WIRELESS SENSOR NETWORK ON SELECTING FORWARDING ATTACK: A SURVEY

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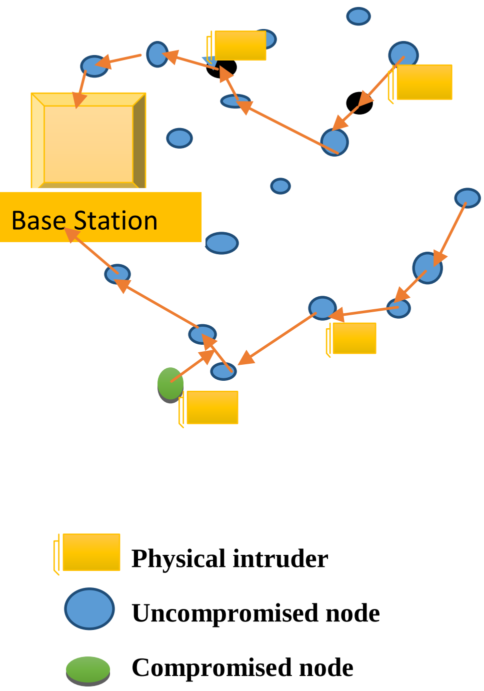
Abstract: A Wireless Sensor Network (WSN)is a network made of numerous small independent sensor nodes which sense the network by detecting events in the surrounding environment.. The Sensor Networks suffer from various security threats like (i)sink hole attack, (ii) black hole attack, (iii) wormhole attackand (iv) selective forwarding attacks (5)smurf attack.Selective forwarding attacks corrupt some missioncriticalapplications such as battlefield surveillance, forestfire monitoring and military monitoring system. In these attacks, corrupted or malicious nodes behavelike normal nodes in most time but selectively dropsensitive packets.The compromised node attempts to disrupt the normal communication process by selectively dropping the certain packets while forwarding the others.Such selective dropping is hardto detect. In this paper we have described all theexisting defensive schemes according to our best knowledgeagainst this attack and getting a better understanding related to this attack and its complete workingscenario.**Fig1**. An example of selective forwarding attacks.



Keywords

Wireless Sensor Network, Selective Forwarding Attacks, Compromised Nodes, threats, Denial of Service (DoS)

I. Introduction

In Selective Forwarding Attack, internal nodes that are compromised selectively will be forwards some ofthe packets passing through them. If any node drops all the packets, then it will be becomes black hole attack. Therefore,selective forwarding attack is sometimes called as a special case of black hole attack.

Attacks against wireless sensor networks(WSN) could be broadlyconsidered from two different levels of views.

1. The attack against routing mechanisms.
2. The attack against security mechanisms.

Attack Models

Many security attacks are present in Wireless Sensor Networks
and they are,

1. Dos attack
2. Black hole attack
3. Sink hole attack
4. Wormhole attack
5. Selective forwarding attacks.
6. Sybil attacks
7. Node replication attacks
8. Hello flood attack

The main objective of this paper is to give an overview of different techniques which will be able to prevent Selective Forwarding Attack. Thispaper is organized as follows: Section 2 present theoverview of selective forwarding attack and its types.Section3 classifies the detection technics of SelectiveForwarding attack. Section4 gives the little bit information about prevention technics of Selecting Forwarding Attack.The final section concludes this paper.

II. Overview of Selective Forwarding Attack

The Selective Forwarding attack, a special case of denial of service(Dos) attack, was first defined by Karlof as "malicious nodes behaves like black hole and may refuse tos forward certain messages and simply drop them, ensuring that they are not propagated any further." It is normally assumed that the intermediate nodes, in multihop sensor networks,it is participating in the communication process between the source and the sink, faithfully forwarded the messages that they receive from the other nodes. In the Selective forwarding attack, also known as Grayhole attack,in this case the compromised node attempts to disrupt the normal communication process by selectively dropping the certain packets while forwarding to the others. The adversary may choose to drop the packets originating from the particular node or multiple nodes, thus causing the denial of service for that node(s) or the packets of a particular type. The selective forwarding attack can be launched as inside attack by compromising a legitimate node within the network to drop the subset of packets while forwarding the others. To be more effective, the adversary tries to place itself on the actual data flow path between the two communicating nodes such as this will help to get more traffic. Because of limited transmission range, sensor networks forwards these packets to the base station in multihop manner and while being routed to the base station packets may be dropped because of collision, congestion or any other network problems. The selective forwarding attack exploits these network problems and thus it will becomes more difficult to detect.

2.1. Types of Selective Forwarding Attack:

In the original form of the selecting forwarding attack, the compromised node attempts to disruptedcommunication between the communicating nodes by dropping certain packets of interest while forward the others. The Table 1 below describes the other forms of selective forwarding attack:

Table 1: Types of Selective Forwarding Attack

Name	Description
Blackhole attack	Compromised node drops every packet it receives; also it may forward the packet to wrong path creating unfaithful routing information in the network.
Neglect and Greed	Compromised node arbitrarily neglects to forward certain packet but still acknowledge the reception of data to the sender. When the node gives priority to its own messages, it becomes greedy, thus dropping the packets received from the other nodes and forwarding its own messages.
Blind Letter Attack	With arbitrarily malicious nodes in the network, it should be guaranteed that the next node to which the relay node forwards the packet is actually a legitimate neighbor of the current relay node.

Besides the above described types, the malicious sensor node involved in launching the selective forwarding attack may delay the forwarding of the packets to the next hop to create the confused routing information.

2.2 Different Forms of Selective Forwarding Attack

There are some different forms of selective forwarding attack.In the First form of the selective forwarding attack, the compromised node drops some packets. In the Second form, the Selective forwarding attack behaves like a Black hole, in which the message is forwards to the wrong or incorrect path, creating false routing information in the network. Third form of selective forwarding attack delays packet passing through the network generating confused routing information between sensor nodes.

3. Classification of Schemas Against Selective Forwarding Detecting:

The schemes for defending or protecting against selective forwarding attack can be classified according to the two types of criteria i.e. nature of scheme and defense scheme.The nature of scheme can be classified into two classes i.e. centralized and distributed.Defense of scheme can again be classified into two classes, detection based and prevention based.

A. Detection and Preventions:

Detection based schemes are detect the malicious node or the attack or both. On theother hand the prevention based schemes only ignores the nodes or by pass the malicious node and are not capable of detecting the malicious nodes and the attack.

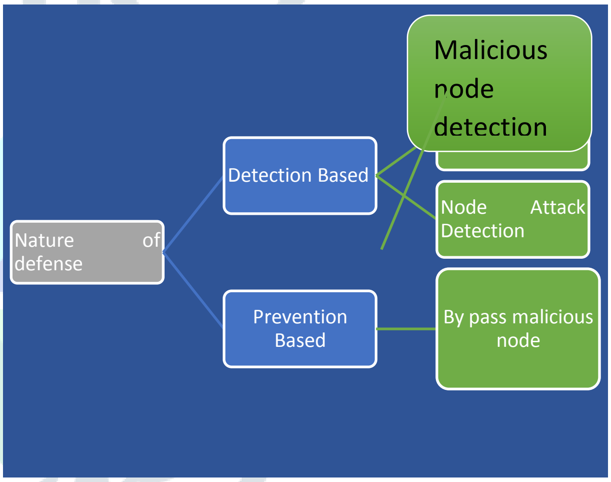


Figure 2. Classification by defense of schemes

B. Distributed and Centralized

In Distributed based schemes, both sensor nodes and base stations are responsible for prevention and detection of the malicious nodes and selective forwarding attack.On the other hand,the centralized based schemes only base stationor cluster head are responsible for countering the selective forwarding attack.

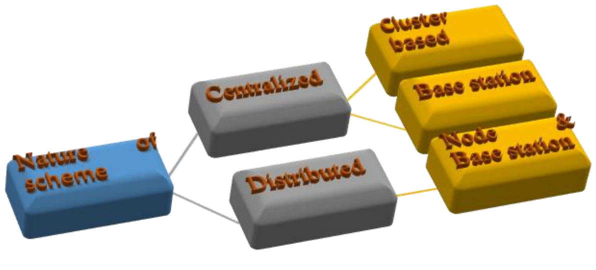


Figure 3. Classification by nature of schemes

3.1 Attack Defensive Technics:

Many techniques are introduced by several researchers to detect malicious nodes that cause selective forwarding attack in Wireless Sensor Networks.There are many detecting technics by which many researchers are trying to remove the complexity which is generated by Selecting Forwarding Attack. In the existing Defensive technique algorithm, a single static path is created for sending the packets to the sink node in the network.When an attack is identified, server removes the malicious node and the packets are retransmitted through the new shortest path without losing the connection.

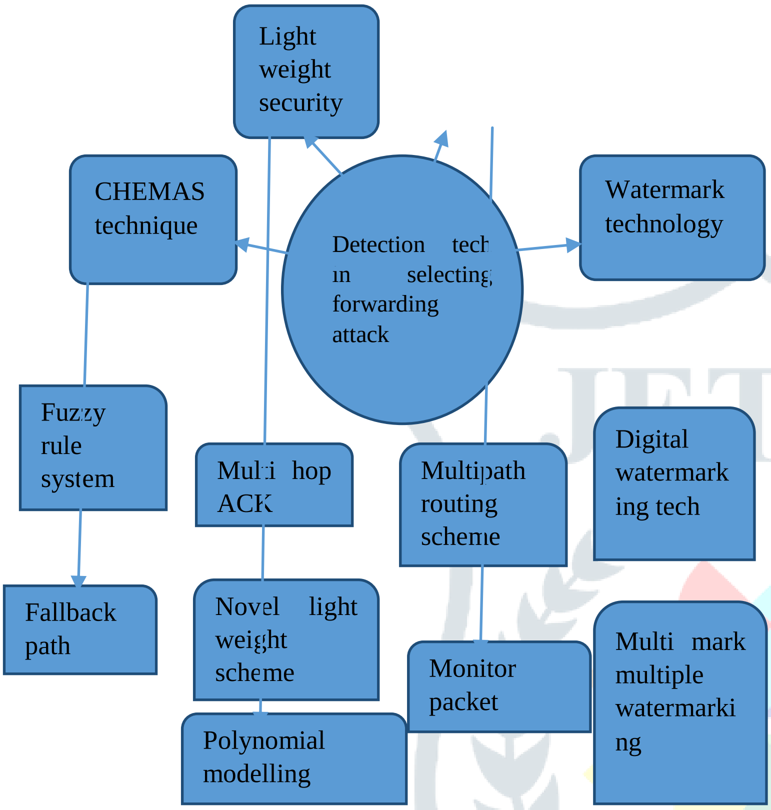


Figure 4: Classification of Selective Forwarding Attack Techniques

3.1.1 Defense Mechanism

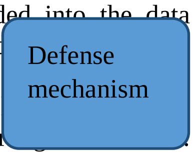
This Defensive techniqueconsists of three phases for secure information delivery. In first phase the node firstly discovers a path and its neighbor nodes also, in the second phase, data is propagated in a multipath, it require tochecks whether the received data is correct or not, and in the final phase if any error is detected then a MONITOR packet is generated and then the malicious node is removed.

3.1.2 Lightweight Defense Scheme

Lightweight security scheme is used to detect selective forwarding attack using multi hop acknowledgement technique or scheme to launch alarms by obtaining responses from intermediate nodes.. This scheme allows both the base station and source nodes to collect attack alarm information from intermediate nodes.Each node in the forwarding path is incharge of detecting malicious nodes. If an intermediate node detects a node as malicious in its downstream/upstream, then it will send an alarm packet to the source node/base station through multi-hops. Downstream denotes direction towards base station and upstream denotes direction towards source node. The detection process consists of upstream detection and downstream detection.. In the other words, though the base station is deafened by malicious node so the source node can make decisions and responses. The scheme can efficientlyobtain those alarm information whenever intermediate nodes in packet forwarding path detect any malicious or corrupted packet dropping.

3.1.3 Watermark Technology

In the digital watermarking technology is used to calculatethe rate of packets which is dropped and modified. Each sensor node can send only a few data bits at a time and by this the length of watermark embedded into the data should be very short. The source noc watermark W with key K and feature of Then the source node embeds or tightly ho into the original data and transfers it thr When the packets reach the BaseStation, then the Base Station obtains the feature of thepackets and generates the watermark W1 by watermark generation algorithm, then the Base Station extracts the watermark directly from the received packets by Watermark embedding algorithm denoted as W2; finally the packet modified rate is calculate by comparing the watermark W1 and watermark W2.



3.1.4 CHEMAS Technique

The Checkpoint Based Multi-hop Acknowledgement Scheme (CHEMAS) was developed by Bin Xiao et al., to detect the selective forwarding attack. When a message is generated by a source node and is delivered to the base station,then the checkpoint nodes are selected randomly. The base station and each checkpoint nodes generate theacknowledgement (ACK) message that is transmitted from the start node to the source node. ACK messages have the Time to Live (TTL) value, which is responsible for sets the hop count. If TTL becomes zero, ACK message is dropped and an alert message is sent to the source node. If any particular node does not send ACK message to the source node then it is identified as the compromised node. Then the source node sends an alarm message about the compromised node to the base station. Another technique for the Checkpoint Based Multi-hob Acknowledgement Scheme (CHEMAS) to detect the compromise nodes that perform a selective forwarding attack when sensing data transmission. If more number of check nodes is presented, then the checking time of the packet transferred will increase and so there will be a time delay in reaching the destination.

4. Selective Forwarding attack prevention:

Multipath routing can be used to counter the selective forwarding attacks. Messages routed over paths whose nodes are completely disjoint are completely protected against selective forwarding attacks involving at most compromised allowing nodes to dynamically choose a packet's next hop probabilistically from a set of possible candidates can further reduce the chances of an adversary gaining complete control of a data flow.

Conclusion:

Secure and safe and on time transmission of packets is the basic need in wireless sensor network. One of the attacks that distract this need is Selective Forwarding attack. This paper presents a brief overview of the selective forwarding attack and its working.In this paper also describes the detection measures against it in the wireless sensor networks.

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