Psr: A Proactive Source Routing Protocol For Manets

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Abstract: Opportunistic data forwarding has drawn much attention in the research community of multihop wireless networking, with most research conducted for stationary wireless networks. One of the reasons why opportunistic data forwarding has not been widely utilized in mobile ad hoc networks (MANETs) is the lack of an efficient lightweight secure routing scheme with strong source routing capability. In this paper, a lightweight secure source routing (SSR) protocol is proposed which is used to bypass insecure nodes and make sure transmission takes place only through secure nodes to the destination. SSR can maintain more network topology information than distance vector (DV) routing to facilitate source routing, although it has much smaller overhead than traditional DV-based protocols [e.g., destination-sequenced DV (DSDV)], link state (LS)-based routing [e.g., optimized link state routing (OLSR)], and reactive source routing [e.g., dynamic source routing (DSR)]. Computer simulation in Network Simulator 2 (ns-2) ensures security of transmission with less overhead in PSR protocols.

Keywords: Distance Vector, AODV, Source routing, MANET

Introduction: In computer networking, source routing allows a sender of a packet to partially or completely specify the route the packet takes through the network. In contrast, in non-source routing protocols, routers in the network determine the path based on the packet's destination. Source routing allows easier troubleshooting, improved trace route, and enables a node to discover all the possible routes to a host. It does not allow a source to directly manage network performance by forcing packets to travel over one path to prevent congestion on another. In the Internet Protocol, two header options are available which are rarely used: "strict source and record route"

(SSRR) and "loose source and record route" (LSRR). Because of security concerns, packets marked LSRR are frequently blocked on the Internet. If not blocked, LSRR can allow an attacker to spoof its address but still successfully receive response packets. Policy-based routing can also be used to route packets using their source addresses. Software Defined Networking can also be enhanced when source routing is used in the forwarding plane. Studies have shown significant improvements in convergence times as a result of the reduced state that must be distributed by the controller into the network Routing determines what path a data packet should follow from the source node to the destination. Data forwarding regulates how packets are taken from one link and put on another. Opportunistic data forwarding refers to a way in which data packets are handled in a multi hop wireless network. Unlike traditional IP forwarding, where an intermediate node looks up a forwarding table for a dedicated next hop, opportunistic data forwarding allows potentially multiple downstream nodes to act on the broadcast data packet. One of the initial works on opportunistic data forwarding is selective diversity forwarding by Larsson. In this paper, a transmitter picks the best forwarder from multiple receivers, which successfully received its data, and explicitly requests the selected node to forward the data.

- Here a lightweight proactive source routing protocol is used so that each node has complete knowledge of how to route data to all other nodes in the network at any time. When a flow of data packets are forwarded towards their destination, the route information carried by them can be adjusted by intermediate forwarders. Furthermore, as these packets are forwarded along the new route, such updated information is propagated upstream rapidly without any additional overhead. As a result, all upstream nodes learn about the new route at a rate much faster than via periodic route exchanges.
- Opportunistic data forwarding is taken to another level by allowing nodes that are not listed as intermediate forwarders to retransmit data if they believe certain packets are missing.

In this paper, we propose a lightweight secure source routing (SSR) protocol to facilitate opportunistic data forwarding in a secure manner in MANETs. A linked list maintained in each source, intermediary and destination nodes regarding the list of nodes to which data is to be transmitted. Each time a packet is received a sequential search is performed through the list and the suitable next hop is detected. Each node is aware of the location of all nodes in the list . Dynamic source routing protocols are quite inefficient in such cases as the route is determined dynamically on demand. This causes considerable delay in transmission. In the simulation analysis phase a round trip time is calculated and the results are depicted as graphs.

Proposed System- Secure Source Routing With Ssr:

- *Design of Secure Source Routing for static nodes:* The diagram presents a working scenario with secure transmission from source to destination nodes by making use of PSR in case of static wireless nodes. Here about nine intermediary nodes are present where only three nodes marked SN are secure nodes. The remaining nodes in black circles are insecure nodes. S,D represents the source and destination respectively.

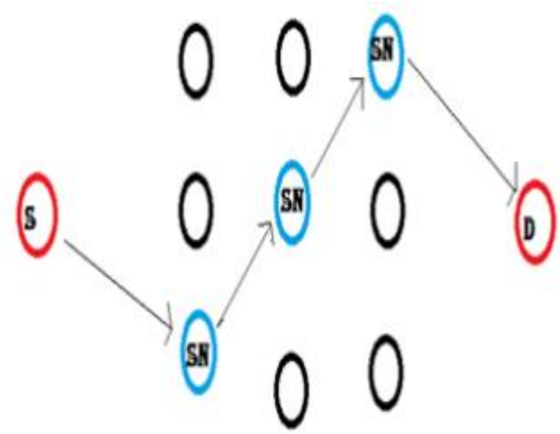

Fig1. *Secure transmission scenario with SSR*

Algorithm in source node :

a. Detect all neighbouring nodes.

b. Look up the linked list of neighbouring nodes.

c. Find a match between the neighbouring nodes detected and nodes in the list.

d. Transmit data packet to the first match found.

Experiment Settings: Since many routing protocols' performances are well known in the classic two-ray ground reflection propagation model, we select such a model as well in our simulation to present a consistent and comparable result.1 Without loss of generality, we select a 1-Mb/s nominal data rate at the IEEE 802.11 links to study the relative performance among the selected protocols. With the default physical-layer parameters of the simulator, the transmission range is approximately 250 m, and the carrier sensing range is about 550 m. We compare the performance of PSR with that of OLSR, DSDV, and DSR. The reasons that we select these baseline protocols that are different in nature are as follows. On one hand, OLSR and DSDV are both proactive routing protocols, and PSR is also in this category. On the other hand, OLSR makes complete topological structure available at each node, whereas in DSDV, nodes only have distance estimates to other nodes via a neighbor. PSR sits in the middle ground, where each node maintains a spanning tree of the network. Furthermore, DSR is a well-accepted reactive source routing scheme, and as with PSR, it support source routing, which does not require other nodes to maintain forwarding lookup tables. All three baseline protocols are configured and tested out of the box of ns-2. In modeling node mobility of the simulated MANETs, we use the random waypoint model to generate node trajectories. In this model, each node moves toward a series of target positions. The rate of velocity for each move is uniformly selected from [0, vmax]. Once it has reached a target position, it may pause for a specific amount of time before moving toward the next position. This mobility model may eventually lead to an uneven node distribution in the network. That is, the nodes' density in the central area of the network may be higher than that at the network boundary. This uneven node distribution coincides with the real case in our daily life. However, at the beginning of simulations, the nodes' positions are evenly assigned; therefore, we discard the simulation data in the first 30 s, and only the data at a steady state is collected. All networks have 50 nodes in our tests. We have two series of scenarios based on the mobility model. The first series of scenarios have a fixed vmax but different network densities by varying the network dimensions. The second series have the same network density but varying v_{max}.

Performance Evaluation: We study the performance of our work using computer simulation with Network Simulator 2 (ns-2). C++ and Tool Command Language (TCL) are the two languages used in NS-2. It uses TCL/OTCL (Tool Command Language/ Object Oriented TCL) as a command & configuration interface. Basically TCL is its scripting and frontend language and C++ is its backend language. NS-2 includes a tool for viewing the simulation results, called Network Animator (NAM). It uses three

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types of files namely Tool Command Language file (.tcl), Trace file (.tr) and Network Animator file (.nam). Tool command language file (.tcl) has subsets of commands which are written into it for simulation. While simulator runs on .tcl, simulation trace file (.tr) and animation file (.nam) are created during the session. Trace file (.tr) is used to trace the whole process and Network Animator file (.nam) is used to visualize the behaviour of network protocols and traffic the model. We use various performance metrics required for evaluation of protocols. These matrices are important because it analyse the performance of the network. We compare it against PSR, OLSR, DSDV, and DSR, in which OLSR, DSDV and DSR are three fundamentally different routing protocols in MANETs, with varying network densities and node mobility rates. Our tests show that the overhead of proposed method is indeed only a fraction of that of the baseline protocols. Nevertheless, as it provides global routing information at such a small cost, our method offers similar or even better data delivery performance. Here, we first describe how the experiment scenarios are configured and what measurements are collected. T

Conclusion: This paper has been motivated by the need to support opportunistic data forwarding in MANETs. To generalize the milestone work of ExOR for it to function in such networks, we needed an efficient proactive protocol. Such a protocol should provide more topology information than DVs but must have significantly smaller overhead than LS routing protocols; even the MPR technique in OLSR would not suffice. Thus, we put forward a table-based routing protocol using BFS and DFS. Its routing overhead per time unit per node is on the order of the number of the nodes in the network as with DSDV, but each node has the full-path information to reach all other nodes. Proposed method uses only one type of message, i.e., the periodic data update, both to exchange routing information and as hello beacon messages. We interleave full-dump messages with differential updates so that, in relatively stable networks, the differential updates are much shorter than the full-dump messages. As a result, the routing overhead of proposed work is only a fraction or less compared with DSDV, OLSR, and DSR, as evidenced by our experiments. It is better than PSR. In the simulation in this paper, we used such method to support traditional IP forwarding for a closer comparison with

DSDV and OLSR, whereas DSR still carried source routed messages. In our work, we tested the capability in transporting source-routed packets for opportunistic data forwarding, where we also found that its small overhead met our initial goal. This is fundamentally different from traditional IP forwarding in proactive routing with more built-in adaptively, where the routing information maintained at nodes closer to the destination is often more updated than the source node.

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