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Review: Energy Efficient Wireless Sensor Network Routing Algorithm

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***Abstract* – In the recent years, the technology of wireless sensor networks has gained a lot of importance. Wireless sensor networks are a special case of ad-hoc wireless networks. A wireless sensor network is a collection of sensor nodes that communicate through wireless links to work together to carry out functions. The sensor nodes' basic function is to monitor the physical and environmental changes in terms of pressure, humidity, temperature etc. (referred as sensing). Sensor nodes have processing, communication and sensing capabilities.**

***Keywords* – MANET, WLAN, WSN, Routing.**

I. INTRODUCTION

A network consists of two or more computers that are linked in order to share resources, exchange files, or allow electronic communications where resource means any type of media, hardware of computer system or any other external device for example CDs, RAM, printers etc. The computers on a network may be linked through cables, telephone lines, radio waves, satellites, or infrared light beams. Computer network may classify on the base of different parameters.

A computer Network is a methodology by which the two or more end users can connect in order to data sharing [1]. To install any network there are three basic needs. These are 1) Computers 2) Connecting Media and 3) Protocol.

Figure 1 shows the classification of computer network but the proposed work has focused on the wireless network, now let understand the wireless network. Wireless LAN (WLAN) uses electromagnetic waves to send information. It transmits data without a physical connection. WLAN supports the same capabilities and the speed of a wired network. In different wireless stations can connect to an access point or can be an ad hoc network. The data transmitted in a wireless LAN is placed on a radio carrier wave. Modulation of the carrier is made to accurately demodulate the received signal. Radio waves are transmitted at different frequencies so they can be transmitted without interfering with each other because the interference degrades the signal quality drastically. The receiver comprises a filter circuit so that it can be tuned to the desired while rejecting all other frequencies.

II. MOBILE AD-HOC NETWORK

A Mobile Ad-Hoc Network (MANET) is a temporary network having collection of wireless mobile nodes without using central access, infrastructure or centralized administration. There are number of characteristics in Mobile ad-hoc networks having verity of features, such as the dynamic network topology, limited bandwidth and energy constraint in the network. Mobile ad hoc network is significant for military operation to provide communication between squads, emergency case in out-of-the-way places, medical control etc. Routing in ad-networks has been a challenging task ever since the wireless networks came into existence. The major reason for this is the constant change in network topology because of high degree of node mobility. A number of protocols have been developed for accomplish this task. Some of them are DSDV and AODV routing protocols. For communication nodes in the network should be able to sense and discover with nearby nodes. But transmission range of MANIT network interfaces is very limited; so for exchanging data within the node across the network may be required multiple network "hops" . One of the simple ways for routing is to send packets to the destination from the source node through intermediate nodes using the geometric information of all the nodes in the network. Getting accurate geometric information is still not easy. Where is one of another supplement of route determining by means of actively asking all the neighbours for information regarding shortest path to the destination.

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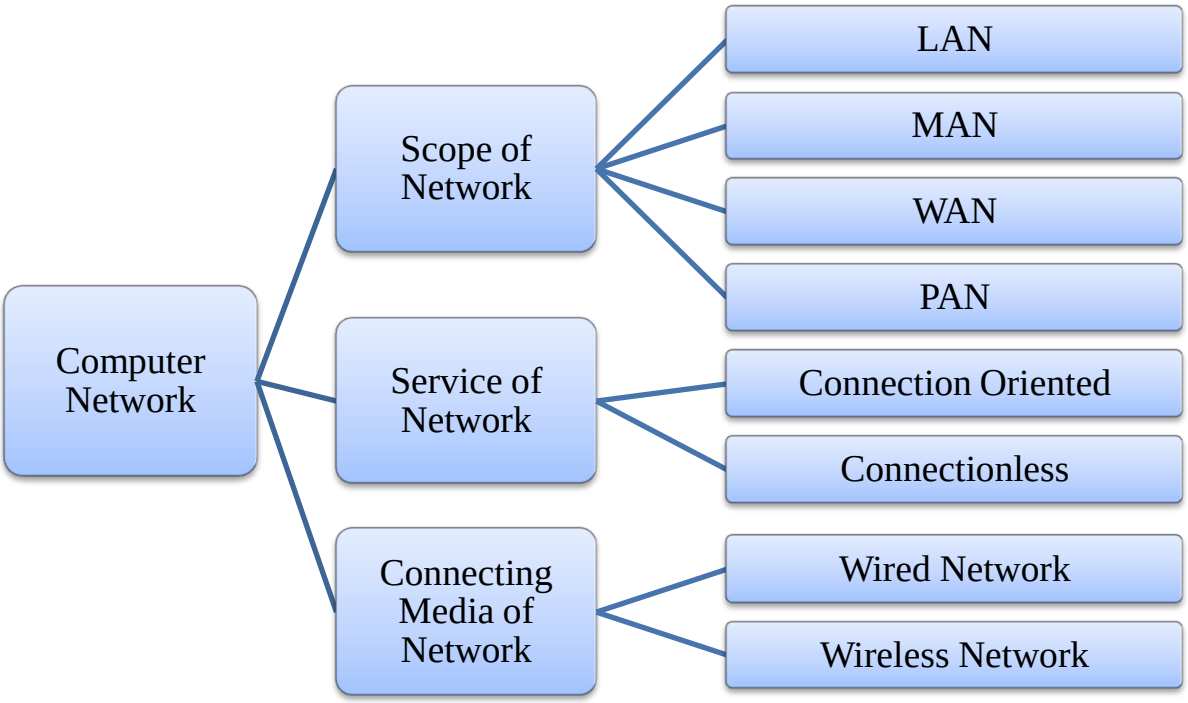

Fig.1. Simplest Classification of Computer Networks

The earliest broadcast mechanism is flooding [1], where every node in the network retransmits a message to all its neighbors upon receiving a message. Flooding is simple and easy to implement and it can be costly in terms of network performance, and one of the major problem that arise in flooding is "Broadcast Storm Problem". The broadcast storm problem results in high redundant message retransmissions, network bandwidth contention and collision. The flooding protocol have been studied [2] and its result indicates that rebroadcast could provide at most 61% additional coverage and only 41% additional coverage in average over that already covered by the previous broadcast. As a result, they have concluded that rebroadcasts are very costly and should be used with caution. To mitigate this problem, several broadcast schemes have been proposed [3,4, 5]. These schemes are commonly divided into two categories; deterministic schemes and probabilistic schemes. Deterministic schemes use network topological information to build a virtual backbone that covers all the nodes in the network. In order to build a virtual backbone, nodes exchange information, typically about their immediate or two hop neighbors. This results in a large overhead in terms of time and message complexity for building and maintaining the backbone, especially in the presence of mobility. Probabilistic schemes, in disparity, rebuild a backbone from scratch during each broadcast. Nodes make instantaneous local decisions about whether to broadcast a message or not using information derived only from overheard broadcast messages. These schemes incur a smaller overhead and demonstrate superior adaptability in changing environments when compared to deterministic schemes [6]. However, these schemes have poor reach ability as a trade off against overhead. An optimal broadcast protocol minimizes, The maximum time needed for the broadcasted message to reach all nodes, The average time, over all the nodes, needed for the broadcasted message to arrive at each node.

III. Wireless Sensor Network

Wireless Sensor Networks (WSN) has emerged as an important area for research and development. Though WSN is in its early stages, its impact is envisaged to be far reaching, from daily life, to remote monitoring of environment, habitat, agriculture, health care, automobiles, hazardous zones, disaster prone zones, defense applications to probing of planets. Moreover they can be used for monitoring as well as control. In fact, they form the basic constituent of ubiquitous sensing, communication, computing, and control.

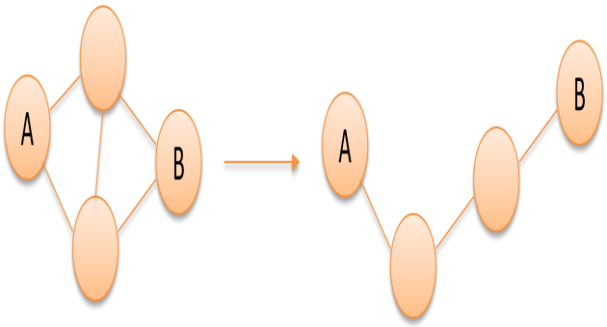

Fig.2. Sensor Network

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A WSN can be defined as a network of devices, denoted as nodes, which can sense the environment and communicate the information gathered from the monitored field through wireless links. The data is forwarded, possibly via multiple hops, to a sink that can use it locally or is connected to other networks through a gateway. The nodes can be stationary or moving. They can be aware of their location or not. They can be homogeneous or not. This is a traditional single-sink WSN. Almost all scientific papers in the literature deal with such a definition. This single-sink scenario suffers from the lack of scalability: by increasing the number of nodes, the amount of data gathered by the sink increases and once its capacity is reached; the network size cannot be augmented. Moreover, for reasons related to MAC and routing aspects, network performance cannot be considered independent from the network size.

Wireless Sensor Networks consists of individual nodes are able to interact with their environment by detecting or physical parameter monitoring; these nodes must work together to perform their duties, as usual, only one node is unable to do so; and use wireless communication to enable this collaboration. The definition of WSN, according to the Smart Dust DARPA program, "A sensor network is a display of a large number of small, inexpensive, self-powered to detect, computing devices, and communicate with other devices to collect local information to make global decisions on physical media."

The latest player in the industry of information technology to new devices and wireless communication systems and their use in the treatment of a wide variety of real world problems has resulted in several new areas of active research Wireless sensor networks you are one of those hot topic. As we know, the Internet has been able to provide a large number of users with the ability to move easily various forms of information and thus revolutionized business, defense, education, industry, research and science. Sensor networks can in the long run, just as important, providing the measurement of physical phenomena around us, which leads to understanding and ultimately the use of this information for a wide range of practical applications.

Wireless Communication is associate degree application of science and technology that has come back to be important for contemporary existence. From the first radio and phone to current devices like mobile phones and laptops, accessing the world network has become the foremost essential and indispensable a part of our life-style. Wireless communication is associate degree ever-developing field, and also the future holds several potentialities during this space.

A MANET is outlined as a set of wireless mobile nodes that are unit capable of communication to another while not the utilization of a network infrastructure or any centralized administration. The mobile hosts aren't absolute to any centralized management like base stations or mobile switch centers. Every mobile node operates not solely as a number however additionally as a router, forwarding packets for alternative mobile nodes within the network which will not be at intervals direct wireless transmission vary of every alternative. The thought of MANET is additionally known as infrastructure less networking. [2]

IV. LITERATURE REVIEW

Chu-Fu Wang et al. [9] Recent advances in micro manufacturing technology have enabled the development of low-cost, low-power, multifunctional sensor nodes for wireless communication. Diverse sensing applications have also become a reality as a result. These include environmental monitoring, intrusion detection, battlefield surveillance, and so on. In a wireless sensor network (WSN), how to conserve the limited power resources of sensors to extend the network lifetime of the WSN as long as possible while performing the sensing and sensed data reporting tasks, is the most critical issue in the network design. In a WSN, sensor nodes deliver sensed data back to the sink via multihopping. The sensor nodes near the sink will generally consume more battery power than others; consequently, these nodes will quickly drain out their battery energy and shorten the network lifetime of the WSN. .

Fabian Castaño et al. [10] In this paper, the author has consider the duty scheduling of sensor activities in wireless sensor networks to maximize the lifetime. We address full target coverage problems contemplating sensors used for sensing data and transmit it to the base station through multi-hop communication as well as sensors used only for communication purposes. Subsets of sensors (also called covers) are generated.

Subir Halder et al. [11] Wireless sensor networks (WSNs) have been receiving significant attention due to their potential applications in environmental monitoring and surveillance domains. In WSNs, unbalanced energy consumption is an intrinsic problem and this can considerably decrease network lifetime. One primary way of mitigating uneven energy consumption is judicious deployment of sensor nodes so that the energy flow remains balanced throughout the network. In this work, at first we analyze layered network architecture and find out the conditions that need to be satisfied for optimal deployment setting in order to achieve complete area coverage, energy balance and prolonged network lifetime. We also analyze two standard distribution functions to find out their suitability as node deployment function and found neither of the distribution functions ensures balanced energy consumption, thereby failing to prolong network lifetime.

Davut Incebacak et al. [12] Contextual privacy in Wireless Sensor Networks (WSNs) is concerned with protecting contextual information such as whether, when, and where the data is collected. In this context, hiding the existence of a WSN from adversaries is a desirable feature. One way to mitigate the sensor nodes' delectability is by limiting the transmission power of the

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nodes (i.e., the network is operating in the stealth mode) so that adversaries cannot detect the existence of the WSN unless they are within the sensing range of the WSN. Position dependent transmission power adjustment enables the network to maintain its level of stealth while allowing nodes farther from the network boundary to use higher transmission power levels. To mitigate the uneven energy dissipation characteristic, nodes that cannot dissipate their energies on communications reduce the amount of data they generate through computation so that the relay nodes convey less data.

Fabian Castaño et al. [13] This paper addresses the maximum network lifetime problem in wireless sensor networks with connectivity and coverage constraints. In this problem, the purpose is to schedule the activity of a set of wireless sensors, keeping them connected while network lifetime is maximized. Two cases are considered. First, the full coverage of the targets is required, and second only a fraction of the targets has to be covered at any instant of time. An exact approach based on column generation and boosted by GRASP and VNS is proposed to address both of these problems. Finally, a multiphase framework combining these two approaches is built by sequentially using these two heuristics at each iteration of the column generation algorithm. The results show that our proposals are able to tackle the problem efficiently and that combining the two heuristic approaches improves the results significantly.

Keontaek Lee et al. [14] Generally, the lifetime of a wireless sensor network (WSN) is defined as the duration until any sensor node dies due to battery exhaustion. If the traffic load is not properly balanced, the batteries of some sensor nodes may be depleted quickly, and the lifetime of the WSN will be shortened. While many energy-efficient routing schemes have been proposed for WSNs, they focus on maximizing the WSN lifetime. In this paper, we propose a scheme that satisfies a given 'target' lifetime. Because energy consumption depends on traffic volume, the target lifetime cannot be guaranteed through energy-efficient routing alone. We take an approach that jointly optimizes the sensing rate (i.e., controlling the sensor-traffic generation or duty cycle) and route selection.

V. CONCLUSION

In the previous study, multiple disjoint paths are discovered among source and destination. Among the discovered routes, the optimal paths are selected based on bandwidth constraints, delay constraints and path stability. When any flow request is received, it is initially categorized as real time and non-real time flows where real time flows are given higher priority.

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