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RESULT ON EFFECTIVE SECURITY MECHANISM FOR WIRELESS SENSOR NETWORKS

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Abstract*:* Now a day's wireless sensor networks are growing fast. Therefore effective security mechanism should be provided. Related Security must address from the starting of the network design, because sensor networks interact with sensitive data and operate in a hostile unattended environment. Due to resource and computing constraints, providing security in routing protocol is the biggest challenge in sensor network. Many sensor network routing protocol have been proposed, but very few have been designed with security as a goal as sensor nodes has limited computation, power and storage resources hence a Asymmetric cryptographic algorithms are not suitable for providing security. On the other hand, it is not possible to replace the batteries of thousands of sensor nodes, hence sensing, computing and communication protocols must be made as energy efficient as possible.

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INTRODUCTION

A Wireless Sensor Network (WSN) consists of number of inexpensive, lightweight, battery-operated multifunctional sensor nodes. For collecting information or monitoring environment sensor networks are deployed in military or citizen field. Sensors nodes are energy constrained and work until its energy gets exhausted. It is not possible to replace the batteries of thousands of sensor nodes, maximizing the lifetime of sensor nodes becomes the main challenge in sensor networks. Therefore sensing, computing and communication protocols must be made as energy efficient as possible. A secure communication between sensor nodes and base station is another important issue in wireless sensor networks. A very few research has been reported in the literature so far on sensor network security. Sensor nodes can also be used in habitat monitoring, energy management, inventory control, and military warfare. Thus many sensor networks will likely to be deployed in open, physically insecure, or even hostile environments.There are a variety of applications are available for sensor networks that depends on the deployment platform. communication in sensor network should be encrypted and authenticated for providing security. Researchers therefore began focusing on building a sensor trust model to solve the problems beyond the capability of cryptographic security. It is important to prevent unauthorized users from eavesdropping, obstructing and tampering with sensor data, and launching denial-of-service (DOS) attacks against entire network. A secure routing protocol should be such to handle any attack in a way so that network continues to function properly.

II.Litreture survey

Many researchers have proposed many different techniques to provide security in ad-hoc wireless networks. The application of these techniques to sensor networks is promising. In the paper [7] the authors Perrig et al. presented two security protocols optimized for use in sensor networks, SNEP and μTESLA. SNEP provides confidentiality, authentication, and freshness between nodes and the sink, and μTESLA provides authenticated broadcast. Both are useful building for securing routing protocols in sensor networks. To the studies on symmetric key cryptography, recently, there are a number of studies investigating the implementation of PKC (Public Key Cryptography) in sensor networks.

The authors in the paper [1] presented a new taxonomy for the classification of authentication protocols in ad hoc networks. Ad hoc networks can be classified into static and mobile networks. Sensor networks (SensNets) typically are static ad hoc networks. On the other hand, mobile ad

hoc networks (MANETs) are autonomous systems of mobile nodes that are free to move at will. A hybrid network may also exist.

From a security standpoint, ad hoc networks face a number of challenges. Attacks may come from anywhere and from all directions [8].

The authors believe that authentication is the cornerstone service, since other services depend on the authentication of communication entities [9]. Authentication supports privacy protection by ensuring that entities verify and validate one another before disclosing any secret information. In addition, it supports confidentiality and access control. In this paper the author's present taxonomy for the classification of authentication protocols in ad hoc networks. They identify three major criteria for classification, based on a node's role in the authentication process, the type of credentials used for authentication, and the phase during which the establishment of credentials takes place.

Energy Efficient Security Protocol [Cam et al., 2003] Wireless sensor network consists of thousands of wireless nodes, each having sensing capability. These sensors are operated by extremely low powered battery for their sensing, computation and communication purpose. As the sensors are energy constraints, asymmetric cryptographic algorithms are not suitable for providing security. Therefore symmetric cryptographic algorithm is used to support the sensor network security [7]. Again, these algorithms also compromise security due to limited key length and memory available on the sensors. In the paper [3], the authors proposed an "energy efficient security protocol" by using non-blocking OVSF (Orthogonal Variable Spreading Factor) [13] technique in addition to changing session keys dynamically.

IV.EFFICIENT DISTRIBUTED TRUST MODEL

- **Definition and Properties of Trust**

There are several definitions given to trust in the literature [10]. Trust is always defined by reliability, utility, availability, risk, quality of services and other concepts. Here, trust is defined as a belief level that one sensor node puts on another node for a specific action according to previous observation of behaviours. That is, the trust value is used to reflect whether a sensor node is willing and able to act normally in WSNs. In this paper, a trust value ranges from 0 to 1. A value of 1 means completely trustworthy and 0 means the opposite. Direct trust: Direct trust is a kind of trust calculated based on the direct communication behaviours. Recommendation trust: the recommendations from third parties are not always reliable; we need an efficient

mechanism to filter the recommendation information. The filtered reliable recommendations are calculated as the recommendation trust. Indirect trust: When a subject node cannot directly observe an object nodes' communication behaviours, indirect trust can be established. Based on [11] and [12], we can conclude that there are three main properties of trust: asymmetry, transitivity and composability.

- **The Calculation of Direct Trust**

Unlike prior work, we compose our direct trust by considering communication trust, energy trust and data trust. The sensor nodes in WSNs usually collaborate and communicate with neighbour nodes to perform their tasks. Therefore, the communication behaviour is always checked to evaluate whether the sensor node is normal or not. The unsuccessful communication maybe caused by malicious nodes or unstable communication channel. Therefore, just evaluating the communication behaviours is not enough for trust evaluation.

C. Calculation of the Communication Trust and Energy Trust

Communication channels between two sensor nodes are unstable and noisy, thus monitoring sensor node's behaviours in WSNs based on previous communication behaviours involves considerable uncertainty. Energy is an important metric in WSNs since sensor nodes are extremely dependent on the amount of energy they have. Malicious nodes always consume abnormal energy to launch malicious attacks. Therefore, we use energy as a QoS trust metric to measure if a sensor node is selfish or maliciously exhaust additional energy. Using an energy prediction model, sensor nodes' energy consumption in different periods can be obtained. First, an energy threshold u is defined. When the residual energy Eres of one sensor node falls below the threshold value, the sensor node is not competent enough to perform its intended function. Thus, the energy trust of the sensor node is considered to be 0. Otherwise, the energy trust is calculated based on the energy consumption rate pene. The higher the energy consumption rate pene is, the less residual energy remains, which ultimately leads to a smaller ability of sensor nodes to complete the task.

D. Calculation of the Data Trust

The trust of the data affects the trust of the network nodes that created and manipulated the data, and vice-versa, we introduce the evaluation of data trust in this section. The data packets have spatial correlation, that is, the packets sent among neighbour nodes are always similar in the same area. The data value of these packets in general follows some certain distribution, such

as a normal distribution. For the sake of simplicity, in this paper, we also model the distribution of the data as a normal distribution.

E. Calculation of the Recommendation Trust

The recommendation trust is a special type of direct trust. When there are no direct communication behaviours between subject and object nodes, the recommendations from recommender are always taken into account for trust calculation. However, in most existing related works, the true and false recommendations are not distinguished. How to detect and get rid of false recommendations is important since it has great impact on the trust calculation.

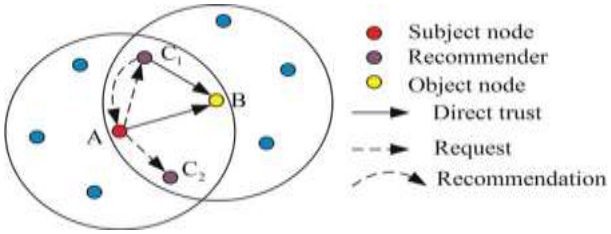
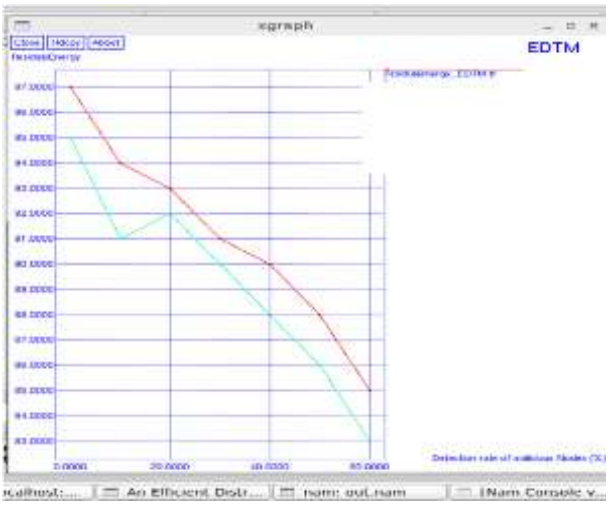


Figure 3: Calculation of the recommendation trust.

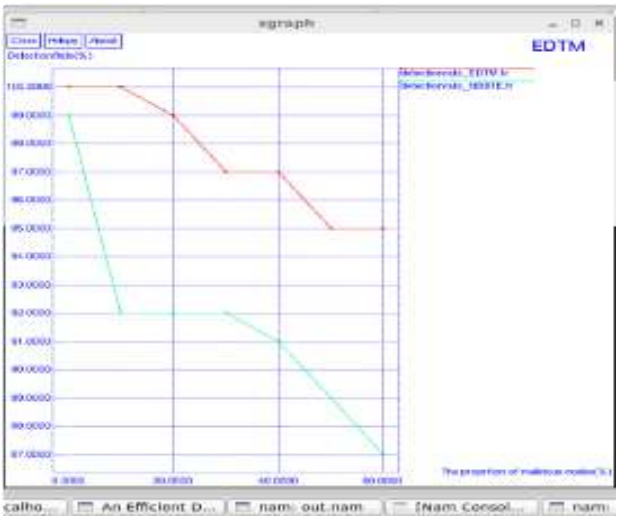
V. RESULT ANALYSIS

A. Metrics are using for Performance Evaluation of EDTM are: Residual Energy, Detection Rate, Trust Value vs. No. of Trust Calculation.

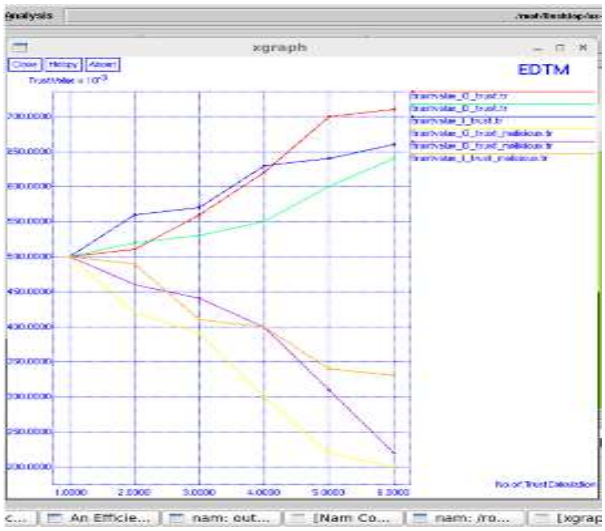
Here we compare EDTM with the previous trust model NBBTE. EDTM is much more energy efficient, because in EDTM sensor nodes interact only with their neighbor nodes. As a result, nodes do not keep trust information about every node in the network. Only keeping neighborhood information implies significant lower energy consumption, less processing for trust level calculation, and less memory space. Here we can see that as the residual energy decrease, detection of malicious node getting decrease.



B. EDTM is robust to the five kinds of malicious attacks selective forwarding attack, data forgery attack, DoS attack, on/off attack, bad and good mouthing attack. Here we can see that dictation rate of malicious node is high.



C. Due to the dynamic behavior of WSNs such as leaving or joining the network, the trust values of sensor nodes should be updated periodically. First, the trust value should not be updated too often. Because frequently updating the trust value will waste a lot of energy. If the cycle time is too long, it cannot efficiently reflect the current behaviors of the object node. Here we can see that update trust value at the specific time period.



VI.CONCLUSION

The severe constraints and demanding deployment environments of wireless sensor networks make computer security for these systems more challenging than for conventional networks. Limited power and resources of sensor nodes make the key challenge in maximizing lifetime as well as providing security in sensor networks. However, several properties of sensor networks may help address the challenge of building secure networks. The trust model has become important for malicious nodes detection in WSNs. It can assist in many applications such as secure routing, secure data aggregation, and trusted key exchange. Due to the wireless features of WSNs, it needs a distributed trust model without any central node, where neighbor nodes can monitor each other. In addition, an efficient trust model is required to handle trust related information in a secure and reliable way.

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