

Energy Efficient Protocols and Environment Based Protocol Issues in WSN

Shariq Aziz Butt*¹

Department of Information Technology, Superior University, Lahore, Pakistan

Abstract

Wireless Sensor Network (WSN) is used to sense data and event where human can't reach. Wireless Sensor Network (WSN) is made up with small size of nodes which need battery's power to sense Data. Energy Efficiency is a primary requirement in a Wireless Sensor Network (WSN). The Battery power to sense data is major issue in the Wireless Sensor Network (WSN). Therefore the Network's life is dependent on the Energy. There are many different Types of Techniques such as Sleep/Awake, AAS (Automatic Active and Sleep State) and Location Aware (LA) that are used to manage the power consumption of Nodes. In this paper we will cover the Wireless Sensor Network (WSN), Issues with the Wireless Sensor Network (WSN), Sleep/Awake Technique. We will discuss the Environmental deployment of Sleep Awake Protocol and Location Aware Protocols and Deployment issues with them.

Index Terms: Wireless Sensor Network, AAS, Sleep/Awake, Location Aware.

1. Introduction:

A Wireless Sensor Network is a group of transducers with a communication infrastructure to monitoring and recording conditions at different Locations. Wireless Sensor Network is used to monitor an environment and record the Data. Wireless Sensor Network measures different types of environmental conditions such as Temperature, Pollution, Humidity, Speed and Energy etc. The Wireless Sensor Network measures these values with the help of Sensing Nodes. In a Wireless Sensor Network a lot of Nodes Exist. These nodes are in small size and consume very minute energy to Sense Data. Node takes energy from the small capacity power Battery. In Wireless Sensor Network issues are related to consumption of energy take place. Sleep Awake and Location Aware Techniques are used to overcome the Issues. In Sleep Awake technique node goes into Sleep mode to save Energy. When an event generates it comes into Active State. In the Location Aware technique all nodes know about the Location of Sink (Base Station) and its neighbor node Location too. They don't need to use energy to find Locations. In this paper we will discuss in 2nd section WSN, in 3rd section issues to WSN, in 4th Sleep/Awake technique, in 5th section Location Aware technique, in 6th section Environment based WSN and in the last 7th section Conclusion.

2. Wireless Sensor Network:

Wireless Sensor Network is the type of Networks. When an environment where a human can't reach and sense data then a network needs to access and sense the data so Wireless Sensor Network is used. It helps and enhances work

execution both in the field of industry and our day by day Life. Remote Sensor Network (WSN) has been broadly utilized as a part of numerous ranges particularly for observation and checking agriculture and habitat Monitoring. Environment checking has turned into an essential field of Control and Protection, giving constant Framework and Control communication with the physical World. An intelligent and smart Wireless Sensor Network system can accumulate and process a lot of information from the earliest starting point of the Observing and Managing. Wireless Sensor Network can be deploying where nobody can reach. In different environmental conditions WSN is used to sense data such as Speed, Temperature, Humidity, Forest Fire Detection, Air Pollution, Earth Sensing etc. Wireless Sensor Network is made up with the nodes to sense data or activity and base station to get data from the Nodes. These nodes are placed at any where in the Environment. These nodes are very tiny in size. These nodes are used to sense the environment conditions all the time. The Node needs energy to work so it gets energy from battery connected to Environment. This Battery is not highly powerful. It can't give energy all the time to nodes for sensing Data. The Battery is not able to frequently recharge. The Network's Life and Work depends on the node's energy consumptions. In Wireless Sensor Network there is need to minimize the Battery power consumption of nodes so that the nodes work all the time and increase the Wireless Sensor Network Life Time.

3. ISSUES with Wireless Sensor Network:

There are the following issues with the Wireless Sensor Network:

- I. The major issue in the Wireless Sensor Network is the Energy Consumption.
- II. Battery Power supply to nodes for all Time Working and Sensing Data.
- III. Nodes deployment issues because the distance and coverage area Matters in deployment of Nodes.
- IV. When the distance and coverage area will increase then the node needs more energy to transmit Data.
- VII. Data loss from source to sink in the WSN.
- VIII. Nodes are not sensing the data at the time of event generating due to lack of energy supply from the Battery.
- IX. Node dies in the network due to energy depletion and whole the network becomes Down/Fail.
- X. Deliverance of insufficient amount of Information.

4. Sleep/Awake Scheme:

Different techniques are used for the Wireless Sensors Network to manage the energy and increase the performance of the Network. Sleep and Awake technique is used to enhance the life of the Network. In this approach node in the network goes into the Sleep State if there is no activity performed but when an activity is performed/event is generated then the node Awake and sense the Data. In the Sleep State the energy is not consumed by nodes so the energy became Save. Each node computes its energy level and position in the network then this information is used to keep Sleep and Awake the Nodes. Sleep and Awake State of the nodes is shown in the figure 1.

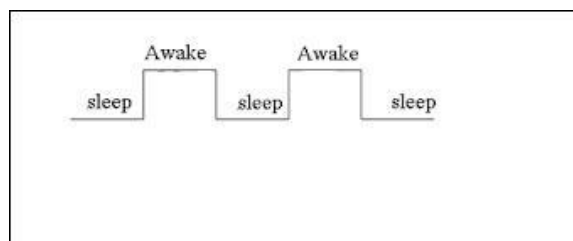


Fig.1. Sleep/Awake state

4.1 Issue with Sleep/Awake:

The main issue with the Sleep and Awake scheduling technique is that when a node Goes in to Sleep State then it may go into Deep Sleep State and may cause of fail of sensing data or event Occurring. When a node goes into Deep Sleep State then more energy is required to awake the node hence it might be possible that node consumes whole saved energy to awake and it did not sense the event and a disaster Occur.

4.1.1 Solution to Sleep and Awake :

1. Sub node of main Node/Wake up Node:

The Solution of this issue with the Sleep and Awake is making an environment of parent and child node mean with each Sleep node attach a Child node/Wake up Node. The Parent node will be the actual node Child node will be the Sub Node of the Parent Node. The Child node will consume very small energy to keep in active state as compare to Parent Node. So the Parent Node will be in Sleep State and Child Node will be in Active State. When an event is occurred then the Child node will send a message to Parent node that an event is occurred so come out from Sleep State to Awake State.

2. AAS (Automatic Active and Sleep State):

AAS is Automatic Active and Sleep State Mechanism. In this technique when a node is in idle state and consume energy then network life period Decreases. The Node after sensing event, collecting information goes into OFF state means Sleep State Automatically. When an event occurs then Node comes out in ON state mean in Active State. The AAS decreases the idle time of the node and save Energy. It enhances the life of the Network. Node's Sleep and Awake States can easily and forcibly Manage.

5. Location Aware Scheme:

In a Wireless Sensor Network all nodes are attached with a Network. The Network contains nodes and base station and a mechanism to sensing and collecting Information. In Network node's location and distance from base station Matters. In Location Aware protocol all nodes are well aware about their locations and neighbor node's Location too. The Node does not need time and energy to get information about the Sink (base station) and Location of the neighbor Node. In Location Aware protocol a GPS system help nodes to become Location Aware. Hence node no needs to send initial data packets to get the Sink Location. In this situation less energy is consumed to send information to sink (Base Station). Time is saved in Location Aware protocol and network performance is enhanced. In the Location Aware protocol node finds the shortest path to send the message or information due to Location Information. The Node no needs to route the message through out the whole Network. The Information directly and shortly is reached at the Destination. Therefore the Location Aware protocol is energy efficient protocol for the Wireless Sensor Network.

6. Environment Based Wireless Sensor Network:

There are many environments that needed deployment of Wireless Sensor Network to detect and

Sense the information Sense the Information. These environments are such as Health, Security and Military etc. The Wireless Sensor Network should provide services for military environment such as Command, Control, Communications, Computing, Intelligence, Surveillance, Reconnaissance and Targeting Systems. In the Battlefield Context, Rapid Deployment, Self-Organization, Fault Tolerance Security of the network should be required. The Sensor devices or Nodes should provide following services like Monitoring friendly forces, Equipment and Ammunition, Battlefield Surveillance, Reconnaissance of opposing forces, Targeting, Battle damage assessment Nuclear, Biological and Chemical attack detection reconnaissance and many security related services (e.g. detecting any thing that can be a person). In this type of Environment based deployment (military) Sleep/Awake protocol is not an efficient protocol because as discussed above node can go into Deep Sleep mode so when an event is generated then it might be possible that node did not come out from the Deep Sleep or if it came out then might be after event occurrence and not sense the information and disaster/damage took Place. In this Environment Location Aware protocol is best to Deploy. When an even will generate then the nodes will detect the event and will sense the information on the right time and will prevent from any major Disaster/Danger. Location Aware is suitable for military WSN Services.

7. Conclusion:

Wireless Sensor Network is the network to sense data and gets information where human can't reach easily. The energy is used to sense the Data. Energy is major component as like as an issue for WSN Networks. There are Sleep/Awake and Location Aware protocols to increase the life and energy efficiency of Network. These protocols can enhance the energy efficiency in the WSN Network. Deployment of these two protocols according to environment is an Issue. As like military service and security services Environments. The Sleep/Awake is not a suitable protocol due to its deep Sleeping State. In this scenario Location Aware is a best and suitable protocol for deployment, energy efficiency and for network Long Life.

References:

- [1] Mansoor-uz-Zafar Dawood, Noor Zaman, Abdul Raouf Khan and Mohammad Salih, "Designing of energy efficient routing protocol for Wireless Sensor Network (WSN) Using Location Aware (LA) Algorithm", Journal of Information & Communication Technology Vol. 3, No. 2, (Fall 2009) 56-70.
- [2] RATHNA. R AND SIVASUBRAMANIAN. A," IMPROVING ENERGY EFFICIENCY IN WIRELESS SENSOR NETWORKS THROUGH SCHEDULING AND ROUTING", International Journal of Advanced Smart Sensor Network Systems (IJASSN), Vol 2, No.1, January 2012.
- [3] Anar A. Hady , Sherine M. Abd El-kader and Hussein S. Eissa (2013) , "Intelligent Sleeping Mechanism for wireless sensor networks", Electronics Research Institute, Computers and Systems Dept., Cairo, Egypt.
- [4] Dimitrios J. Vergados, Dimitrios D. Vergados and Nikolaos Pantazis "An Energy Efficiency Scheme for Wireless Sensor Networks", Department of Information and Communication Systems Engineering.
- [5] Subhash Dhar Dwivedi and Praveen Kaushik," Energy Efficient Routing Algorithm with sleep scheduling in Wireless Sensor Network", Department of Computer Science Engineering, MANIT, Bhopal, India.
- [6] Babar Nazir, Halabi Hasbullah and Sajjad A Madani ,(2011),"Sleep/wake scheduling scheme for minimizing end-to-end delay in multi-hop wireless sensor network", EURASIP Journal on Wireless Communications and Networking Springer.
- [7] S.Kavitha and S.Lalitha, "SLEEP SCHEDULING FOR CRITICAL EVENT MONITORING IN WIRELESS SENSOR NETWORKS", International Journal of Advanced Research in Computer and Communication Engineering Vol.3 Issue 1, January 2014.
- [8] Issa Khalil, Saurabh Bagchi and Ness B. Shroff, "SLAM: Sleep-Wake Aware Local Monitoring in Sensor Networks", Dependable Computing Systems Lab (DCSL) & Center for Wireless Systems and Applications (CWSA) School of Electrical & Computer Engineering, Purdue University.

<http://www.ijecee.com/>

- [9] Gowrishankar.S, T.G.Basavaraju and Manjaiah D.H (2008), "*Issues in Wireless Sensor Networks*", Proceedings World Congress on Engineering 2008 Vol.1.
- [10] Stefanos A. Nikolidakis, Dionisis Kandris , Dimitrios D. Vergados and Christos Douligeris, "*Energy Efficient Routing in Wireless Sensor Networks Through Balanced Clustering*", Algorithms2013, Available:<http://www.mdpi.com/journal/algorithms>.
- [11] Abdul Razaque and Khaled M. Elleithy, "*Energy-Efficient Border Node Medium Access Control Protocol for Wireless Sensor Networks*", Computer Science and Engineering Department, University of Bridgeport, Bridgeport, CT 06604, USA; Available e-Mail: elleithy@bridgeport.edu Message: WSN talk.
- [12] S.JERUSHA, K.KULOTHUNGAN and A. KANNAN, "*LOCATION AWARE CLUSTER BASED ROUTING IN WIRELESS SENSOR NETWORKS*", Department of Information Science and Technology, Anna University, Chennai, India, Available e-mail: jerujere@gmail.com, Kulo_tn@annauniv.edu and k_annan@annauniv.edu.
- [13] Peter Corke, Tim Wark and Wen Hu IEEE fellow, "*Environmental Wireless Sensor Networks*", Vol. 98, No. 11, November 2010 Proceedings of the IEEE.
- [14] A.V. Sutagundar and S.S. Manvi 2013, "*Location aware event driven multipath routing in Wireless Sensor Networks: Agent based approach*", Egyptian Informatics Journal Cairo University.