

# Trust Management of Multipath Routing for Intrusion Tolerance in Heterogeneous WSN

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**Abstract:** Trust management of heterogeneous wireless sensor networks (HWSNs), utilizing multipath routing to answer user queries in the presence of untrustworthy and malicious nodes. The key concept of our trust management is to exploit the trade off between energy consumption vs. the gain in dependability, timeliness, and defence to maximize the system useful lifetime. It is commonly believed in the research community that clustering is an effective solution for achieving scalability, energy conservation, and dependability. Using heterogeneous nodes can further enhance performance and prolong the system lifetime. In existing system DSR is used to solve this problem. DSR is a reactive routing protocol which is able to manage a MANET without using periodic table-update messages like table-driven routing protocols do. DSR was specifically designed for use in multi-hop wireless ad hoc networks. Ad-hoc protocol allows the network to be completely self-organizing and self-configuring which means that there is no need for an existing network infrastructure or administration. To satisfy the above problem by using the Gradual Cluster head election Algorithm (GCA), it is reducing energy consumption of local clusters and overall networks. It elected the cluster head among nodes which are possible for the cluster head and proved the energy efficiency in the network. **Keywords:** HWSN, DSR, GCA, cluster head, energy efficiency, multipath routing

## I. INTRODUCTION

Wireless sensor network (WSN) consists of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on.

Wireless sensor networks (WSNs) have led to many new multipath routing protocols specifically designed for sensor networks. Multipath routing is an efficient technique, which selects multiple paths to deliver data from source to destination in wireless sensor networks. Multipath routing establishes multiple paths between the source-destination pair. In single path new route discovery process is initiated, which increases energy consumption. Node failure also causes packets to be dropped and may cause a delay in delivering the data to the sink, thus the real-time requirements of the multimedia applications are not met. Multi-path routing increases the number of possible routes and through this it increases the heftiness and throughput of the transmissions. Multipath routing is commercial for heavy load scenario than single path. Multipath routing is mainly used either for load balancing or for dependability. Load balancing can be achieved by balancing power utilization among the nodes improving network lifetime.

The capability of a network to provide service to selected network traffic over various technologies. The primary goal of QoS is to provide priority including dedicated bandwidth, controlled jitter and latency required by some real-time and interactive traffic, and improved loss characteristics. Intrusion detection system (IDS) with the goal to detect and remove malicious nodes. In sensor networks, most adversaries would target the routing layer, since that allows them to take control of the information flowing in the network. Besides, sensor networks are mainly about reporting data back to the base station, and disrupting this process would make an attack a successful one. So, for such networks, the most appropriate architecture for an IDS would be network-based, as opposed to host-based. A network-based IDS uses raw network packets as the data source. It listens on the network and captures and examines individual packets in real time.

DSR is a reactive routing protocol which is able to manage a MANET without using periodic table-update messages like table-driven routing protocols do. DSR was specifically designed for use in multi-hop wireless ad hoc networks. Ad-hoc protocol allows the network to be completely self-organizing and self-configuring which means that there is no need for an existing network infrastructure or administration. For restricting the bandwidth, the process to find a path is only executed when a path is required by a node (On-Demand-Routing). In DSR the sender (source, initiator) determines the whole path from the source to the

destination node (Source-Routing) and deposits the addresses of the intermediate nodes of the route in the packets. Compared to other reactive routing protocols like ABR or SSA, DSR is beacon-less which means that there are no hello-messages used between the nodes to notify their neighbors about her presence.

Gradual Cluster head election Algorithm (GCA) which gradually elects cluster heads according to the proximity to neighbour nodes and the residual energy level and one-hop neighbour information (GCA-ON), which elects cluster heads based on  $E_r$  and the relative location information of sensor nodes. This method mainly focuses on the cluster head selection. It focuses on reducing energy consumption of local clusters and overall networks. It elected the cluster head among nodes which are possible for the cluster head and proved the energy efficiency. The cluster leader election will be based on the energy and the leader will send the messages to inter cluster members and the intra clusters. And it finds the average energy of the overall network and it re-elects the new cluster head.

## II. EXISTING SYSTEM

A WSN must not only satisfy the application specific QoS requirements such as reliability, timeliness and security, but also minimize energy consumption to prolong the system useful lifetime. It is commonly believed in the research community that clustering is an effective solution for achieving scalability, energy conservation, and reliability. Using heterogeneous nodes can further enhance performance and prolong the system lifetime.

In existing system DSR is used to solve this problem. DSR is a reactive routing protocol which is able to manage a MANET without using periodic table-update messages like table-driven routing protocols do. DSR was specifically designed for use in multi-hop wireless ad hoc networks. Ad-hoc protocol allows the network to be completely self-organizing and self-configuring which means that there is no need for an existing network infrastructure or administration.

### 2.1 Dynamic Source Routing Protocol

DSR is a reactive routing protocol which is able to manage a MANET without using periodic table-update messages like table-driven routing protocols do. DSR was specifically designed for use in multi-hop wireless ad hoc networks. Ad-hoc protocol allows the network to be completely self-organizing and self-configuring which means that there is no need for an existing network infrastructure or administration.

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DSR was developed for MANETs with a small diameter between 5 and 10 hops and the nodes should only move around at a moderate speed. DSR is based on the Link-State-Algorithms which mean that each node is capable to save the best way to a destination. Also if a change appears in the network topology, then the whole network will get this information by flooding.

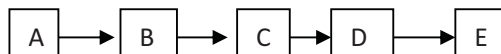
### 2.1 DSR contains 2 phases

- Route Discovery (find a path)
- Route Maintenance (maintain a path)

#### 2.2.1 Route Discovery:

If node A has in his Route Cache a route to the destination E, this route is immediately used. If not, the Route Discovery protocol is started:

Node A (initiator) sends a RouteRequest packet by flooding the network



1. If node B has recently seen another RouteRequest from the same target or if the address of node B is already listed in the Route Record, Then node B discards the request!
2. If node B is the target of the Route Discovery, it returns a RouteReply to the initiator. The RouteReply contains a list of the “best” path from the initiator to the target. When the initiator receives this RouteReply, it caches this route in its Route Cache for use in sending subsequent packets to this destination.
3. Otherwise node B isn’t the target and it forwards the Route Request to his neighbors (except to the initiator).

Path-finding-process: Route Request & Route Reply

#### 2.2.2 Route Maintenance:

In DSR every node is responsible for confirming that the next hop in the Source Route receives the packet. Also each packet is only forwarded once by a node (hop-by-hop routing). If a packet can’t be received by a node, it is retransmitted up to some maximum number of times until a confirmation is received from the next hop.

Only if retransmission results then in a failure, a RouteError message is sent to the initiator that can remove that Source Route from its Route Cache. So the initiator can check his Route Cache for another route to the target. If there is no route in the cache, a RouteRequest packet is broadcasted.

1. If node C does not receive an acknowledgement from node D after some number of requests, it returns a Route Error to the initiator A.
2. As soon as node receives the Route Error message, it deletes the broken-link-route from its cache. If A has another route to E, it sends the packet immediately using this new route.
3. Otherwise the initiator A is starting the Route Discovery process again.

### 2.3 Advantages

Reactive routing protocols have no need to periodically flood the network for updating the routing tables like table-driven routing protocols do. Intermediate nodes are able to utilize the Route Cache information efficiently to reduce the control overhead. The initiator only tries to find a route (path) if actually no route is known (in cache). Current and bandwidth saving because there are no hello messages needed (beacon-less).

### 2.3 Disadvantages

The Route Maintenance protocol does not locally repair a broken link. The broken link is only communicated to the initiator. The DSR protocol is only efficient in MANETs with less than 200 nodes. Problems appear by fast moving of more hosts, so that the nodes can only move around in this case with a moderate speed. Flooding the network can cause collisions between the packets. Also there is always a small time delay at the begin of a new connection because the initiator must first find the route to the target.

## III. PROPOSED SYSTEM

### 3.1 Gradual Cluster Head Election Algorithm (GCA):

In the proposed method the path has to be given and an alternate has to be chosen by the routing technique and we implement the trust methodology to evaluate the neighbor nodes and there is no need for clustering technique and the light weight IDS can be a additional feature to detect the various attack types and our modification mainly focus on the energy consumption and the intrusion tolerance and our modified protocol will act according to the trust implementation it chooses the only when the trust value attains and there will not be any routing overhead .And it will improve the QOS and the energy consumption also will be less.

The Gradual Cluster head election Algorithm (GCA) is used for electing the cluster and cluster heads. This method mainly focuses on the cluster head selection . It focuses on reducing energy consumption of local clusters and overall networks. It elected the cluster head among nodes which are possible for the cluster head and proved the energy efficiency. The cluster leader election will be based on the energy and the leader will send the messages to inter cluster members and the intra clusters .And it finds the average energy of the overall network and it re-elects the new cluster head.

### 3.2 Electing The Cluster And Cluster Heads:

In this module mainly focuses on the cluster head selection. The Gradual Cluster head election Algorithm (GCA) is used for electing the cluster and cluster heads. It elected the cluster head among nodes which are possible for the cluster head and proved the energy efficiency.

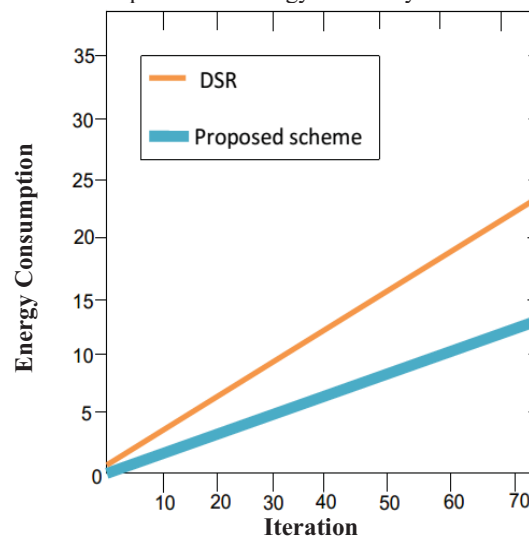


Figure 1. Energy consumption in DSR & GCA method

The cluster leader election will be based on the energy and the leader will send the messages to inter cluster members and the intra clusters. And it finds the average energy of the overall network and it re-elects the new cluster head. The energy consumption will be less over than this dynamic source routing protocol.

### 3.3 Deploying Redundancy Management System:

The effective redundancy management system was deployed after the cluster and cluster head selection the redundancy management system is applied, and the QoS was improved such as reliability, and timeliness is improved. The data is transferred from source to sink. Through this redundancy technique the data is routed from source to sink. So the energy of the node will be increased.

## IV. CONCLUSION

A WSN must not only satisfy the application specific QoS requirements such as reliability, timeliness and security, but also minimize energy consumption to prolong the system useful lifetime. It is commonly believed in the research community that clustering is an effective solution for achieving scalability, energy conservation, and reliability. Using heterogeneous nodes can further enhance performance and prolong the system lifetime. In existing system DSR is used to solve this problem. DSR is a reactive routing protocol which is able to manage a MANET without using periodic table-update messages like table-driven routing protocols do. DSR was specifically designed for use in multi-hop wireless ad hoc networks. Ad-hoc protocol allows the network to be completely self-organizing and self-configuring which means that there is no need for an existing network infrastructure or administration. To satisfy the above problem by using The Gradual Cluster head election Algorithm, it is reducing energy consumption of local clusters and overall networks. It elects the cluster head among nodes which are possible for the cluster head and proved the energy efficiency in the network.

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