Survey of Trust Management Schemes for Clustered Wireless Network

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Abstract **-** A sensor system will review our health, our home, the streets we follow, the workplace or the industry we work in or even the aircrafts we use, trying to improve our safety. Notwithstanding, the wireless sensor networks themselves are inclined to security attacks. The list of security attacks, in spite of the fact that officially exceptionally long, keeps on enlarging obstructing the development of these networks. The trust management schemes comprise of a powerful tool for the detection of unexpected node behaviors either malicious or faulty. In wireless sensor networks, sensor nodes in the region of interest must report the cognitive process to the sink by sensing, and this report will satisfies the report frequency necessary by the sink. Inside the domain of system security, we decipher the idea of trust as a connection among entities that take part in different conventions. Trust relations are focused around confirmation made by the past connections of substances inside a convention. In wireless sensor network the resource efficiency and reliability of a trust system are the most basic supplies. Due to the low reliability and high overhead the developed existing trust systems for wireless sensor networks are unable of satisfying these supplies. Therefore there is need to propose a lightweight and reliable trust system which can efficiently decrease the networking consumption while malicious, selfish and faulty cluster heads and also exceeds the limitations of traditional weighting methods for trust factors in which weights are allocated subjectively and also insist less communication overhead and memory.

Index Terms -.GTMS, HTMP, TCHEM, ATRM.

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I. INTRODUCTION

Wireless sensor systems propose conceivably helpful arrangements for different applications including atmosphere and temperature observing, freeway traffic analyzing, individuals heart rates sensing, and numerous other military applications. A real feature of these systems is that sensor nodes in systems help one another by passing information, in network process and control packets starting with one node then onto the next. It is regularly termed an infrastructureless, self-organized, or spontaneous system. Trust management is major to recognize pernicious, selfish and compromised nodes which have been validated. It has been broadly contemplated in numerous network situations, for example, peer-to-peer network, peer and pervasive processing et cetera. Be that as it may, in all actuality, sensor nodes have constrained assets and other extraordinary characters, which make trust management for WSNs more critical and testing. Up to the present, explore on the trust management components of WSNs have mainly focused on nodes trust assessment to upgrade the security and power. The reasonable applications of this strategy incorporate the course, information incorporation and cluster head vote. Clustering algorithms can effectively improve the network throughput and scalability for wireless sensor network like EEHC, HEED, LEACH [4], and EC [13]. The nodes are grouped into the cluster with the help of clustering algorithm and within each cluster the node which have high computing power and energy selected as a cluster head CH).Typically the nodes closer to the base station will be vigorously loaded.[7] Trust foundation in a grouped environment is of Incredible criticalness. Trust is the desire of one element about the activities of an alternate. A trust framework empowers a CH to recognize faulty or malicious nodes inside a group, guides the selection of trusted routing nodes through which a cluster member (CM) can send information to the CH. Amid inter-cluster communication, a trust framework additionally helps in the selection of trusted routing gateway nodes or other trusted CHs through which the sender node will forward information to the base station (BS).

A WSN contains battery-power sensor nodes with greatly restricted handling abilities. With a thin radio communication range, a sensor node remotely sends messages to a base station through a multi-hop path. The asset effectiveness and reliability of a trust framework are the most basic necessities for WSNs. Then again, existing trust frameworks created for clustered WSNs are unequipped for fulfilling these necessities due to their high overhead and low reliability. Additionally, implementing complex trust assessment calculations at every CM or CH is not practical. In existing trust mechanisms, trust management system gather remote feedback and then the criticisms from all the nodes are aggregated to get the worldwide notoriety which can be utilized to assess the global trust degree (GTD) of this node. Because of the broadcast nature of the WSN environment, it contains a substantial number of undependable or malicious nodes. Criticism from these undependable nodes may bring about the incorrect evaluation of feedback. So a trust system ought to be profoundly reliable as far as giving administration in an open WSN environment.[10]

II. TRUST MANAGEMENT SYSTEM:

Trust is a critical variable in the choice making procedures of any system where instability is a component. Management System: if a component of the system knows ahead of time the real conduct of their accomplices (e.g. malicious, faulty, and collaborative), it can settle on an impeccable choice. All the components of the network work towards the same objective, and they have not reason or the will to carry on selfishly. On the other hand, a sensor node does not have data with respect to others that will permit it to know ahead of time how a transacting accomplice is going to act. Thusly, there is some

data asymmetry that the node must arrangement with. At the point when a sensor node picks an accomplice to team up with, such accomplice should be fair and completely synergistic. Sensor systems can endure the attack of noxious nodes or the presence of flawed nodes. As a result, vulnerability in sensor networks is an issue that must be managed a Wireless Sensor Network must be ready to design itself amid its lifetime in vicinity of exceptional occasions.

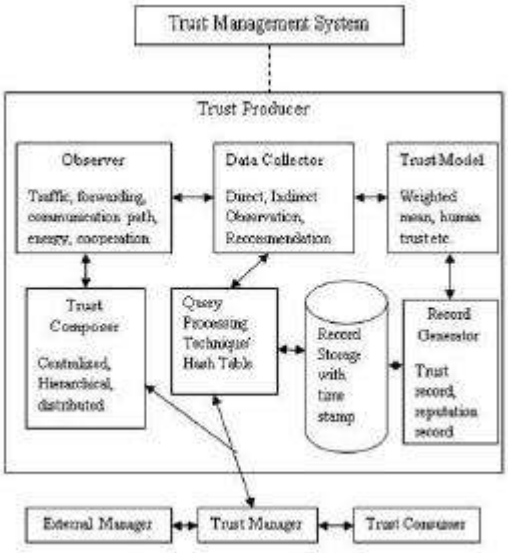

Fig1:Architecture of Trust Management system

III. RELATED WORK

A.GTMS (Group Based Trust Management Scheme):

Traditional trust schemes for clustered WSNs focus on the trust values of individual nodes but, In GTMS evaluates the trust of group of nodes. This approach gives us the benefit of requiring less memory to store trust records at each Sensor node in the network. GTMS works on two topologies: intragroup topology where distributed trust management approach is used and intergroup topology where centralized trust management approach is adopted. This methodology helps to drastically reduce the cost associated with trust evaluation of distant nodes. GTMS not only provides a mechanism to detect malicious nodes but also provides some degree of prevention mechanism. [9]

ADVANTAGES:
1. Scheme is memory efficient and consumes less communication overhead.
2. GTMS uses a hybrid trust management approach, which reduces the cost of trust evaluation.

DISADVANTAGES:
1. Limited work has focused on resource efficiency.
2. Limited work focused on dependability of trust system itself.
3. GTMS relies on broadcast based strategy to collect feedback from the CMs of the cluster, which requires significant amount of resources and power.

B.HTMP (Hierarchical Dynamic Trust Management Protocol):

This trust scheme consider not only quality of service (QoS) trust derived from communication networks, but also social trust derived from social networks to judge if a node is trustworthy to deal with selfish (uncooperative) or malicious nodes. This approach design and validate a hierarchical trust management protocol that can dynamically learn from past experiences and adapt to changing environment conditions (e.g., increasing hostility or misbehaving node population) to maximize application performance and enhance operation agility. This is achieved by addressing critical issues of hierarchical trust management, namely, trust composition, aggregation, and formation. For trust composition, novel social and Quality of Service trust components are considered. For trust aggregation, the best way to aggregate trust (direct vs. indirect trust evaluation) and propagate trust (trust data collection, dissemination and analysis) for each individual trust component, and ascertain protocol accuracy by means of a novel model-based analysis methodology.[1]

ADVANTAGES:
1. This scheme design and validate hierarchical trust management protocol that can dynamically learn from past experiences and dynamically adapt to changes in the environment.
2. Subjective trust is validated against the objective trust.

DISADVANTAGES:
1. Implementing such complex trust evaluation scheme at each CM of the cluster is unrealistic.
2. Very less work has been focused on resource efficiency and dependability.
3. More Memory space required for storing the trust values.

C. TCHEM (A Trust Based Cluster Head Election Algorithm):

Its framework is useful for cluster-based wireless sensor networks and, a mechanism that reduces the likelihood of compromised or malicious nodes being selected (or elected) as cluster 5heads. Number of assumptions are made. Firstly, a reliable link layer protocol and cluster formation algorithm is assumed. [12]Once the clusters are formed they maintain the same members, except for cases where nodes are blacklisted die or when new nodes join the network. All the nodes communicate via a shared bidirectional wireless channel and operate in the promiscuous mode, that is, if node A sends a message to node C via node B, then node A can hear if node B forwarded that message onto node C, the destination key distribution is not considered but it is assumed that each node has three keys; a master, cluster and pairwise. The master key is shared by every node and facilitate broadcast by the base station. Members of each cluster share the cluster key. Each cluster has a different cluster key. This key facilitates multicasting communication from the base station to a cluster and also group communication within the clusters themselves. The pairwise key allows node-to- node communication. [2]

ADVANTAGES:
1. This approach can decrease the likelihood of malicious or compromised nodes from becoming CHs.
2. It reduces the effect of bad mouthing attack.

DISADVANTAGES:
1. TCHEM does not cover trust in detail because of which numerous key issues of trust management are not introduced.
2. Scalability of TCHEM model is not validated.

D. ATRM (Agent Based Trust and Reputation Management Scheme):

This technology introduces trust and reputation local management strategy with the aid of the mobile agents running on each node. The benefit of this local scheme is centralized repositories are not required for trust and reputation, and nodes themselves are capable of

providing their own reputation information whenever required. [11] The objective of the scheme is to manage trust and reputation locally with minimal overhead in terms of extra messages and time delay. This scheme shows extensive performance evaluation results, which clearly shows that trust and reputation can be computed in wireless sensor networks with minimal overhead. [8]

ADVANTAGES:
1. Centralized repositories are not required for trust and reputation.
2. Reputation computation and propagation is performed without network wide flooding and with no acquisition latency.
3. Minimum overhead is achieved in terms of extra messages and time delay.

DISADVANTAGES:
1. The assumption, mobile agents are resilient against malicious nodes that try to steal or modify information that such agents carry may be unrealistic.
2. Very less attention to overhead on agents.

IV. COMPARATIVE ANALYSIS OF DIFFERENT TRUST SCHEMES AVAILABLE FOR CLUSTERED WSNS.

Sr. no.	Name of paper	Trust Metric	Trust Calculation Direct / Indirect	Scheme Used	Supported Network Architecture
1	Global Trust Management Scheme	Past Interactions	Both	Hybrid	Clustered WSN
2	Hierarchical Trust Management Scheme	QOS+ Social Trust	Both	Hybrid	Clustered WSN
3	Trust Based Cluster Head Election Mechanism	Data Packets	Both	Distributed	Ad-Hoc
4	Agent Based Trust and Reputation Management	Agent Based	Both	Hierarchical Certificate Based	Clustered WSN
5	Lightweight and Dependable Trust System	GTD+Past Interactions	Both	Centralised + Distributed	Clustered WSN

Fig: Comparative Analysis of Different Trust Schemes Available For Clustered WSNs.

V. CONCLUSION AND FUTURE SCOPE:

This framework can greatly improve system efficiency while reducing the effect of malicious nodes. By adopting a dependability-enhanced trust evaluating approach for co-operations between CHs, LDTS can effectively detect and prevent malicious, selfish, and faulty CHs. Due to cancelling feedback between cluster members (CMs) or between cluster heads (CHs), this approach can significantly improve system efficiency while reducing the effect of malicious nodes. The proposed secure protocol can be used in most applications, not only one-to-one secure transmission, but also broadcasting and multi-casting. With the help of simulation results we can say that this model demands less memory and communication overhead as compared with other typical trust systems and is more suitable for clustered WSNs. In future system can also save energy and increase the lifetime of a network. Also try to make more lightweight and reliable than the current system.

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