

Performance Analysis of Load Minimization In AODV and FSR

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ABSTRACT

Mobile Ad-hoc network (MANET) is one of the important technologies in the emerging field; therefore research concerning its security problem especially, intrusion detection has attracted many researchers. Analyzing methodology plays a central role in the data analysis process. Dynamic state routing (DSR) results in reducing performances of detection system because it uses irrelevant and redundant features to analyze the performance. This method proposes Fisheye State Routing (FSR) protocol usage in intrusion detection which can be used for self-organizing wireless devices. This protocol exchanges information with neighbour nodes only, which help in reducing the update message size. In this protocol every update message doesn't contain information about all nodes in the network. Instead, information about closer nodes is exchanged more frequently than it is done about farther nodes, thus reducing the update message size. This protocol is more desirable for large mobile network where mobility is high and bandwidth is low as it provides an efficient and scalable solution for intrusion detection in mobile ad-hoc network. Finally it is compared with the AODV and the performance was found to be efficient than AODV.

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1. INTRODUCTION

Mobile Ad-hoc Network (MANET) is an unstructured wireless network that can be established temporarily, e.g. applications for MANET may include deployment in battlefield, small offices of universities. Each node is selfish and independent in the decision making. In MANET, nodes can add-in to the network or detach from it at anytime. Thus, there is no central control on the network for the nodes to follow. Intrusion detection models were introduced by Denning in 1987 and rather are a new technology. Intrusion detection systems can be categorized into two models: Signature-based intrusion detection and anomaly-based intrusion detection. Signature-based intrusion detection uses signatures of the attacks to detect the intrusion. This type of detection monitors the network for finding a match between the network traffic and a known attack pattern. On the other hand, anomaly-based intrusion detection creates a profile based on the normal behavior of the network. In this method, detection is performed by learning the normal behavior of the network and comparing it versus the behavior of the monitored network. The advantage of the anomaly-based detection is its ability to detect new attacks without any prior knowledge about it. In Ad-hoc networks, packets that are sent from each node can be used for network condition monitoring. Using the traffic data, behavior of the node's neighbor can be monitored. In the anomaly-based intrusion detection, the profile of the network in its normal state of operation is initially extracted. Detecting any deviation from the normal state of operation in the network, will produce an alarm message to show the anomalous behavior. These techniques include Principal Component Analysis. Fisheye state routing (FSR) is the protocol used in

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the proposed scheme. It is a link state based routing protocol which is adapted to the wireless ad hoc environment. We have considered the parameters of latency and energy consumption of AODV and FSR. The rest of the paper is organized as follows. In section 2, we survey the research method of the existing and proposed wireless routing schemes.. Section 3 presents the performance results and we conclude our paper in section 4.

2. RESEARCH METHOD

2.1 EXISTING SYSTEM

In existing system, intrusion detection is performed using AODV protocol. Ad hoc on-demand distance vector routing ([AODV](#)) forms a route on-demand when a transmitting computer requests one. AODV is the most popular reactive routing protocol in MANET. The reactive implies that a node exchange routing information only when it need to transfer some data and keep the routing information updated as long as the communication with the node exists. When a source node need to send some data to another node and it doesn't have or have invalid path to the same, then it starts a route discovery process in order to establish a route towards destination node by sending route request message (RREQ) to all its neighbours. Neighbouring nodes receive the request, increment the hop count and forward the message to their neighbours. This broadcasting of RREQ message is known as flooding. The objective of RREQ message is not only to find a path to destination but also making other nodes learn about a route toward source node (reverse route). When an intermediate node receives a RREQ message from a node A for S, then it has a reverse route to node S through a with path length equals to hop count field of RREQ.

Finally, when RREQ message reaches destination node, it response by initiating a route reply message (RREP). The RREP is sent as a unicast, using the path towards the source node established by the RREQ. Similarly, the RREP message allows intermediate nodes to learn a route towards the destination node. Hence, the end of the route discovery process, packets can be delivered from the source to the destination node and vice versa. A third kind of routing message, called route error (RERR), allows nodes to notify breakage of link between any two node or information about those nodes which are unreachable at present. In AODV it is not necessary that always a RREQ should reach the destination node. Any intermediate node already has a valid route towards destination, can generate a RREP message and does not forward the RREQ any further. This enables quicker replies and limits the flooding of RREQS. AODV uses a sequence number to identify the freshness of routing information. Each node maintains its own sequence number and increments it before sending any new RREQ or RREP message. These sequence numbers are included in the routing messages and also stored in routing tables. AODV always give preferences to fresh or new information, thus node updates its routing table if they receive a message with a sequence number higher than the last recorded one for the destination. The main disadvantage of AODV protocol is loss of power consumption and latency. The redundant and irrelevant features often reduce the performance of the system both in speed and predictive accuracy.

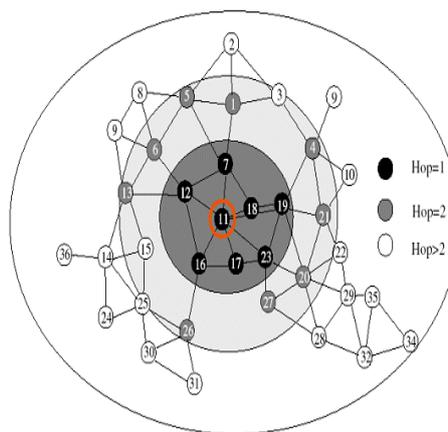


Figure1. Flow Diagram

2.2 PROPOSED SYSTEM

In proposed system we use Fisheye State Routing (FSR) protocol which can be used for self-organizing wireless device. In this protocol every update message doesn't contain information about all nodes in the network. Instead, information about closer nodes is exchanged more frequently than it is done

about farther nodes, thus reducing the update message size. FSR provides efficient, scalable solutions for wireless mobile ad-hoc network. Thus the load minimization is possible and also loss of data is prevented. Fisheye State Routing (FSR) is an improvement of GSR (both are based on the link state protocol). The large size of update messages in GSR uses a considerable amount of bandwidth. Fisheye State Routing (FSR) belongs to the class of proactive (table-driven) ad hoc routing protocols and its mechanisms are based on the Link State Routing protocol used in wired networks. It tries to minimize the routing overhead by using a fisheye technique. Each node assigns other network participants to specific fisheye scopes dependent on their distance to the node itself. The amount of routing information is reduced by assuming longer link-state update intervals for nodes at higher distances than for network participants in the node's vicinity.

2.3 FISHEYE STATE ROUTING

2.3.1 FLOW DIAGRAM DESCRIPTION

An example of a fisheye's scope is shown above for the (red) center node. The scope is defined in terms of the number of hops needed to reach a certain node. In FSR, every update message doesn't contain information about all nodes in the network. Instead, information about closer nodes is exchanged more frequently than it is done about farther nodes, thus reducing the update message size. The center node has most up to date information about all nodes in the inner circle and the accuracy of information decreases as the distance from node increases. This procedure of dividing the network into different scope levels is done at each node, meaning that it is independent on a central entity. Even if a node doesn't have accurate information about far away nodes, the packets will be routed correctly because the route information becomes more and more accurate as the packet gets closer to the destination.

2.3.2 PROTOCOL OPERATION

Fisheye State Routing (FSR) is a table-driven or proactive routing protocol. As mentioned, FSR is based on link state routing and it is able of immediately providing route information when needed. FSR is functionally similar to LS as it maintains a full topology map at each node. The link state packets are exchanged periodically instead of event driven. The topology tables are sent to local neighbours only (instead of flooding the entire network) Sequence numbers are used for entry replacements as well as for providing loop-free routing. It uses the "fisheye" technique proposed by Kleinrock and Stevens [12], where the technique was used to reduce the size of information required to represent graphical data. The eye of a fish captures with high detail the pixels near the focal point. The detail decreases as the distance from the focal point increases. In routing, the fisheye approach translates to maintaining accurate distance and path quality information about the immediate neighborhood of a node, with progressively less detail as the distance increases.

FSR is functionally similar to LS Routing in that it maintains topology map at each node. The key difference is the way in which routing information is disseminated. In LS, link state packets are generated and flooded into the network whenever a node detects a topology change. In FSR, link state packets are not flooded. Instead, nodes maintain a link state table based on the up-to-date information received from neighboring nodes, and periodically exchange it with their local neighbors only (no flooding). Through this exchange process, the table entries with larger sequence numbers replace the ones with smaller sequence numbers. The FSR periodic table exchange resembles the vector exchange in Distributed Bellman-Ford (DBF) (or more precisely, DSDV [17]) where the distances are updated according to the time stamp or sequence number assigned by the node originating the update. However, in FSR link states rather than distance vectors are propagated. Moreover, like in LS, a full topology map is kept at each node and shortest paths are computed using this map. In a wireless environment, a radio link between mobile nodes may experience frequent disconnects and reconnects.

The LS protocol releases a link state update for each such change, which floods the network and causes excessive overhead. FSR avoids this problem by using periodic, instead of event driven, exchange of the topology map, greatly reducing the control message overhead. When network size grows large, the update message could consume considerable amount of bandwidth, which depends on the update period. In order to reduce the size of update messages without seriously affecting routing accuracy, FSR uses the Fisheye technique. Fig. 1 illustrates the application of fisheye in a mobile, wireless network. The circles with different shades of grey define the fisheye scopes with respect to the center node (node 11). The scope is defined as the set of nodes that can be reached within a given number of hops. Nodes are color coded as black, grey and white accordingly. The number of levels and the radius of each scope will depend on the size of the network. The reduction of routing update overhead is obtained by using different exchange periods for different entries in routing table. More precisely, entries corresponding to nodes within the smaller scope are propagated to the neighbors with the highest frequency.

3. RESULTS AND ANALYSIS

3.1 SIMULATION MODEL AND METHODOLOGY

We implement our routing scheme in a multihop, mobile wireless network simulator using Network simulator version 2.27. Network Simulator (NS) is a simulation tool targeted at both wired and wireless networking research. NS Provides substantial support for simulation of TCP, routing and multicast protocols over wired and wireless networks. The used version of NS is 2.27(NS2). It implements network protocols such as FTP and Telnet, routing algorithms such as SPF and DV and 'lower' layers such as logic link(LL) and media access control(MAC) . Currently NS development is support through DARPA with SAMAN and through NSF with CONSER.The simple way NS2.27 can be used is for studying the property of a well-known protocol. In this case , a script language OTcl is used to glue the network components provided by NS2.27, configure the parameters and launch activities . NS2.27 will read the configurations; simulate each network event and record events and statistics in to trace files. After the simulation, Nam can demonstrate the events in a visualized way. For the simple usage of NS2.27, an understanding to the simulation framework is necessary. NS2.27 provides a collaborative environment. It is freely distributed. Expert developers came up with the shared codes, protocols, models, etc.

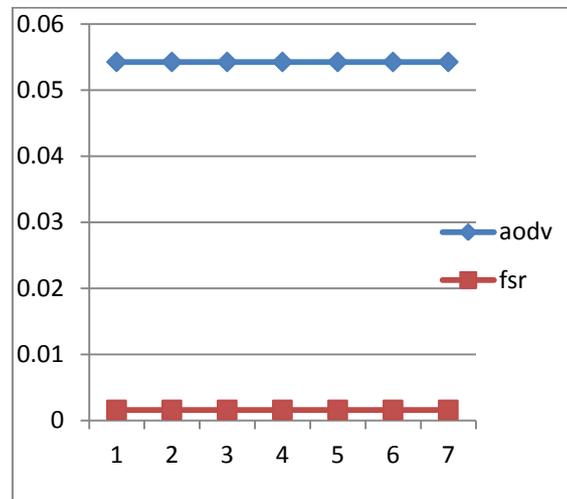


Figure 2.Latency in AODV and FSR

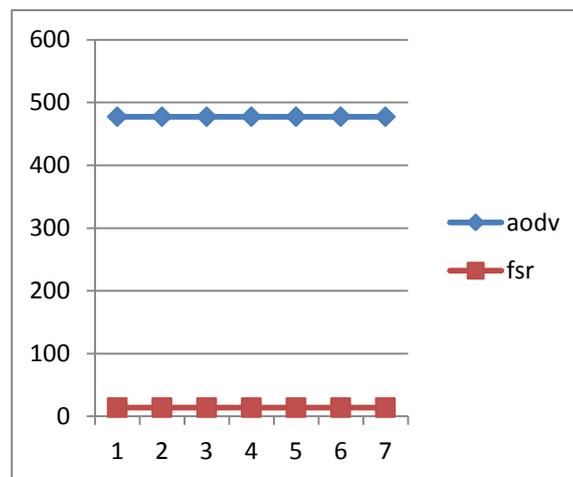


Figure 3.Energy consumption in AODV and FSR

In this paper we consider both AODV and FSR protocols with the parameters such as latency and energy consumption. For latency measurement in both the routing protocols number of nodes and time is considered and it is found that the latency of FSR is considerably less than the latency of AODV. The latency of AODV is found to be 0.054 milli seconds and AODV is 0.005 milli seconds which results in the variation of bandwidth. The next parameter is Energy consumption similar to latency the energy consumption is between the number of nodes and the power consumed in this aspect also FSR is more efficient than AODV. Fig2 and Fig3 gives the graphical representation of latency and Energy consumption and the table of comparison is given below.

Table 1. Comparison of latency and energy consumption in AODV and FSR

ROUTING	LATENCY (in milliseconds)	ENERGY (mW)
AODV	0.054	469
FSR	0.005	14

3. CONCLUSION

In this paper FSR protocol has been compared with AODV and their performance based on latency and energy consumption is analysed and it is found that FSR is more efficient and the load is minimized comparatively than AODV. Load of each node has been reduced to a smaller extent when compared to an existing protocol and increases the performance of each node. This project has some advantages like less redundancy, prevents data loss and easily executable. As a result FSR is more desirable for large mobile networks where mobility is high and the bandwidth is low. By choosing proper number of scope levels and radius size, FSR proves to be a flexible solution to the challenge of maintaining power consumption in ad hoc networks. In future this project leads to many beneficial things in mobile ad-hoc network. This work can be extended to various other protocols like TORA and GSR.

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