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The Survey on Energy Efficient Routing Protocols

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Abstract: ***In this paper we propose an approach. The wireless sensor network consists of the nodes, base station and these networks are low cost, has limited battery, which is rechargeable, other than battery, gateways can be used, and for the communication, for the communicating we need rules so many numbers of protocols are designed for the routing. For routing protocols like LEACH, SPEED, MGEAR, DD and SPIN the above protocols are essential for conserving the energy. The routing protocol increases the lifetime of the network. This below survey represents which protocol is energy efficient.***
Keywords: Wireless sensor network, energy efficient protocols, sensor network.

I. INTRODUCTION

WSN is the technology that is mostly used, and the most active research areas. WSN is the technology that is mostly used in military, process monitoring the environment, space, and health, industrial and so on. WSN are spatially distributed sensors and it actually consists of 100 to 1000s of modes. This technology will be more impacted on future life. A WSN node uses the resources like battery for the enhancing of the network life time. So to enhance the network life time, main network parameter that we consider is energy and next is the quality of service. By making the energy Station we can make the network very efficient and we can extend the life of the network. Many researchers have been carried to improve the energy efficiency level of the network many protocols have been designed.

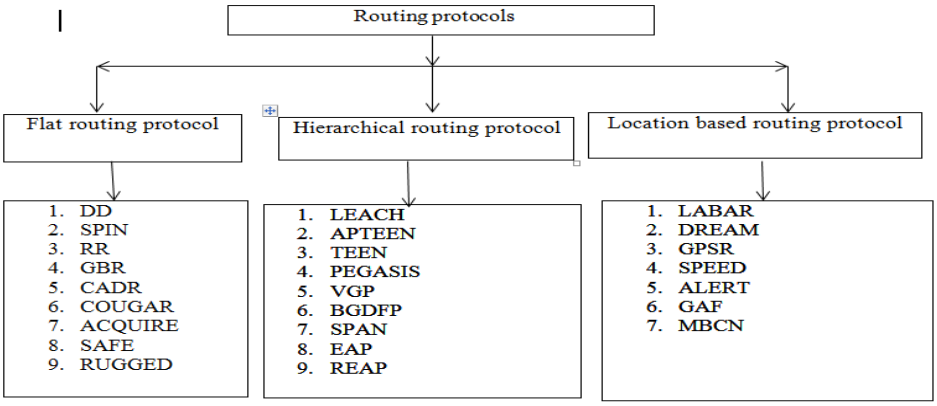
The protocols have been divides into 3 main types

A. Data centric protocol
B. Hierarchical protocol
C. Location based protocol

These protocols have been designed to send the packets from the source and their destination. To develop the proper protocol the many things have to be taken into considerations the main factor that has to be considered is energy. There are 27 protocols in total and he most of the sensor nodes may use the energy for the transferring the data to the base station.

When the energy of the node decreases it causes instability of the network because it cannot transfers the data to the base station. The many techniques are designed to improve the efficiency and to increase the energy of the network they are aggregation of the data, clustering efficient routing. So the nodes should be active till the completion of the process of communication. The main factors for the designing are energy, quality of service,Topology information, error detection, fault tolerance and so on.

II. CLASSIFICATION OF ROUTING PROTOCOLS



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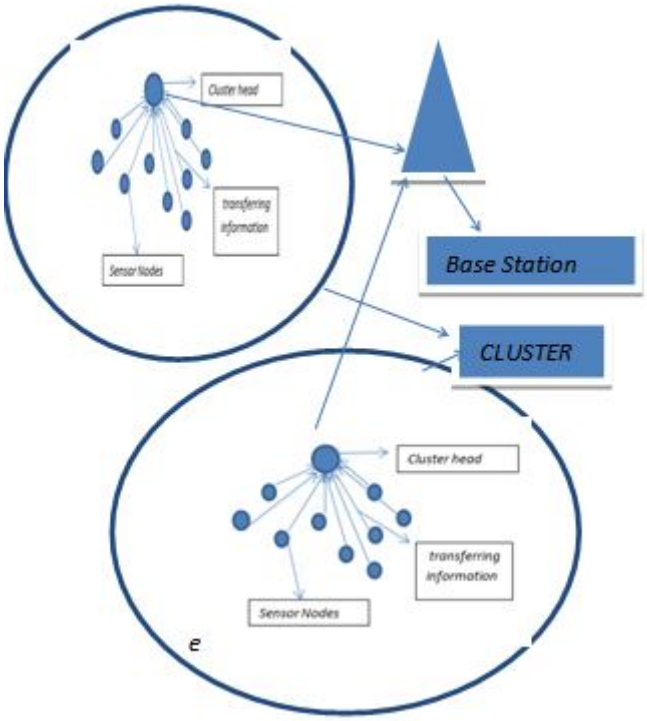
The above diagram explains how the routing protocol can be classified and here the flat routing protocol are mainly used for the small number nodes that are present in the environment and the energy is consumed more in flat routing protocol and in the hierarchical routing protocol the clustering and the data aggregation takes place. And the next classification is location based routing protocol in which the sensors are based on location.
The following protocols are summarized shown below they are:

A. LEACH - (Low Energy adaptive clustering hierarchy)

It has many numbers of nodes they are base station and sensor nodes in which the base station is far from the sensor nodes in which they collect the information from the sensor nodes. The sensor node sends information to the base station, normally for sending the information It requires the high energy. Initially all the nodes present in the environment have the same energy that energy is called the initial energy. Hence the nodes with the highest energy will become the cluster head .The cluster head monitors and collects the information from the other nodes and then sends the received information to the base station.
When the cluster head receives the information from the sensor nodes the entire nodes loses energy and this causes the instability of the network and it may lose information too. So this can be reduced by the data aggregation and clustering. Hence we can increase the efficiency of the network and there will be reliable routing of the data.
The following diagram shows the how the leach algorithm performs:



The Cluster head can be selected by the formula as shown below:

$$T(n) = \frac{P}{1 - P * (r \bmod 1/P)}$$

if n € G

$T(n) - 0$, otherwise

Where:
P is the percentage of nodes that are present in cluster heads
R is the current round
G is the set of nodes

The LEACH loses some energy from the sensor nodes and cluster heads because, It receives the information from the all the nodes.

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Hence more energy is required.

Advantages:

The data aggregation also takes place in LEACH protocol.

Disadvantages:

It increases the overhead of the cluster head.

If the distance is more the data may be lost.

If the node loses energy it may cause instability of the network.

B. DD protocol- (Directed Diffusion Routing Protocol)

This directed diffusion routing protocol consists of many components in which data is called as the attribute value pairs and the task is disseminated by the network as associate degree for the attribute value pairs. This dissemination sets up gradient at intervals; hence the network is designed to draw the events.

In this directed diffusion routing protocol creates the gradient vector to send the information to the source and the destination and it works based on the query driven information for sending the information to all the nodes. The directed diffusion routing protocol comes under the flat routing protocol. This flat routing protocol mainly concentrates on the small family of nodes in which the path can be created and the data can be easily transferred.

Advantages:

If fewer nodes are present in the environment then the data can be transferred easily without much energy required for the transmission.

In the directed diffusion routing protocol the network can erect the failure of nodes.

The routing protocol can also adopt the topology changes, whenever we want to change the topology.

Data Caching can also takes place in this routing protocol.

Disadvantages:

In the directed diffusion routing protocol, if the gradient vector is not created then the path will not be creates hence the networks become instable.

The nodes have to be aggregated, if the data has to be transferred continuously.

When the nodes become more in the environment there will be loss of energy and the information may be delayed when the nodes become more. Hence the more energy is consumed by the network.

C. SPEED – (Stateless Protocol for End to End Delivery)

The SPEED protocol can be expanded as the stateless protocol for end to end delay. Here as the name indicates that this SPEED protocol mainly concentrates on the end to the delay and the real time traffic. Account to the authors the speed protocol mainly concentrates on the 3 factors delay and speed energy. SPPED protocol can increases the network life time by considering all the above 3 factors. The decisions of the routing are based on a single hop delay and relay speed. The speed protocol considers no energy metric, hence the depletion of the nodes are faster. The next further research of the SPEED is EE Speed i.e. energy efficient SPEED as the name indicates this balances energy. The transferring of the data decisions are mainly decided on the greedy geographical based routing, by using the geographical based routing we can take the shortest path and hence it reduces the energy.

Advantages:

SPEED protocol provides the confession avoidance when the traffic is high.

The acknowledgement window is present in the SPEED protocol to calculate the elapsed time when ACK is received from the neighbour, hence the SPEED can be increased.

Disadvantages:

Deploying of the sensor nodes on the shortest paths becomes very difficult.

D. SPIN - (Sensor protocols for information via negotiation):

The SPIN can be expanded as sensor protocols for information via negotiation. SPIN comes under the data centric routing techniques and in which this data centric routing mainly concentrates on query based routing. Query based routing can be defined as the whenever the data that is required to be retrieved when the base station sends the query to the nodes that are depleted randomly. Then which nodes contain data are sent to the base station and hence the data can be retrieved easily. Here in sensor protocols for

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information via negotiation routing protocols consists of the nodes, in which these nodes are described as the Meta data. The Meta data is nothing but the huge data in which the main advantages of Meta data it avoids the transmission of the data which are duplicated. Here the spin protocol mainly concentrates on the energy available on the nodes and available resources this helps in the utilizing of the energy efficiency, hence increases the network life time. Here the SPIN protocols uses the advertising the message to the nodes hence the below disadvantages can be cleared. It also uses the handshaking protocol to the actual transfer of the data with the identifier, here the identifier acts as the meta data.

Advantages:

SPIN protocol consists of the resource manages this resource manager helps in knowing the how much resources are available.

By the above statement the SPIN protocol increases the network lfe time.

Negotiation is present in the advanced protocols.

Disadvantages:

Here in SPIN protocols receives the same copies of the data from its neighbors without knowing whether that node receives the data.

In SPIN family protocol hence the overlapping of the nodes takes place hence the BW and energy is not used properly.

E. GEAR – (Geographic Energy Aware Routing Protocol)

GEAR represents as Geographic and energy aware routing Protocol in this protocol mainly classified under the location base routing protocol. This gear protocol uses the geographic forwarding algorithm to forward the information and this geographic and energy aware routing protocol uses the location i.e. latitude and longitude for the forwarding the information.

Example GPS finds the location to track. In the same way GEAR uses energy aware neighbour selection to route packet to destination. GEAR routing protocol is based on the query based routing protocol, whenever the data is required it can be sent via the query to the node which the information can be required and here the information can be easily required.

In the GEAR environment, when the nodes that are present are less, then the routing protocol uses the single hop forwarding. And the further research is based on the large number of nodes present in the environment, when the forwarding algorithm doesn't work because when the hop count exceeds this may lead to the development of the M-GEAR routing protocol for the forwarding of the data when the large number of nodes are present in the environment.

Advantages:

Geographic and Energy aware routing protocol provides the longer network life time than the most non energy aware routing algorithm.

Energy can be easily balanced by taking a different path or a alternative path for forwarding the data to the destination.

Disadvantages:

If the nodes are more than dissemination of the nodes takes place then the forwarding algorithm doesn't works, Hop count exceed and the forwarding algorithm doesn't end forwarding the data, By this the flooding occurs this may leads to lose the data.

The below table represents the comparison of the energy efficient routing protocols as shown:

Protocol	DD	SPIN	LEACH	SPEED	GEAR
Classification of protocol	Flat Routing protocol	Flat Routing protocol	Hierarchical Routing protocol	Location based Routing protocol	Location based protocol
Algorithm used in the protocol	Query based driven approach	Query based driven approach	Based on the cluster head algorithm	Greedy geographical based routing	Recursive forwarding algorithm
Single hop forwarding	No single hop		Yes if less nodes are present		Yes if less nodes are present

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Multihop forwarding	No Multihop forwarding		Yes if more nodes are present		M-GEAR provides multihop
Data aggregation	Yes it takes place	No it doesn't takes place	Yes it takes place	Yes it takes place	Yes it takes place
Stability of the network	Instable		Stable network		
Load Balance	Load balance is not maintained		It can be maintained		It can be maintained
Multipath	There exists multipath	Exists	exists	exists	No it doesn't exist
Performance			It can be increased by utilizing energy efficiently		Can be achieved
Expansion of the protocol	Directed diffusion routing protocol	Sensor protocols for information via negotiation	Low Energy adaptive clustering hierarchy	Stateless Protocol for End to End Delivery	Geographic and energy aware routing protocol
Energy or the network life time	More energy is consumed when compared to others	Increases network life time	Increases network life time	Increases network life time	It is best when compared to nonaware protocol
\					

III. CONCLUSION

The wireless sensor networks are widely growing field in the computer science and engineering in present days and most active research topics in the networks and the WSN mainly concentrates consumption of the energy, data delivery and the quality of service. And this survey on the energy efficient routing protocols among the 6 different routing protocols is DD, SPIN, LEACH, SPEED, GEAR . and this provides the comparison between the all 6 protocols in the above table it gives the complete information of the protocols. And the further researches made easy to prove which the best energy efficient routing protocol is because the energy is the main consideration for the efficient routing protocol.

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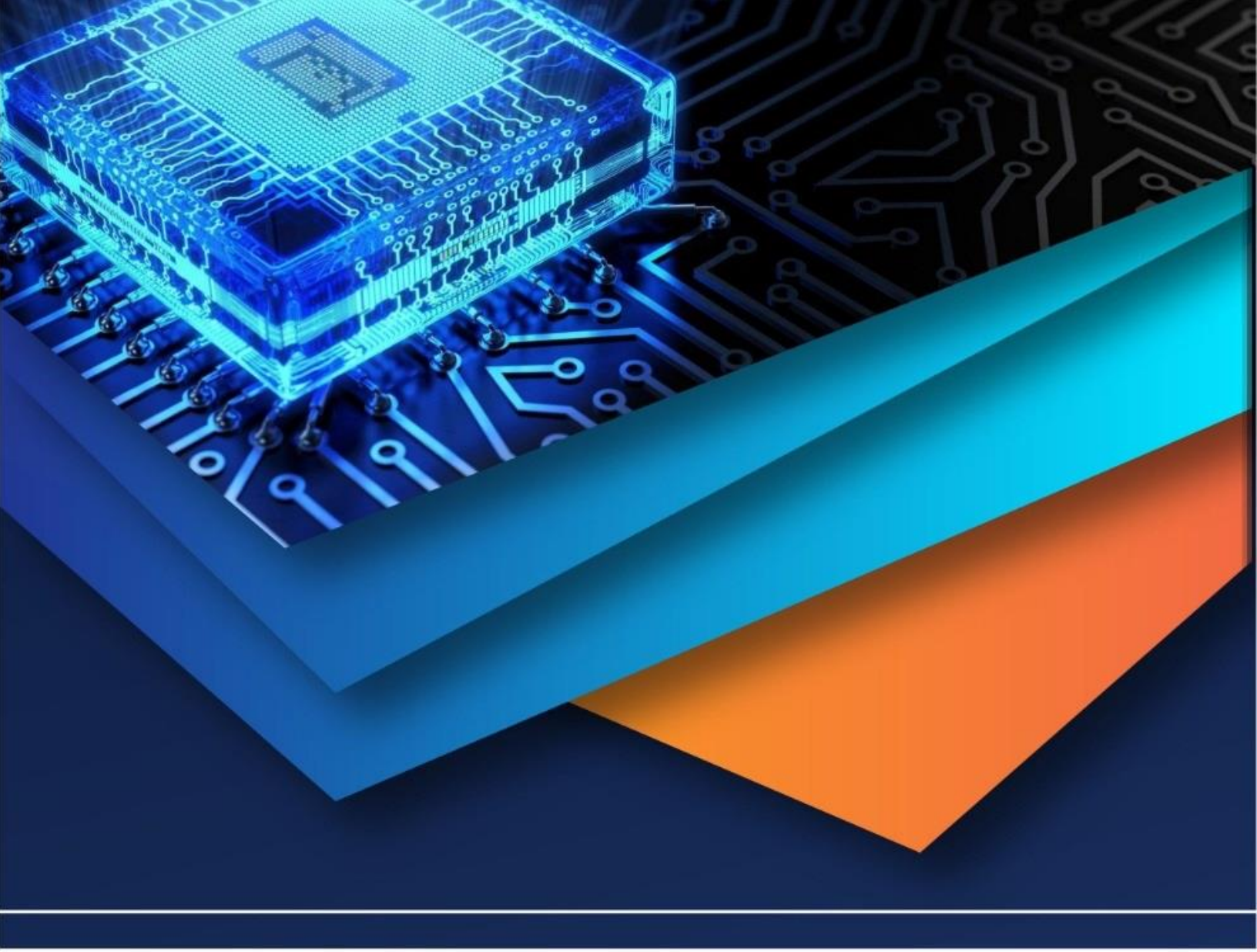

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