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ENERGY CONSUMPTION IN WIRELESS SENSOR NETWORK : SIMULATION AND COMPARTATIVE STUDY OF FLAT AND HIERARCHICAL ROUTING PROTOCOLS

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ABSTRACT

Sensor networks are dense wireless networks of small, low-cost sensors, which collect and disseminate environmental data, it used in a variety of fields like military surveillance, habitat monitoring, monitoring and gathering events in hazardous environments, surveillance of buildings, whether monitoring etc. In wireless sensor networks Flat and Hierarchical routing are two most typical routing protocols. Comparing the two routing protocols (flat / hierarchical) is very important to know well the performance of each routing, for that, in this paper we will discuss in first some of the major Flat routing protocols (AODV, DSDV, GSR, FSR, OLSR, SPIN) and hierarchical routing protocols (LEACH-C, LEACH-F, PEGASIS, ZHLS) for wireless sensor networks, and later we will compare and simulate the behavior on lifetime and energy using NS2 simulator for flat and hierarchical routing protocols.

KEYWORDS

Wireless Sensor Networks, Flat Routing Protocols, Hierarchical Routing Protocols, NS2

1. INTRODUCTION

Sensor networks have emerged as a promising tool for monitoring the physical worlds, utilizing self organizing networks of battery-powered wireless sensors that can sense, process and communicate. WSN used in general to control a particular environment and involved in specific applications: military, medical, and environmental, for the monitoring of critical

infrastructure in the affected areas and hostile. It consist of small low power nodes with sensing, computational and wireless communications capabilities that can be deployed randomly or deterministically in an area from which the users wish to collect data. The nodes in wireless sensor networks are commonly known as motes (Akyildiz, Su, Sankarasubramaniam & Cayirci, 2002; Norouzi & Sertbas, 2015; Esmaeeli & Ghahroudi, 2016).

In a WSN, each node acts as transmitter and router. The energy sensor failure can significantly change the network topology and impose a costly reorganization of the latter (Akyildiz et al., 2002; Corke et al., 2010), most communication protocols in Ad-Hoc networks do not adapt to the characteristics of sensor networks, hence the need to improve them or to develop new protocols. Many routing strategies were created for wireless sensor networks. Some are adaptations of strategies that exist for other types of networks (mainly for wireless networks in the broadest sense), while others were designed specifically for wireless sensor networks (Li & Hong, 2008).

This paper is concerned with routing in wireless sensor networks. The scalability, limited processing power, memory and battery life of the nodes present many challenges when it comes to routing in these networks (Akyildiz et al., 2002; Corke et al., 2010) in the other our paper will look at several routing protocols to assess their suitability for use in wireless sensor networks. The remainder of this paper is organized as follows. Section 2 contains characteristics of sensor network, section 3 contains routing in wireless sensor network, section 4 contains wireless sensor networks architecture, section 5 contains role routing protocols and study routing protocols in wsn, section 6 contains parameters simulation of flat and hierarchical protocols , section 7 contains simulation results of hierarchical protocol leach, leach-c and pegasis, section 8 contains simulation and discussion results of flat and hierarchical protocols , finally section 8 contains conclusion .

2. CHARACTERISTICS OF SENSOR NETWORK

WSN is currently used for real-world unattended physical environment to measure numerous parameters (Buratti, Conti, Dardari & Verdone, 2009). In the other WSN have a scope broad and diverse. This is made possible by their low cost, their small size, the wireless communication medium used and the wide range of types of sensors available. Another advantage is the ability to self-organize and establish communications with each other without human intervention, particularly in inaccessible or hostile, which increases the number of more targeted areas by their application (Ren, Lin & Huang, 2003). A major constraint in wireless sensor networks is the protection of communications (Ibrihich, Krit, Laassiri & El Hajji, 2013; Ibrihich, Krit, Laassiri & El Hajji, 2014). Extending the lifetime of the network by deploying adequate routing and security protocols enables efficient energy management (Akyildiz et al., 2002; Esmaeeli et al., 2016). Recharging batteries whose capacity is limited, in hostile areas is often impossible. For this, the WSN require effective security mechanisms and inexpensive energy (Corke et al., 2010; Li et al., 2008).

Although the sensor networks not misbehave benefits as the cost of equipment and the cost of implementation instead, however, they suffer from a lot of gaps as asymmetric connections (one-way communications between nodes), the problem of interference that generates an error rate of transmission and weakens the performance a radio link and the node mobility resulting

in frequent breakage road causing a rate therefore enough errors (Ren et al., 2003), for that the significan characteristics of WSN must be considered for efficient deployment of the network (Buratti et al., 2009) to know : Low cost, Energy efficient, computational power, communication capabilities security and Privacy, distributed sensing and processing, dynamic network topology, Self-organization, Multi-hop communication, Application oriented, Robust Operations and Small physical size (Muhamamad, Huang, Dharmandra & Hongyan, 2012).

3. ROUTING IN WIRELESS SENSOR NETWORKS

3.1 Routing Protocol in WSN

Routing protocols are designed differently to meet the objectives of a wireless sensor network, the strategy (or protocol) routing is used in order to discover the paths between nodes. The main purpose of this strategy is the establishment of roads that are correct and effective between any pair of units, which ensures the exchange of messages continuously. Given the limitations of the WSN networks, road construction should be done with a minimum of control and consumption of bandwidth. In the manner of creation and maintenance of routes in the routing data, the routing protocols can be separated into two main categories. The pro-active protocols that establish the routes in advance based on the periodic exchange of routing tables and reactive protocols that seek routes on demand. Other classes are a quote namely protocols Hybrid Routing (Combine both proactive and reactive techniques), geographical, hierarchical quality of service and multicast (Akyildiz et al., 2002).

4. WIRELESS SENSOR NETWORKS ARCHITECTURE

4.1 WSN Architecture Nodes

WSN is dynamic which can consist of various types of sensor nodes. The environment is heterogeneous in terms of both hardware as well as software. The sensor node construction focuses to reduce cost, increase flexibility, provide fault tolerance. Improve development process and conserve energy. The structure of sensor node consists of sensing unit (sensor and analog to digital converter), processing unit (processor and storage), communication unit (transceiver), and power supply unit (Muhamamad et al., 2012). The Figure 1 shows the structure of sensor node:

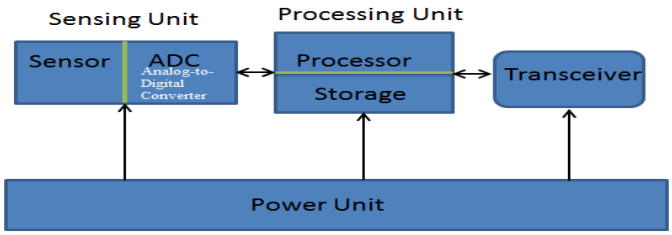

Figure 1. Structure of Sensor Node

4.2 WSN Architecture Network

To have a general idea of the kind of architectures and operating systems which are suitable for sensor networks, we give an example of each. In sensor networks there are two types of architecture for networks, flat architecture that constitutes a homogeneous network where all nodes have the same in terms energy resources, calculation and memory (Al-Karaki & Kamal, 2004; Royer & Toh, 1999; Ibrihich, Krit, Laassiri & El Hajji, 2016), and another hierarchical architecture where all nodes do not have the same roles and therefore the same resources, the Figure2 and Figure 3 shows two types of architecture in networks sensor.

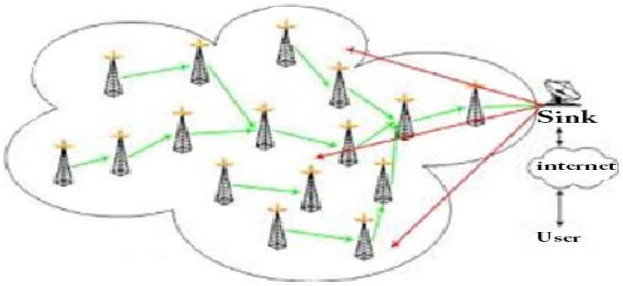

Figure 2. Flat Sensor Network Structure

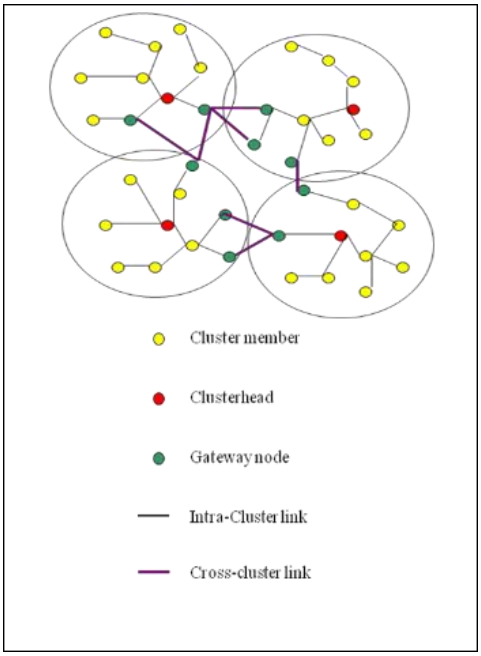

Figure 3. Hiearchical Sensor Network Structure

4.3 Classification of Protocols in WSN

Classification of routing protocols in Wireless Sensor Networks is done in different levels based on either application or network structure (Kaganurmath & Ganashree, 2016), so the main objective of the protocol is correct and effective establishment of routes between a pair of nodes so that messages can be routed. The features and functioning of these protocols will differ. The Figure Fig.4 displays a classification of routing protocols in WSN according to the structure network, different type of function that can use each protocol, Transmission mode for each protocol and some protocol developed in each structure (Al-Karaki & Kamal, 2004; Boubiche & Bilami, 2008; Krit, Laassiri & El Hajji, 2012; Ibrihich et al., 2013; Ibrihich et al., 2014; Ibrihich et al., 2015). The major blocks shown in Figure 4 a concise description of three units is as follows:

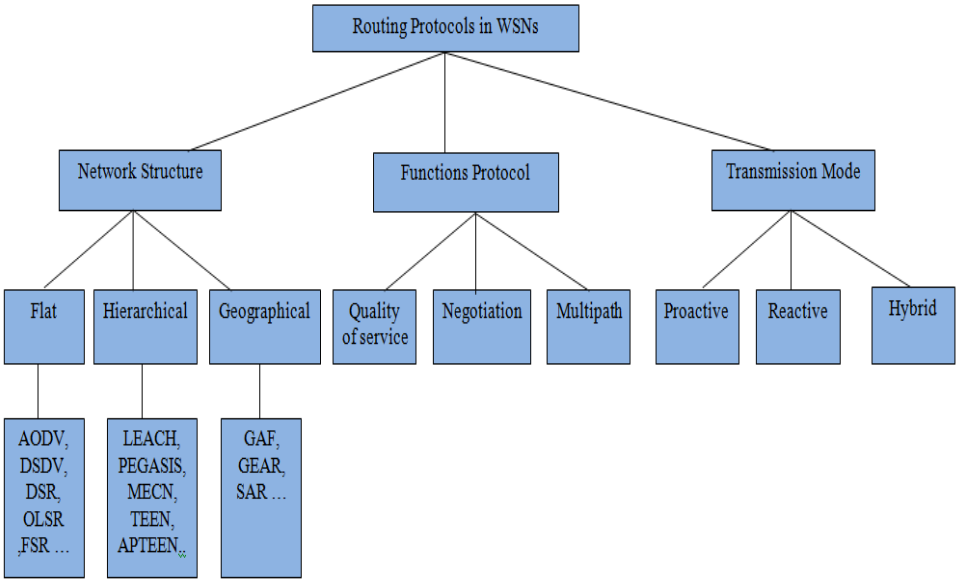

Figure 4. Classification of Routing Protocols and Function Protocol Type in WSN

- **Network Structure unit:**

. Hierarchical Structure: The network is clustered. The routing is done on several levels (intra-cluster and inter- cluster).

. Flat Hierarchical: All nodes have the same role and cooperate with each other to complete the routing.

. Geographical Hierarchical: The nodes of the location information are used for data routing.

- **Functions Protocol unit:**

. Quality of service: The network must meet the data quality with reasonable energy consumption.

. Negotiation: Eliminate redundant transmissions and establish communications by network resources.

. Multipath: The nodes of the location information are used for data routing.

- **Transmission Mode unit:**

. Proactive Mode: The paths are established a priori.

. Reactive Mode: The paths are established on demand as needed.

. Hybrid Mode: Combines both proactive and reactive techniques.

5. ROLE ROUTING PROTOCOL AND STUDYING ROUTING PROTOCOL IN WSN

Routing Protocols are network protocols used to dynamically advertise and learn the networks connected, and to learn the routes (network paths) which are available. Routing protocols running in different routers exchange updates between each other and most efficient routes to a destination. Routing protocols have capacity to learn about a network when a new network is added and detect when a network is unavailable. However, in wireless sensor networks the routing protocol allows nodes to connect directly to each other to relay messages through multiple hops. The presentation of a state of the art flat major routing protocols in ad hoc networks is important since the presentation of these protocols allow us to better analyze the advantage of the hierarchical approache especially in large networks (Dhillon & Chakrabarty, 2003). In the following a brief overview will begiven for flat protocols (AODV , DSDV , GSR , FSR , OLSR , SPIN) and hierarchical protocols (LEACH -C , LEACH -F, PEGASIS , ZHLS) implemented in NS-2 (NS-2, 2012) level of energy and behavior on lifetime.

5.1 Flat Routing Protocol

5.1.1 DSDV Protocol

DSDV (Destination Sequenced Distance Vector) is a proactive protocol distance vector routing. Each network node maintains a routing table with the next hop and the number of hops for all possible destinations. Periodic updates of Broadcasts tend to maintain the routing table completely updated at any time. In DSDV, two types of update packages are used: " fulls dump" , containing all the information and smaller packages, containing only the information that has changed since the last full dump . Updates are either incremental or full (Royer & Toh, 1999; Perkins & Bhagwat, 1994).

5.1.2 AODV Protocol

AODV (Ad-hoc On-demand Distance Vector) is a distance-vector protocol, as DSDV, but it is reactive rather than proactive as DSDV. Indeed, AODV requests a route when it needs it (Royer & Toh, 1999; Perkins & Bhagwat, 1994).

AODV uses sequence numbers in a manner similar to DSDV to avoid routing loops and to indicate the "novelty" of roads. An entry in the routing table essentially contains the address of the destination, the address of the next node, the distance in number of hops, the destination sequence number, the expiration time of each entry in the table. When a node needs to find a

route to a destination whose entry in the routing table does not exist or has expired, it broadcasts a route request message (Route Request message, RREQ) to all its neighbors. The RREQ message is broadcast over the network to reach the destination. During its journey through the network, the RREQ messages makes creating temporary records routing table for the reverse route of the nodes through which it passes. If the destination or a route to it is found, a road is made available by sending a route reply messages (Route Reply, RREP) to the source node. This road crosses response along the temporary reverse path of the RREQ message (Perkins & Royer, 1999; Perkins, Royer & Das, 2002).

5.1.3 GSR Protocol

GSR (Global State Routing) is a protocol similar to the protocol described above DSDV. This protocol uses ideas based routing link state (Link State, LS), and improves avoiding inefficient mechanism flood routing messages. GSR uses a global view of the network topology, as is the case in the LS -based protocols. The protocol also uses a method called dissemination method, used in the DBF (Distributed Bellman- Ford) (Chlamtac, Conti & Liu, 2003).

5.1.4 FSR Protocol

FSR (Fisheye State Routing) can be seen as an improvement of the GSR protocol presented previously. The high number of exchanged update messages involves a large consumption of bandwidth, which has a negative effect in the Ad-hoc networks characterized by limited bandwidth. The FSR protocol is based on the use of technology "fish eye" (fisheye), proposed by Klein rock and Stevens who used to reduce the amount of information needed to represent the graphical data. The eye of fish captures with precision the points near the focal point, in FSR, dissemination flood of messages does not exist. The exchange is done only with immediate neighbors. The update data periodically exchanged in FSR, like the vector exchanged in DSDV protocol, where distances are modified according to the time stamp or sequence number associated with the node that was the origin of the setting up to date (Chlamtac et al., 2003).

5.1.5 OLSR Protocol

OLSR (Optimized Link State Routing) uses two kinds of the control messages: Hello and Topology Control (TC). Hello messages are used for finding the information about the link status and the host’s neighbors. With the Hello message the Multipoint Relay (MPR) Selector set is constructed which describes which neighbors has chosen this host to act as MPR and from this information the host can calculate its own set of the MPRs. the Hello messages are sent only one hop away but the TC messages are broadcasted throughout the entire network. TC messages are used for broadcasting information about own advertised neighbors which includes at least the MPR Selector list. The TC messages are broadcasted periodically and only the MPR hosts can forward the TC messages (Chlamtac et al., 2003; Soms & Malathi, 2016).

5.1.6 SPIN Protocol

SPIN (Sensor Information Negotiation Protocol) is a protocol that uses the idea of appointment data using high-level descriptors or meta given. Prior to transmission, meta- data is exchanged between the sensors by a data advertising mechanism. Each node receiving new data, the announcement to its neighbors and those interested retrieve data by sending a request (Al-Karaki & Kamal, 2004; Chlamtac et al., 2003).

5.2 Hierarchical Routing Protocol

When the network size becomes larger, its management becomes more difficult. Flat routing protocols work well when the network does not include a large number of nodes. The structuring of a network is one of the main tools to save energy in each network node (Rana, Vhatkar & Atique, 2014), resulting in prolonging the lifetime of the system. One of the known structures is the hierarchy that is used to partition the network into subsets to facilitate network management especially routing, which takes place on several levels (Wei, Xiaoying & Wang , 2016). The strength of this type of architecture is the aggregation and data fusion to reduce the number of messages transmitted to the sink, which means better energy efficiency. In fact, two main approaches are derived from these protocols: cluster-based approach and chain–based approach (Esmaeeli & Ghahroudi, 2016; Wang, Tsai & Mao, 2006).

5.2.1 LEACH Protocol

LEACH (Low Energy Adaptive Clustering Hierarch) is a self organizing adaptive protocol based on clustering (Esmaeeli & Ghahroudi, 2016), which uses randomized rotation of cluster heads to evenly distribute the energy load among sensor nodes in the network. It is considered one of the first hierarchical routing approaches based on clustering (Raghatate & Wajgi, 2014), the idea behind LEACH is to form clusters of nodes sensors depending on the strength of the received signal and to use local cluster heads (cluster head , CH) as routers to route data to the base station (Heinzelman,Chandrakasan & Balakrishnan, 2002; Raghatate & Wajgi, 2014).

5.2.2 LEACH-C Protocol

Since the LEACH algorithm does not guarantee the number of CH provided for initializing the algorithm or the equitable distribution of CH, centralized version of LEACH-CENTRAL algorithm is proposed (Esmaeeli & Ghahroudi , 2016). The latter allows determining, from the exact position of the nodes, the optimal configuration to minimize energy expended. LEACH-C is a variant of LEACH where the clusters are formed in a centralized manner by the base station. LEACH-C uses the same transmission step that LEACH. During the initialization phase of the Base Station (BS) receives information of each node on their location, and their energy reserve. Then, it executes centralized cluster formation algorithm to form clusters and select their CH. LEACH-C uses the algorithm of simulated success for optimal clusters. Once the clusters are formed, the base station sends this information to all nodes in the network. However, the centralized version of LEACH is not suited for large-scale networks (Wang et al., 2006; Heinzelman et al., 2002; Asif, Aljawarneh & Kazi, 2016; Aljawarneh, Moftah & Maatuk, 2016).

5.2.3 LEACH-F Protocol

LEACH -F (LEACH - CENTRAL - Fixed) is a further development of the LEACH protocol based on clusters that are formed once and then are fixed (Esmaeeli & Ghahroudi, 2016). Then, the cluster head position rotates among the nodes in the cluster. The advantage is that , once the clusters are formed , no further initialization phase will take place , LEACH -F uses the same centralized algorithm cluster formation that LEACH -C . Fixed clusters in LEACH -F does not allow new nodes to be added to the system and do not adjust their behavior based on the nodes death (Wang et al., 2006; Heinzelman et al., 2002).

5.2.4 PEGASIS Protocol

PEGASIS (Power Efficient Gathering in Sensor Information Systems) is a protocol based on the chains (Rana et al., 2014). The protocol of the basic idea is that in order to prolong the lifetime of the network, the nodes will be organized so that they form a chain, and will have need to communicate with only their closest neighbors and take turns in communicating with the base station (Lindsey & Raghavendra, 2002; Raghatate & Wajgi, 2014). indeed, PEGASIS has two main objectives. First, increasing the lifetime of each node by using collaborative techniques and thus increase the lifetime of the network. Secondly, allow only the local coordination between neighboring nodes so that the bandwidth consumed in the communication is reduced (Lindsey & Raghavendra, 2002; Raghatate & Wajgi, 2014).

5.2.5 ZHLS Protocol

ZHLS (Zone –based Hierarchical Link State Protocol) is a protocol based on the training area, that is to say the decomposition of the network into a set of disjoint zones (Heinzelman et al., 2002; Lindsey & Raghavendra, 2002). In this protocol, members of an area do not elect representative sunlike other hierarchical protocols. ZHLS uses GPS technology (Global Position System) so that each node knows its position and the area in which it is located. With this decomposition, there are two levels of topologies: the node level and area level. Topology based on the first level information on the manner in which the nodes of a given area are physically connected, a virtual link may exist between two areas, if there is at least one node of the first zone, which is physically connected to a node of the other area (Kanishka & Maakar, 2014).

6. PARAMETRS SIMULATION OF FLAT AND HIERARCHICAL PROTOCLS

6.1 Simulation Parameters Protocol

The efficiency of each protocol is checked by evaluation of protocols. The evaluation helps to compare and find better technique for wireless sensor network. On requirement of application protocols are selected, in wireless sensor network several parameters are to be tested to do a comparative of both flat and hierarchical architecture.

In our paper we will take the results of simulation in NS2 (NS-2, 2012),in rely on energy and lifetime of the network, so the 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 (Priyantha, Chakraborty & Balakrishnan, 2000), in the other the energy consumption by the network node has an effect on the network lifetime, more than the power consumption of the node increases, the lifetime of the network decreases. Alternatively reduce energy consumption for each node maximized the duration of lifetime networks. Since the

mobile nodes are powered by independent sources of energy , it is interesting to know how it is consumed the energy relative to each other to know the most effective protocols for these two architectures.

In our case study applies this limited compared the energy and lifetime of a Flat protocol (AODV, DSDV) and Hierarchical protocol (LEACH), and then we will compared all this result to the result done by other researchers mentioned in (Heinzelman et al., 2002; Lindsey & Raghavendra, 2002).

6.2 Parameter of Flat Protocol

6.2.1 Simulation Parameters of AODV and DSDV

Communication costs play a great role in deciding the routing technique to be used, for that, in this part and in the same context simulation we will do a comparative of tow flat protocols (AODV, DSDV). The table 1 below shows the simulation context of each protocol.

Table 1. Simulation Parameters of AODV and DSDV Protocols

parameters	Value
Protocols	DSDV, AODV
Number of Node	10
network topology	500 -400
Initial Energy	3.4 J
Energy transmission	0.33 W
Energy Reception	0.1 W
Simulated parameter	Energy consumption
Simulator	NS2

6.3 Parameters of Hierarchical Protocol

6.3.1 Simulation Parameters of LEACH

To know a difference of consumption measurements energy between flat and hierarchical protocols, we will do a simulation of hierarchical protocol LEACH. The table 2 below shows the LEACH protocol simulation context.

Table 2. Simulation Parameter of Leach Protocol

Parameters	Value
Protocol	LEACH
Number of Node	10
network topology	800 -400
Simulated	Number of Living Node
Simulator	NS2

7. SIMULATION RESULTS OF HIEARCHICAL PROTOCOL EACH,LEACH-C AND PEGASIS

Before making a comparative study between the flat and hierarchical protocols studying in this paper, firstly we will presented some results of simulation in simulator NS2 (NS-2, 2012), done by other researchers (Heinzelman et al., 2002; Lindsey & Raghavendra, 2002), which makes a comparative study between the hierarchical Protocol LEACH , LEACH -C and PEGASIS .The presentation of these results mentioned in (Heinzelman et al., 2002; Lindsey & Raghavendra, 2002), it's to make a comparison with our simulation results executed in this paper . The table 3 and figure 5 below shows the parameters and results simulation in Simulator network NS2 of protocols LEACH, LEACH -C and PEGASIS depending on the model mentioned in (Heinzelman et al., 2002; Lindsey & Raghavendra, 2002).

Table 3. Parameters Simulation Protocols LEACH, LEACH-C,PEGASIS

Parameters	Value
Protocol	LEACH,LEACH-C ,PEGASIS
Number of Node	100
network topology	100 x 100 m²
Initial Energy of node	2 J
Simulated parameter	Energy consumption and live node
Simulator	NS2

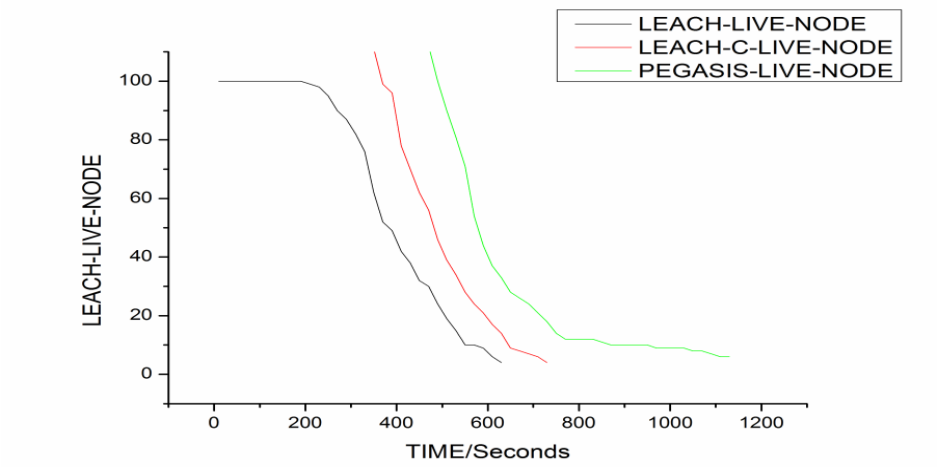

Figure 5. Energy Consumption and Node Lifetime in Hierarchical Protocols LEACH , LEACH -C and PEGASIS

8. SIMULATION AND DISCUSION RESULTS OF FLAT AND HIERARCHICAL PROTOCLES

8.1 Simulation Results of Flat Protocols

8.1.1 AODV Protocol

According to the simulation parameters represented in Table 1 above, the NS2 simulator gives us the following Results, which is representing in both figures below: Figure 6 show the network topology protocol AODV with 10 Node, and Figure 7 show the simulation results energy consumption by protocol AODV .

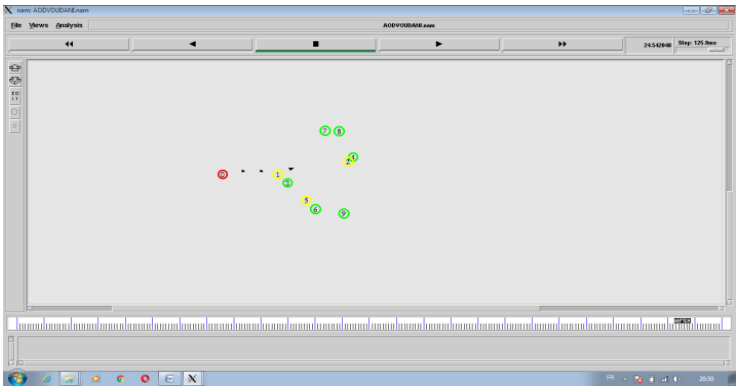

Figure 6. Topology AODVProtocol 10 Nodes

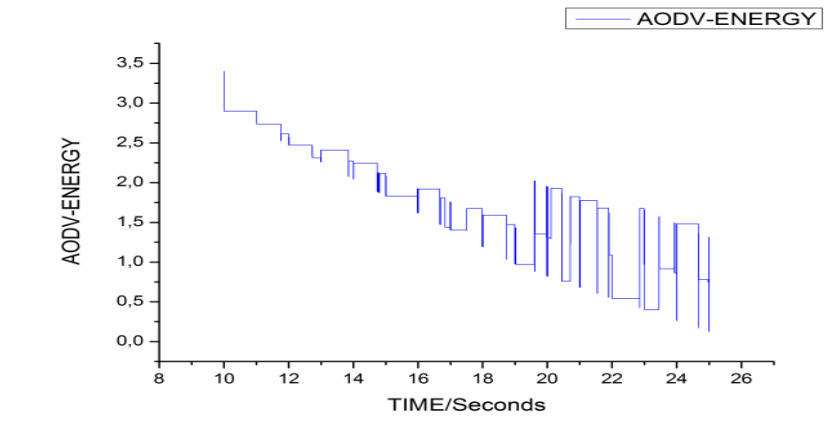

Figure 7. Energy Consumption of AODV Protocol

8.1.2 DSDV Protocol

According to the simulation parameters represented in Table 1 above, the NS2 simulator gives us the following results, which is representing in both figures below: Figure 8 show the network topology protocol DSDV with 10 nodes, and Figure 9 show the simulation results energy consumption by protocol DSDV .

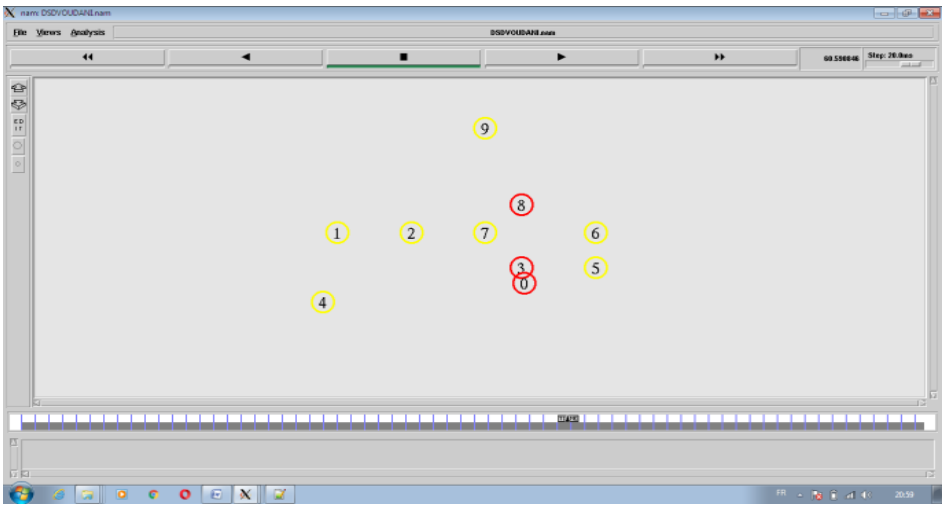

Figure 8. Topology DSDV Protocol 10 Node

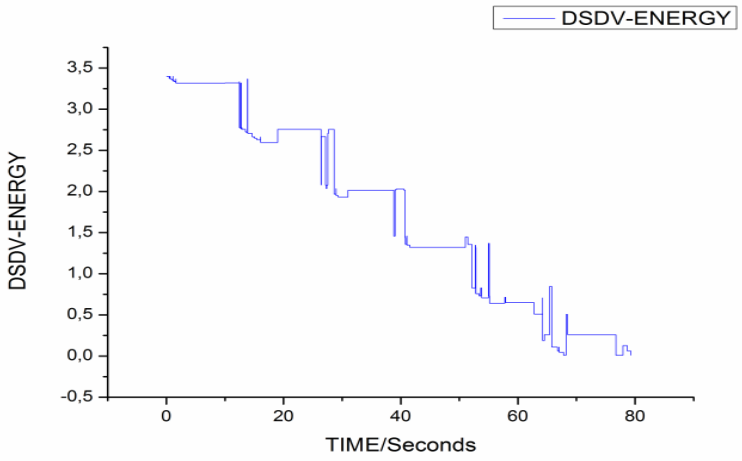

Figure 9. Energy Consumption of DSDV Protocol

8.2 Simulation Results of Hierarchical Protocols

8.2.1 LEACH Protocol

We see that the energy consumption by the network node has an effect on the network lifetime, more than the energy consumption of the node increases, the lifetime of the network decreases and the number of bits processed by the cluster packet increases. According to the simulation parameters represented in Table 3 above, the NS2 simulator gives us the both figures below, the Figure10 shows the simulation results representing the energy consumption in LEACH (resulted in the lifetime of nodes in the network) , and Figure 11 shows the number of bits processed by the cluster packet transmission time.

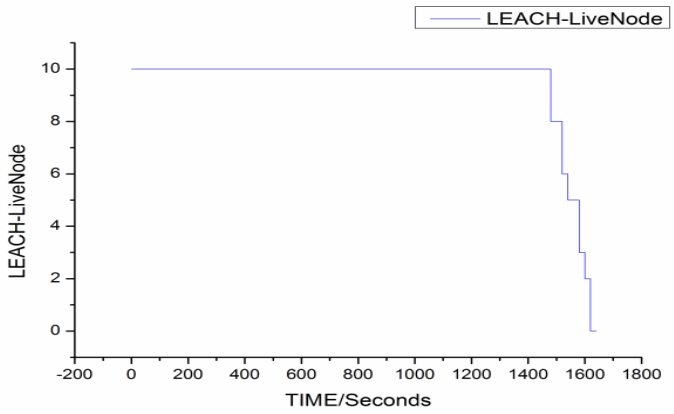

Figure 10. Energy Consumption of the LEACH Protocol

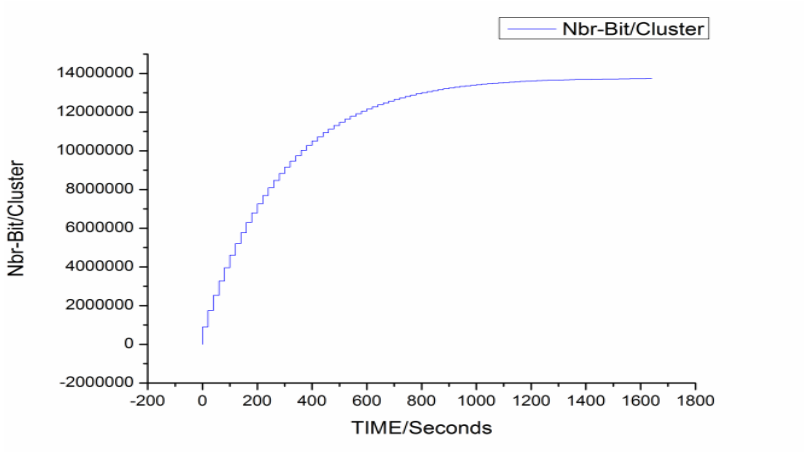

Figure 11. Number of Bits in Cluster LEACH

8.3 Discussion Results

Bitter simulation results we see that the energy consumption is proportional to the number of packets processed and the type of treatment performed (transmission / reception), it is noted that the transmission of a packet request more energy than the reception:

- In the flat AODV protocol (Figure7), in finding energy consumption very important, and a rough time of 25 seconds to notice that energy nodes will approach zero. It means that the node lifetime is very small.
- For flat Protocol DSDV (Figure.9) and in the same context simulation of the AODV protocol, as shown in the simulation result, in recognition that the energy consumption and the DSDV protocol lifetime is better than that of AODV protocol, also we see that energy begins approached zeros in the second 80 instead of 25 for the AODV, and this caused by mobility of node and the number of processed packets in each protocol.
- Flat protocols energy consumption is very high, which reduces the lifetime of each node in the network that is why we have simulated the process LEACH hierarchical routing protocol and compare this results to flat protocols. After the simulation results observed in the nodes of lifetime in the hierarchical protocol (Figure10, Figure 11), is very large than the flat protocols. So the hierarchical protocols are performing than flat protocols.
- Comparison results of hierarchical routing protocols LEACH, LEACH-C and PEGASIS depending on the model mentioned in (Heinzelman et al., 2002; Lindsey & Raghavendra, 2002), we noted that PEGASIS (Figure5) offers better power management compared to LEACH protocol and LEACH-C, which increases the lifetime of node in PEGASIS protocol.

9. CONCLUSION

Sensor Networks hold a lot of promise in applications where gathering sensing information in remote locations is required. It is an evolving field, which offers scope for a lot of research.

Being given that the main purpose of a routing protocol for WSN is the proper and efficient development of routes between a pair of nodes so that messages can be routed with minimum consumption of energy, why multiple routing protocols have been developed these last years to solve the problematic of energy in wirelesses sensor network, for that the energy-constrained nature necessitates us to look at more energy efficient design and operation. We have done a survey on the various issues in sensor networks like energy efficiency.

In this article we had seen in some algorithms flat and hierarchical routing, in order to make a comparison between the two architectures in power consumption and the lifetime of the Network. The work we have done (study and simulation protocols under NS2), allows us to see the difference in energy consumption by the nods in flat and hierarchical protocols.

Finally in this comparative study, we concluded that the hierarchical architecture has more advantage than the flat architecture namely: well-structured network, easy network management, less power consumption, high lifetime, unless the message circulating on networks and the flood problem is avoided. But in general it is interesting to consider and combine maximum routing algorithm to derive the best profits.

As prospects in future works, we plan to make a comparative study of the performance PEGASIS, ZHLS and other protocols to propose another more efficient protocol.

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