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A Survey on Secure Data Discovery and Dissemination to Improve the Lifetime for Wireless Body Area Networks

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Abstract: A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance. They are now used in many industrial and civilian application areas, including industrial process monitoring and control, machine health monitoring, environment and habitat monitoring, healthcare applications, home automation, and traffic control. In addition to one or more sensors, each node in a sensor network is typically equipped with a radio transceiver or other wireless communications device, a small microcontroller, and an energy source, usually a battery. A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from hundreds of dollars to a few pennies, depending on the size of the sensor network and the complexity required of individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and bandwidth. A sensor network normally constitutes a wireless ad-hoc network, meaning that each sensor supports a multi-hop routing algorithm.

Keywords: Wireless Sensor Network (WSN), Multi-Hop Routing Algorithm, Sensor Node, Ad-Hoc Network.

I. INTRODUCTION

A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance. They are now used in many industrial and civilian application areas, including industrial process monitoring and control, machine health monitoring, environment and habitat monitoring, healthcare applications, home automation, and traffic control. In addition to one or more sensors, each node in a sensor network is typically equipped with a radio- transceiver or other wireless communications device, a small microcontroller, and an energy source, usually a battery.

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A Wireless Sensor Network (WSN) provides a low-cost and multifunctional means to link communications and

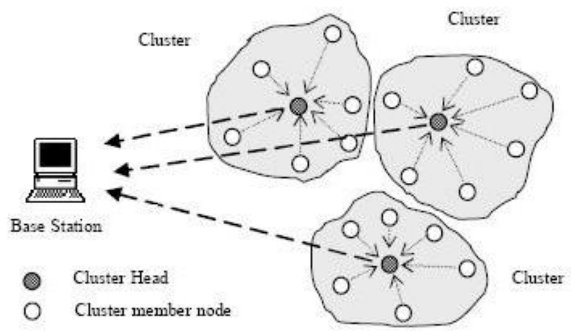

Figure 1.1 Architecture of WSN

computer networks to the physical world. It consists of base stations and a number of wireless sensors. Each sensor is a unit with wireless networking capability that can collect and process data independently. Sensors are used to monitor activities of objects in a specific field and transmit the information to the base station. However sophisticated applications require preprocessing of the data to extract important information so that transmission bandwidth can be preserved by simply transmitting the essential information (e.g., alerting the operator of a critical event). Local processing capability is also important for applications in which the sensor supports bidirectional communication.

In these cases, the users can query the sensor either for status or for a history of previous samples of data. The

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communication module consists of a short-range radio transceiver. The power module is used to house the battery and provides energy to the other modules. The functions of all four modules partially depend on the role of the sensor node. A sensor node can operate in one of the three roles: data collector, cluster head, or data relay. If a node is a data collector, the transducer module directly passes the sampled data to the communication module for transmission. A cluster-head node gathers the sensed data from the cluster members and performs data processing to aggregate multiple signals into one signal. If a node works as a relay, it receives the data from nearby nodes and transmits the data to other nodes or the base station. Sensors have limited energy supply and are usually deployed in a hostile environment. Recharging is almost impossible during the operation. Therefore, long-term applications require energy efficient solutions.

I.I DYNAMIC AND AUTONOMOUS NETWORK OPERATION

Sensors are often deployed and arranged in environments that are inaccessible to humans (e.g., dropped from an airplane into remote mountainous regions). The topology of a WSN changes frequently due to failures of the sensor nodes. Therefore, protocols and algorithms with self-organizing ability are preferred. It is rather critical to operate a WSN at extremely low power levels. Although many solutions are available for conventional wireless networks, they are becoming obsolete and do not cater to present day requirements. Cellular networks, mobile ad-hoc network (MANET), and short-range wireless local area networks, however are unsuitable for achieving the unique characteristics of a large-scale WSN.

II. CHAIN BASED PROTOCOLS FOR DATA BROAD CASTING

Kemei Du, Jie Wu and Dan Zhou describes that in wireless sensor networks, the sensor nodes gather information and send the information to a base station periodically. Some important messages need to be broadcasted to all nodes. Data gathering and broadcasting are important operations that consume significant amounts of battery power. Due to the limited battery life, energy efficiency is becoming a major challenging problem in these power-constrained networks. Chain-based protocols construct a transmission chain connecting all nodes to save energy dissipation of data transmission. They first review several existing chain-based protocols then present the multiple-chain scheme which outperforms the existing ones in the sparse-node distribution case. Furthermore, they develop an energy-efficient chain construction algorithm which uses a sequence of insertions to add the least amount of energy consumption to the whole chain.

It consumes less transmission power compared to the closest neighbor algorithm**.** In this method they proposed a new chain protocol, multiple-chain protocol for all-to-all broadcasting in wireless sensor networks. A new chain-construction algorithm, which establishes a chain with a minimum total energy, is also presented. They have evaluated different chain based protocols through simulations: linear-chain, binary combining-chain and newly proposed multiple-chain. Due to various network topologies and applications, it is impossible that one optimal approach exists which is suitable for all situations. Binary combining scheme works efficiently in sensor networks to balance transmission energy cost and latency. For all-to-all broadcasting, linear-chain consumes less energy per round in the dense case, while multiple-chain wins in relatively sparse networks. However, the bottleneck problem occurs in the multiple-chain scheme.

III. COMPREHENSIVE INFORMATION RETRIEVAL IN WSN

Arati Manjeshwar and Dharma P. Agrawal were said that wireless sensor networks with thousands of tiny sensor nodes are expected to find wide applicability and increasing deployment in coming years, as they enable reliable monitoring and analysis of the environment. In this method they intended a hybrid routing protocol (APTEEN) which allows for comprehensive information retrieval. The nodes in such a network not only react to time-critical situations, but also give an overall picture of the network at periodic intervals in a very energy efficient manner. Such a network enables the user to request past, present and future data from the network in the form of historical, one-time and persistent queries respectively.

This paper is evaluated the performance of these protocols and observe that these protocols are observed to outperform existing protocols in terms of energy consumption and longevity of the network. So finally they have concluded that introduced Hybrid protocol APTEEN which combines the best features of both proactive and reactive networks and to provide periodic data collection as well as near real-time warnings about critical events. This paper is also demonstrated implementation of a query which is versatile enough to respond to a variety of queries. This method is suitable for only a network with evenly distributed nodes. This method is not extended further to sensor networks with uneven node distributions.

IV. PROTOCOLS FOR SELF ARGANIZATIONS OF A WSN

Katayoun Sohrabi, Jay Gao, Visuals Ailawadhi, and Gregory J. Pottie they described that an architecture for self-organizing wireless sensor networks. These are wireless ad hoc networks that connect deeply embedded sensors, actuators, and processors. This combination of wireless and data networking will result in a new form of computational paradigm which is more communication centric than any computer network seen before. Wireless sensor networks are part of a growing collection of information technology constructs which are moving away from the traditional desktop wired network architecture toward a more ubiquitous and universal mode of information connectivity .A wireless sensor network of the type investigated here refers to a group of sensors, or nodes, linked by a wireless medium to perform distributed sensing tasks. Connections between nodes may be formed using such media as infrared devices or radios. They classified the wireless sensor networks into some classes according to that the entire range of design activities related to the hardware platforms that make up sensor networks.

MEMS sensor technology is an important aspect of this category. Digital circuit design and system integration for low power consumption are also in this category as well as design of an own-power sophisticated radio frequency (RF) front-end and associated control circuitry. This paper is implemented a set of algorithms for establishing and maintaining connectivity in wireless sensor networks. The algorithms exploit the low mobility and abundant bandwidth, while coping with the severe energy constraint and the requirement for network scalability. The algorithms further accommodate slow mobility by a subset of the nodes. However, many important research questions remain, including bounds on the minimum energy required for network formation, especially taking into account the interactions with the signal processing functions However, the Hardware testing of alternative algorithms in large networks is quite difficult.

V. PPOSS ROUTING PROTOCOL

A routing protocol is a protocol that specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network, the choice of the route being done by routing algorithms.PPSS is designed based on proactive wake up: when a node (i.e., alarm node) detects a target, it broadcasts an alarm message to proactively awaken its neighbor nodes (i.e., awakened node) to prepare for the approaching target. To enhance energy efficiency, we modify this basic proactive wake-up method to sleep schedule nodes precisely. Specifically, PPSS selects some of the neighbor nodes (i.e., candidate node) that are likely to detect the target to awaken. On receiving an alarm message, each candidate may individually make the decision on whether or not to be an awakened node, and if yes, when and how long to wake up. We utilize two approaches to reduce the energy consumption during this proactive wake-up process. First, the number of awakened nodes can be reduced significantly, Second, the active time of chosen awakened nodes can be curtailed as much as possible, because they could wake up and keep active only when the target is expected to traverse their sensing area. For this purpose, we present a sleep scheduling protocol, which schedules the sleep patterns of awakened nodes individually according to their distance and direction away from the current motion state of the target.

VI. SLEEP WAKE SCHEDULING

Sleep Wake Scheduling is applied in WSN and the Measurements have shown that the energy that a sensor node spends while idly listening amounts to 50%-100% of the energy required for receiving. Furthermore, typically, a sensor node would spend a substantial fraction of the time in the idle state. Therefore, idle listening has been recognized as one of major sources of energy waste in sensor networks and sleep scheduling has been widely studied. The mainstream of research on sleep scheduling can be divided into two approaches. One approach, the "periodical packet-arrival based approach", assumes periodical packet arrival, thus proposing a periodic active/sleep schedule. The second approach is "coverage-based approach", which assumes large density of sensor nodes, thus maintaining the connectivity of the network by a subset of nodes which are ON all the time, while letting the other nodes sleep. There are also various strategies for adaptation of the sleeping schedule, that is -ending the ON period according to different criteria, such as the overheard messages, the network topology, the residual energy of the nodes, the most recently updated neighbor sleeping schedule, the database of neighbor nodes' sleeping schedule, the number of packets queued in the MAC layer, and the waiting time of packets and the length of waiting queue in the previous node.

VII.TARGET TRACKING APPROACH

This approach quantifies the benefits of our approach in terms of energy consumed and accuracy of tracking for different mobility patterns. The key issues in tracking a mobile target are accuracy of tracking and energy expenditure. The accuracy of tracking is strongly influenced by the number of active sensor nodes. The more sensor nodes that are active, the higher will be the accuracy in tracking. Too few will result in inaccurate tracking. On the other hand, energy expenditure is proportional to the number of active sensor nodes; the larger the size of the active tracking region, the higher the energy consumption. To accurately track the target and minimize energy, a minimum set of sensors nodes need to be active.

A cluster-based scheme is proposed, where sensors are statically divided into clusters, and each cluster consists of a single Cluster Head (CH) and a bunch of slave sensors. At every sampling instant, only one cluster of sensors is triggered to track the target. When a target enters the wireless sensor network, the CH that detects the target becomes active while other nodes are in sleep mode. Then the active CH selects three sensor nodes of its members for tracking in which one node is selected as Leader node. The selected nodes sense the target and current target location is calculated. It need to configure some attributes which is supported to execute our routing protocol like Number of nodes, Mobility, Mac protocol, Simulation time, Band width, Transmission range etc…

VIII. CONCLUSION

In this survey investigated a system that is developed in such a way that target tracking in WSN is done in efficient way using an energy efficient prediction based sleep scheduling algorithm with lightweight and confidential data discovery and dissemination protocol. It uses low-complexity symmetric cryptographic techniques for maintaining confidentiality. Also, it changes the encryption key on a per-packet basis to prevent the intermediate nodes from forging the keys, ensuring authenticity of the broadcast data items. Our Theoretical solution conforms that the resource limitations of a WBAN to provide guarantee for the tracking performance. By effectively limiting the scope of this local active environment (i.e., reducing low value-added nodes that have a low probability of detecting the target), PPSS improves the energy efficiency with an acceptable loss on the tracking performance. Given some limitations in tracking accuracy, the potential future work includes optimization-based sleep scheduling and target prediction for abrupt direction changes. So as a future enhancement, the tracking algorithm can be extended by forming clustering as one of the optimization methods.

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