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Improving Lifetime of Wireless Sensor Netwoks with Energy Efficient Routing

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***Abstract*- Wireless sensor network has become well known and most interesting area of research in now days. The main motto of wireless sensor network is to monitor physical or environmental phenomenon. Instead of focusing interaction on humans, focus on interacting with environment. Climatic conditions such as temperature, humidity, luminosity, liquid presence or human intruders acts like in the battle field or at the borders. The Wireless Sensor Network (WSN) monitors the environment for a long duration. A small or no human maintenance is available for this kind of network. All the tasks such as processing and propagation of information have to perform solely by nodes in the WSN. For all the performing capability the only source of energy available are batteries. Thus most of the efforts are made in order to minimize the power consumption and maximize the energy in the network which in turns prolongs the life time of wireless sensor network (WSN). Many power efficient routing techniques are used to minimize the power constraint. In this paper I propose a power efficient routing protocol AODV in combination with a compression algorithm Remote Differential Compression (RDC). Basically the comparison is made in between the power consumption of network with and without using the energy efficient algorithm. The result of simulation can be show usingNS2 simulator.**

Keywords:-Wireless Sensor Network(WSN), Ad hoc On-demand Distance Vector Routing Protocol(AODV), Remote Differential Compression Algorithm (RDC).

1. INTRODUCTION

Wireless sensor network consist of spatially distributed node..The several applications of wireless sensor networks are precision agriculture, habitat monitoring, facility management, logistics tracking of containers and boxes. It constitutes of many nodes which may varies from several hundred to many thousand. Each node is connected with other node within certain range. The cost of wireless sensor network also varies from cheapest to highest depending on the size and configuration. Sensors are well equipped with significant processing, memory, and wireless communication capabilities. The nodes within the networks are capable of performing certain processing such as gathering of information and propagate data to base station (sink). WSN has to work properly for longer duration which may vary from few months to years without replacing or any kind of maintenance. For all its processing the only source of energy are batteries. Thus most of the efforts are taken in order to obtain higher life time for WSN. The sensor nodes consist of different components. Some of the main components of wireless sensor network are shown in the fig 1. The sensor unit gathers the information from environment or motion. All the components basically make use of power for the computation. But large amount of energy is used in the transceiver unit as it basically deals with receiving and propagating data to other nodes or base station.

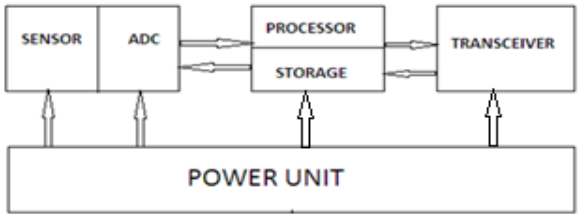


Fig.1: Components of WSN

Thus most of the work is takes placed in order to lower the power consumption attransceiver. The way of minimizing the power consumption at transceiver lever is to use power aware and energy efficient routing techniques. As all working of the network basically supported by batteries only. Thus most researches as focused on maximizing the network life time. Thus more power aware and energy efficient routing protocols and algorithms are developed to reduce power consumption of communication system and save the energy, which in turns increases the life of nodes. The energy efficient routing phenomenon is more important than simple shortest path routing. Power aware routing employees the use of different energy aware metrics while determining a routing path. Several strategies are commonly estimated for power aware routing in WSNs. Minimize the consumption of energy for each message. This criteria might overload some nodes resulting them to die prematurely. Here I am proposing a new concept of minimizing the power consumption at each node level in

the network. This is based on the concept that if the network have battery power remaining at some nodes while others exhaust their battery then it is of no use as each node in the network is equally important. The Ad-hoc On Demand distance vector routing (AODV) will provide the path only when it's required and Remote Differential Compression (RDC) send the data in the compressed form only when each reach a certain defined number.

2. LITERATURE SURVEY

The Minimum Total Transmission Power Routing (MTPR)[1] was early developed forminimizing the total transmission power consumption of nodes participating in the propagation. These protocols build multiple routes for propagating the data to base station. It was based on demand but they did not consider the power aware metrics.

The Min-Max Battery Cost Routing (MMBCR) [2] considers the remaining power of nodes after each transmition as the metric for acquiring routes in order to miximize the lifetime of network. The Multipath Power Sensitive Routing (MPSR)[3] shows how an efficient heuristic based on multipath routing technique can improvize the mean time for the node failure and maintain the power variance of all the nodes as low as possible.The routing is the most important and active field in the MANET. The routing protocols which are designed for wired networks are not usefull for wireless networks due to the node mobility issues in wireless networks. The different protocols proposed to deal with routing problem in the MANET are classified into two categories table driven routing and on demand routing protocol[4]. In order to achieve low power consumtion and increase the network scalability, one approach is to arrange the nodes into cluster. Data gathered from sensors are forwarded to the cluster head first, and then sent to the sink node. Multiple adjacent sensors generate redundant data due to high density of sensor network. Thus for elliminating the data redudundancy and reduced the communication load data aggregation can be used [5]. An Unequal Cluster-based Routing (UCR) protocol [6] is used for mitigating the hot spot problem in wireless sensor networks. It is designed for, sensor network with maximun life time and source driven capability, such as pe-riodical environmental information reporting. UCR does not require any unique node capabilities, such as location-awareness or heterogeneity. Energy Efficient-Power Aware routing algorithm [7] which is an integration energy efficiency with power awareness parameters for routing of packets.Multiple paths are used in improving theeffective bandwidth of communication, responding tocongestion and heavy traffic, and increasing delivery reliability

3.AD-HOC ON DEMAND DISTANCE VECTOR(AODV) ROUTING

As a routing protocol for mobile ad hoc networks, AODV is intended to accommodate networks that are as large as several thousand node. .For data transmission AODV (Ad-hoc On Demand Distance Vector) Routing protocol is used in the\network. In AODV, the network dos not provide path until a connection is needed. It is reactive protocol meaning provide route only when needed by source. It provides destination sequence numbers to identify the most recent path. The major difference between AODV and other on-demand routing protocols is that it uses a destination sequence number to determine an up-to-date path to the destination. Nodes you can communicate with directly are considered to be Neighbors. A node keeps track of its Neighbors by listening for a HELLO message that each node broadcast at set

- Intervals.

AODV is also able to handle changes in routes and can create new routes if there is an error. The packet Transmission takes place with help of RREQ (Rout Request), RREP (Rout Reply) and error is handled with Rout Error (RERR) messages. There are two phases Route Discovery & Route Maintenance.

- Rout Discovery

When one node needs to send a message to another node that is not its Neighbor it broadcasts a Route Request (RREQ) message.

A RREQ consist of (broadcast_id ,dest_addr,dest_sequence_#,source_addr, source_sequence_#,hopcnt. TTL)

AODV Route Reply consist of(dest_addr,dest_sequence_#,source_addr, lifetime,hopcnt). RREP packets are discarded unless dest_sequence_# number is higher than the previous, or

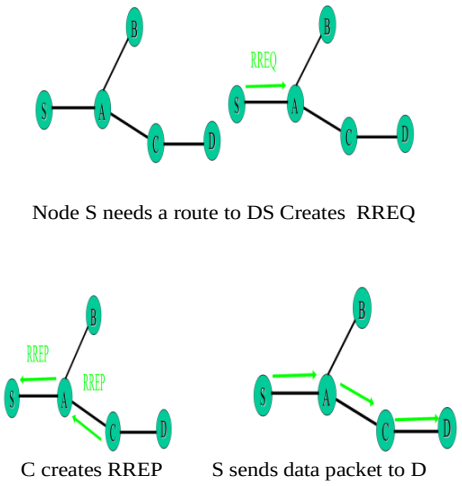
destination_sequence_# is the same, but hop_cnt is smaller (i.e., there's a better path)

- Route Maintenance

Route maintanceiclused that route recovery is done whene ever there occurs a faluire. The absence of HELLO message will indicate link failure.

Whenever a Node receives RERR it looks at the Routing Table and removes all the routes that contain the bad Nodes. After detecting the link breakage, the upstream node will notify the source with an RERR packet source will initialize a new route discovery stage and send the RREQ packet.

An example of packet sending using AODV is given in fig 2. The algorithm itself provides loop free routing. . The advantage of AODV is that it creates no extra traffic for communication along existing links. Also, distance vector routing is simple, and doesn't require much memory or calculation. However AODV requires more time to establish a connection.



Node S needs a route to DS Creates RREQ

C creates RREP S sends data packet to D

Fig2: Example of AODV

3. REMOTE DIFFERENTIAL COMPRESSION (RDC) ALGORITHM

Remote differential compression (RDC), a compression algorithm, that provide efficient synchronization of files with a source by using compression techniques to minimize the amount of data sent between the source and destination. Unlike most of traditional compression algorithms that rely on some regularity in the data to be compressed, RDC breaks a file into chunks. Chunks are the small pieces of data defined by cut points. Cut points are some regular interval division of data to form chunks and forward data in compressed form..The chunks are not already present on the target location can be identified by the application

transferring the data stream. If there is some missing data then that data can be recovered from the sender. For this application can then transfer the missing chunks from the source location. Thus with the help of RDC algorithm no similar data can be transferred and redundancy can be handled.

4. SIMULATION RESULT

The comparision of energy used in the network with implimating AODV algorithm alon and with applying AODV in combination with RDC is shown in the simulation graph. Fig 3 show the creation and packet transmition among the node. Fig 4 shows the energy graph of the network. The x axis shows the number of communication in. whereas y axis shows the energy used. As form the energy graph in fig.4 it is clear that energy consumption of the network using AODV along with RDC is lower as compaired to energy utilization of network using simply AODV.

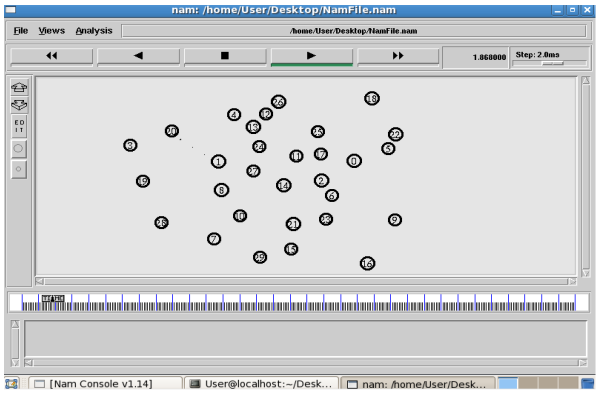


Fig.3: propagation of packets among nodes

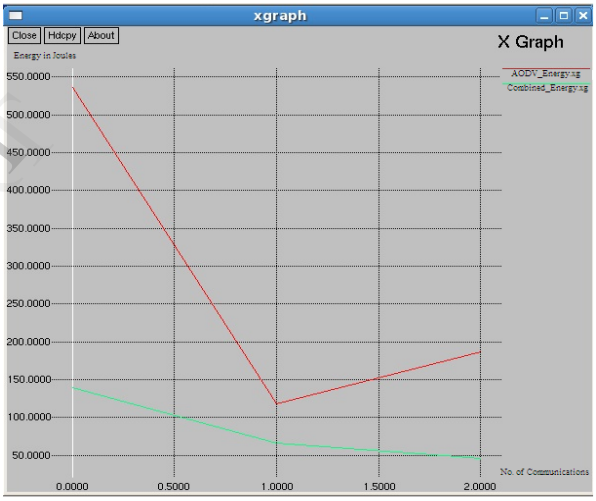


Fig.4: Energy used in the network

CONCLUSION

WSNs require energy-efficient communication to be able to work for a long period of time without human intervention. We present Adhoc On Demand Distance Vector routing(AODV)in combination with Remote Differential Compression algorithm (RDC) method to increase the lifetime of wireless sensor networks. Ii is clear form the simulation result the energy consumption of network only using AODV is greater as compared with the proposed system. The Energy Efficient, Power Aware Routing significantly increased packet delivery ratio, decreasing end- to-end delays for the data packets, lower network load, supporting reliability and decreasing power consumption.

FUTURE WORK

In wireless sensor Network each node is equally important. The nodes which are idle require equal power consumption as the active nodes. Thus it is necessary to turn of the idle nodes. This can be achieve by using virtual backbone scheduling along with the pERPMT i.e. priority Efficient Power Management technique.

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