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Network Lifetime Enhancement in Mobile Ad-Hoc Network: A Review

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***Abstract* – A Mobile Ad-hoc network (MANET) is a collection of a large number of small, spatially distributed, and autonomous devices. These devices are known as sensor nodes. The devices are able to sense, lots of computation work, and ability of wireless communications, but still there is a very limited resources in the device. Here the resource comes under size of memory and short lifetime of battery. MANET are gaining a lot of interest and supporting several applications including environmental monitoring, vehicle tracking, and traffic control.**

***Keyword* – Wireless Mobile Ad-Hoc Network, Energy Efficiency.**

I. INTRODUCTION

Mobile Adhoc networks may consist of many different types of sensors such as seismic, low sampling rate magnetic, thermal, visual, infrared, acoustic and radar, which are able to monitor a wide variety of ambient conditions that include the following:

- Temperature,
- Humidity,
- Vehicular Movement,
- Lightning Condition,
- Pressure,
- Soil Makeup,
- Noise Levels,

Sensor nodes can be used for continuous sensing, event detection, event ID, location sensing, and local control of actuators. The concept of micro-sensing and wireless connection of these nodes promise many new application areas. We categorize the applications into military, environment, health, home and other commercial areas. It is possible to expand this classification with more categories such as space exploration, chemical processing and disaster relief.

Advances in electronic and computer technologies have paved the way for the proliferation of Mobile Adhoc Network (Manet). MANET can be used in various ubiquitous and pervasive applications such as military, health monitoring [1, 2], data acquisition in hazardous environment, and habitat monitoring [3, 4]. A typical WSN may include hundreds to several thousands of sensor nodes that are of low cost and have limited availability of both computation power and energy resources. MANET are often deployed in a random distribution with no existing infrastructure. There might be three types of communication in a sensor network: sensor-to-sensor, sensor-to-sink, and sink-to-sensor.

Securing sensor networks against these threats is a challenging research area due to their wireless and distributed nature and the serious constraints in node battery. So far, research in sensor networks security has made certain progress in providing specialized security mechanisms, like key establishment, secure localization, or secure aggregation etc.

A sensor can be used for continuous sensing, event detection, event ID, location sensing, and local control of the motor. The concept of partial disclosure wireless connection of these nodes promised many new areas of application. Classify applications in the military, the environment, health, home and other commercial places. It is possible to extend this arrangement with more groups, such as space exploration, chemical processing and disaster relief.

Advances in electronic and computer technology has opened the way for the spread of Mobile Adhoc Network (WSN) for. MANET can be used in various applications and broadcast all over the place such as the army, and health monitoring [1.2], to obtain the data in a dangerous environment, and monitoring of habitats [3.4]. A typical WSN can include hundreds of thousands of sensor nodes that are low cost and availability of all of the capacity and energy and the limited computing resources. MANET are often published in the random distribution without existing infrastructure. There may be three types of connections on a network of sensors: sensing sensor, the sensor to the pelvis and the pelvic and sensors.

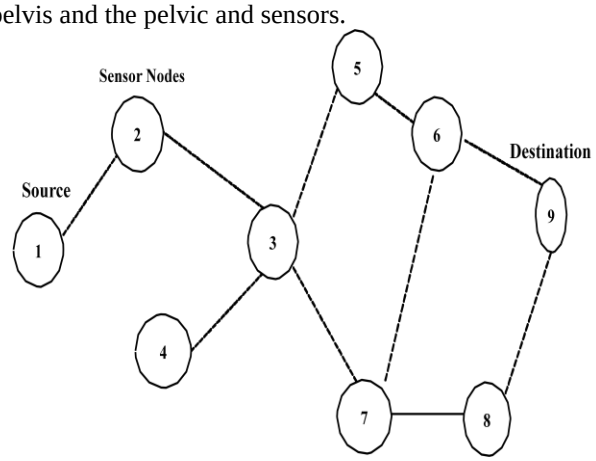

Fig.1. Example of MANET

Securing sensor networks against these threats is a difficult area of research because of the nature of the distribution and wireless serious join on the battery and constraints. So far, the sensor networks for security research has been some progress in the provision of specialized security mechanisms, such as the establishment of a key, a safe place, or safe assembly, etc.

II. CHALLENGES OF MANET

In spite of the diverse applications, sensor networks pose a number of unique technical challenges due to the following factors: Ad hoc deployment: Most sensor nodes are deployed in regions which have no infrastructure at all.

- A typical way of deployment in a forest would be tossing the sensor nodes from an aeroplane. In such a situation, it is up to the nodes to identify its connectivity and distribution. Unattended operation: In most cases, once deployed, sensor networks have no human intervention.
- Hence the nodes themselves are responsible for reconfiguration in case of any changes. Untethered: The sensor nodes are not connected to any energy source. There is only a finite source
- of energy, which must be optimally used for processing and communication. An interesting fact is that communication dominates processing in energy consumption. Thus, in order to make optimal use of energy, communication should be minimized as much as possible. Dynamic changes: It is required that a sensor network system be adaptable to changing
- Connectivity (for e.g., due to addition of more nodes, failure of nodes etc.) as well as changing environmental stimuli.

III. ENERGY EFFICIENCY

Energy consumption is the most important factor to determine the life of a sensor network because usually sensor nodes are driven by battery and have very low energy resources. This makes energy optimization more complicated in sensor networks because it involved not only reduction of energy consumption but also prolonging the life of the network as much as possible. This can be done by having energy awareness in every aspect of design and operation. This ensures that energy awareness is also incorporated into groups of communicating sensor nodes and the entire network and not only in the individual nodes. A sensor node usually consists of four sub-systems: a computing subsystem: It consists of a microprocessor(microcontroller unit,MCU) which is responsible for the control of the sensors and execution of communication protocols

- MCU's usually operate under various operating modes for power management purposes. But shuttling between these operating modes involves consumption of power, so the energy consumption levels of the various modes should be considered while looking at the battery lifetime of each node. a communication subsystem: It consists of a short range radio which is used to communicate with neighboring nodes and the outside world.
- Radios can operate under the Transmit, Receive, Idle and Sleep modes. It is important to completely shut down the radio rather than put it in the Idle mode when it is not transmitting or receiving because of the high power consumed in this mode a sensing subsystem : It consists of a group of sensors and actuators and link the node to the outside world
- Energy consumption can be reduced by using low power components and saving power at the cost of performance which is not required. a power supply subsystem : It consists of a battery which supplies power to the node. It should be
- seen that the amount of power drawn from a battery is checked because if high current is drawn from a battery for a long time, the battery will die even though it could have gone on for a longer time. Usually the rated current capacity of a battery being used for a sensor node is lesser than the minimum energy consumption required leading to the lower battery lifetimes. The lifetime of a battery can be increased by reducing the current drastically or even turning it off often.

IV. COMPONENTS OF A WSN NODE

A WSN node contains several technical components. These include the radio, battery, microcontroller, analog circuit, and sensor interface. When using WSN radio technology, you must make important trade-offs. In battery-powered systems, higher radio data rates and more frequent radio use consume more power. Often three years of battery life is a requirement, so many of the WSN systems today are based on ZigBee due to its low-power consumption. Because battery life and power management technology are constantly evolving and because of the available IEEE 802.11 bandwidth, Wi-Fi is an interesting technology.

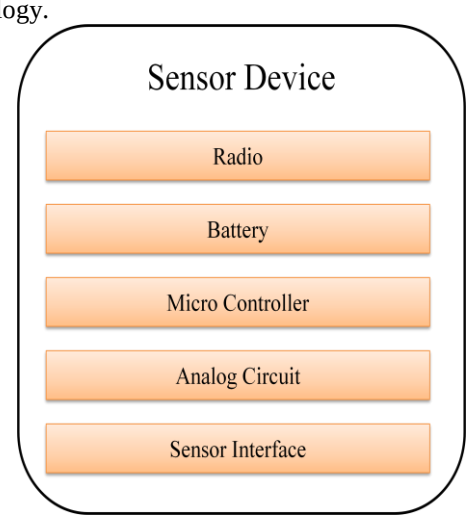

Fig.2. WSN Sensor Node Components

The second technology consideration for WSN systems is the battery. In addition to long life requirements, you must consider the size and weight of batteries as well as international standards for shipping batteries and battery availability. The low cost and wide availability of carbon zinc and alkaline batteries make them a common choice.

To extend battery life, a WSN node periodically wakes up and transmits data by powering on the radio and then powering it back off to conserve energy. WSN radio technology must efficiently transmit a signal and allow the system to go back to sleep with minimal power use. This means the processor involved must also be able to wake, power up, and return to sleep mode efficiently. Microprocessor trends for MANET include reducing power consumption while maintaining or increasing processor speed. Much like your radio choice, the power consumption and processing speed trade-off is a key concern when selecting a processor for MANET. This makes the x86 architecture a difficult option for battery-powered devices.

V. Sink Relocation

In WSN, sinks are bounded with abundant resources and sensors that generate data are termed as sources. The sources can transmit data to one or multiple sinks for the purpose of analysis and processing. [5] In Mobile Adhoc Network, sink relocation is preferred by all applications that involve real time traffic for even in the middle of multiple nodes it can balance the traffic load and thereby lessen the miss rate of real time packets. To carry out sink repositioning, multiple sink deployment and sink mobility can be considered. Precise information of the area being monitored is needed to offer an ideal solution by the sink deployment method, but this method is not a realistic often. To reallocate the sink, its odd pattern of energy must be considered. [6]

VI. Issues of Sink Repositioning

1. When the gateway relocation is sensible, where the gateway has to be placed and how the data traffic has to be handled during the gateway's movement is the most basic issue. Given the traffic distribution and network state at that time, gateway relocation must be based on the motivation by the inefficient pattern of energy depletion or an intolerable increase in the missed deadlines whenever real time packets are used. If such condition is detected, then to enhance the network performance the gateway should identify the most suitable location.
2. Finding an efficient strategy for optimal gateway location is complex and it is NP hard problem. Two characteristics of gateway that are responsible for complexity are as follows,

- The gateway can be moved to immeasurable possible positions, which is the first responsible characteristic for complexity.
- Every temporary discovery solution of gateway location requires the construction of new multi- hop network topology to confirm that the current temporary solution is qualifyable than previous temporary solution. The mathematical expression for this problem necessitates more parameters such as positions of all deployed sensors and state parameters like energy level and transmission range. For a network with large number of nodes, the pursuance of exhaustive search will be impractical.
- Further, when the gateway is moved multiple times, the optimization process has to be repeated for the dynamic nature of the network makes the sensor state and sources of data variant.

3. All the above to the optimization problem, the gateway have need of performing trade-off analysis between the old and new location for gain achieved and overhead on sensors. For instance, the affect on the lifetime of an individual sensor and the system level metrics such as average energy per packet has to be considered when energy metrics are of utmost concern. The gateway moves towards the location in case the relocation is justified. For this scenario, the trade off analysis has to be done so that the data are not lost. However, data loss can occur by packet losses, when the gateway moves out of the transmission range of the sensors that have direct communication path with the gateway.

VII. Related Work

Sensor networks [1] are dense wireless networks where information is gathered by sensor elements spread out in an interest area. The main deficiency of sensors is their finite source of energy. Therefore, an efficient utilization of this energy resource conditions the network lifetime. In order to enhance the performance of these networks, some research efforts have focused on the mobility of a single or multiple sink nodes. In this paper, we propose a new dynamic approach to extend the lifetime of a sensor network based on both mobility and multiplicity of sinks. According to the evolution of the network, in terms of energy dissipation and distribution, this approach aims to find the optimal position for all the sinks in order to maximize the lifetime of the network and move accordingly these sinks in an intelligent manner.

The advancement in wireless communications [2] and electronics has enabled the development of low-cost sensor networks. The sensor networks can be used for various application areas (e.g., health, military, home). For different application areas, there are different technical issues that researchers are currently resolving. The current state of the art of sensor networks is captured in this article, where solutions are discussed under their related protocol stack layer sections. This article also points out the open research issues and intends to spark new interests and developments in this field.

Topology [3]of the structure is the first step in the design and construction of Mobile Adhoc Network. A desirable topology can extend the lifetime of the entire

network. This paper focuses on the complexity of the structure of the topology of wireless sensor network and analyze their complex characteristics in terms of the theory of network science. Wherever wireless sensor network is scanned for. The results indicate that for the mesh network, the node degree is uniformly distributed, have comparatively smaller mean path length and greater coefficient cluster. Then compare it to another network, the wireless sensor network is the network regularly or complete random network

In this article,[4] the algorithms proposed in the method of the wireless sensor network is compared. Energy consumption is very important for self-powered radio nodes. But some energy applications balance is more important. Networks of wireless sensors used in large areas such as farmland or stores consist of hundreds of nodes. In the conventional method of routing is directed to transmit a short time and low energy consumption. But consumption of unbalanced energy can often cause unpredictable failures due to lack of energy in the nodes of frequent use. Energy balance to avoid this dynamic behavior by skipping nodes used. The document discloses examples of algorithms that may be used in the method of the wireless sensor network. The aim of this method is the extension of the network via a data path selection to minimize the dispersion of energy in the network nodes.

Understand energy [5] consumption in a wireless sensor network is the most important of these networks inexpensive sensors deployed appearance. This role models and calculates the energy consumption of a network, such as an intrusion into a secure zone is followed. The network comprises a wireless sensor without randomly distributed, which simulates several protocols to transmit information to detection matrix. Increase the number of heads of munitions range sensor and increase the transmission range of individual nodes directly reduces the energy consumed while monitoring intrusion. However, increasing the precision of the sensor increases energy consumption while monitoring intrusion. Models created to simulate a network, its protocols and data transfers, and a penetrating agent, has proven to be an effective set of tools to test network conditions and determine the cost of energy.

VIII. CONCLUSION

Mobile Adhoc Network have been developed and applied to industrial, commercial, defense and civil sector applications. Energy is the main gole in sensor networks. Battery power consumption is a major issue in the sensor network environment. This article is a review of various issues of sensor network. Here sink relocation has also discussed by which such problem can be solve.

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