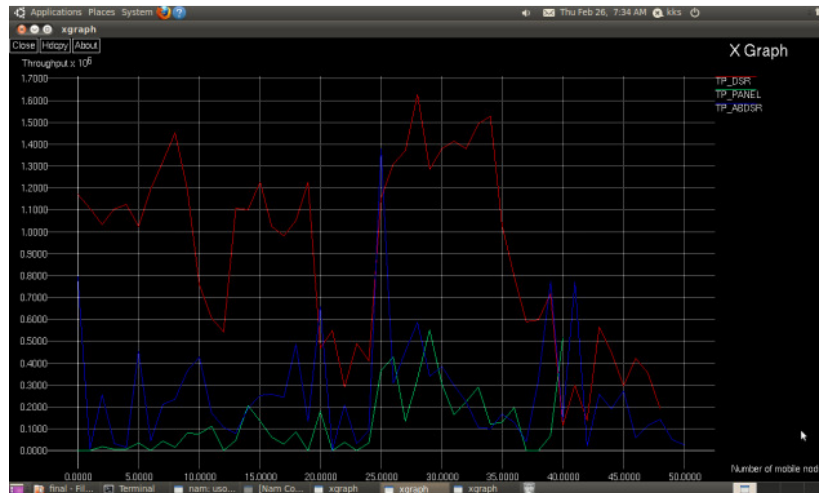Attack Model----> set of the desired samples of attacks.

Figure 2: Throughput of the Packet Transmission

4. Conclusion

We implemented the Location preserving technique using Dynamic Source Routing Technique (Panel – AB-DSR). A Preserving confidentiality of physical layer attribute for packet transmission is high importance against the selective jamming attacks. In this work, we analysed the problem of network path security against selective jamming attack to target packets. The System is been secured against the eaves dropping and DDOS Attacks. Performance evaluation of the system proves that secure configuration of the MANET yields good outcomes in terms of high Throughput and End to End Delay ratios. Many Solutions could be suggested for the future work through employment of Homomorphic techniques which results in more security of the defence application.

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