The International Journal Of Engineering And Science (IJES)
||Volume||2 ||Issue|| 4 ||Pages|| 65-68 ||2013||
ISSN(e): 2319 – 1813 ISSN(p): 2319 – 1805

Wireless Sensor Network for Border Monitoring

[1,]Gundu Siva Sankar, [2,]Suresh Angadi
[1]*Final Year B.Tech, Dept. of ECE, KL University, Vaddeswaram, AP, India*
[2]*Associate Professor B.Tech, Dept. of ECE, KL University, Vaddeswaram, AP, India*

----------Abstract----------

From the day of inception of wireless technology it has been used in various fields of work. In this paper we study about the applying of wireless sensor network in monitoring the border of a country. Here we study about the difficulties in the setup of hardware design of the nodes in those unsuitable areas, about the mode of power supply to the hardware equipment used, the characteristics of the sensors network used in this operation, the network architecture used for remote data access and the implementation strategies. This paper concludes with the discussion of identify important areas of further work in communications and network re-tasking.

General Terms: *Design, Performance, Experimentation, military, border.*

Date Of Submission: 22 April 2013 Date Of Publication: 05,May.2013

I. INTRODUCTION

For border monitoring there are various techniques available to monitor and notify if any intruders cross the Line of Control. The use of wireless sensor network for the large area is now becoming popular for border monitoring and this technology is very precise. Previously the wireless sensors were vulnerable to elements of nature which means they were not water resistant and couldn't with stand hot climate. Even their performance was effected due to these parameters. Now-a-days these sensors can with stand harsh environments and endure severe climatic changes. The parameters of border monitoring are increasing day by day so that it may cause the data traffic and congestion in the future. So the wireless sensors with high-bandwidth spectrum or cognitive radio technology may be the proper solution for smooth data traffic and remote monitoring from a long distance. These sensors can be connected to server or sink node without wire. Wireless sensor nodes are very small devices that with limited battery source. It's processing power and memory both are also limited. In automation and control applications, WSN are popular because they are scalable and easy to handle. Now-a-days there are a number of economical sensor nodes are available with a high-level technology. They are capable to collect the environmental data with precise sensors and are able to transmit it to control station with high efficiency. These sensors can also neglect electromagnetic Interference from other electronic devices and are less prone to hacking. With the use of border monitoring concept, the Army Department can seamlessly monitor the Line of Control and take immediate security measures to curb intruders from trespassing.

The remainder of the paper is organized as follows. Section 2 identifies the requirements of our border monitoring application. Section 3 presents a tiered sensor network architecture that interconnects the core system components ranging from much localized collections of sensor nodes to the area of study to the wide-area where data is ultimately analyzed. Section 4 discusses the working of border monitoring system. Section 5 provides concluding remarks.

II. BORDER MONITORING

Many country research groups have proposed using WSNs for border monitoring. Although there are many interesting research problems in sensor networks, computer scientists must work closely with security personal to create a system that produces useful data. In this section, we examine the need for sensor networks and the requirements that sensor networks must meet to collect useful data for defense purpose. For any country to maintain peaceful relations with its neighbors there is a need to establish a fire free zone in the borders, here the wireless sensor network system is at use. Solder presence in the borders may lead to taunting among them and lead to unexpected conflicts and ultimately results in a war.Wireless networking systems are required in less population density areas where there is chance for illegal human operations, where as it is not necessary in places which has high density of population and security. Another difficulty present in

highly populated area is that the sensors will detect the disturbances caused by people living in that area. The impact of sensor networks for habitat and environmental monitoring will be measured by their ability to enable new applications and produce new, otherwise unattainable, results. In addition, border places often serve as refugia for people who leave their home land in the pursuit of money and good life style. Sensor networks have a significant advantage over traditional methods of monitoring. Finally, sensor network deployment is a comparatively more economical method for conducting long term studies than traditional methods. Presently, a large number of solders are required to monitor the border but implementing of sensor network will reduce the numbers to minimum.

2.1 Border Requirements

[1] Access of Internet

The sensor network at borders should be accessible through internet. An important purpose of border monitoring applications is the ability to support remote communication with main networks.

[2] Network hierarchy

The field station at border needs enough requirements to support database systems and Internet connectivity. However, the borders of political interest are located up to several kilometers away. In the second phase the multiple patches are deployed at areas of interest to provide connectivity to main network. Four or more patches of 150 static (not mobile) nodes are sufficient to start.

[3] Durability of sensor network

Non rechargeable sources of power sources that run for 10-11 months used in sensor networks gained significant audience. Although ecological studies at borders span multiple field seasons, individual field seasons typically vary from 9 to 12 months.

[4] Grid Operation

Energy supply is bounded to each and every level of network. Disconnection may occur when we try to use non conventional energy sources like solar power and wind energy. Our country border has sufficient solar power to run many elements of the application 24x7 with low probabilities of service interruptions due to power loss.

[5] Managing the device from a distance

There is the necessity to monitor and manage the network wirelessly from a large distance since no military presence is required in borders. Except for installation and maintenance purpose in some extraordinary exceptional conditions there should be no presence of military people in the borders.

[6] Hidden operation

The circuits and equipment that is used in border monitoring must be hidden. It should not be identified by the neighboring countries as it may lead to personal indifferences between the two countries. Removing human presence from the border areas present gives us tension free conditions between the nations and lead to economic and political ties.

[7] Behavior of the system

For the functioning of our border monitoring system our sensor network must exhibit stable, predictable, and repeatable behavior. It is difficult to maintain and debug an unpredictable system. Predictability is important to induce confidence in the military that they can depend on these alternatives for protecting the country in borders.

[8] Interactions with main network

As the connections are made using the internet, in cases of maintenance and testing it is the local network that we use. We can use personal digital assistants to serve us in this aspect. It can be used to question, alter parameters of operation.

[9] Recording of data

It is very important to store the readings from a sensor for using in analysis. The data is retrieved from sensor and then sent for error correction. This processed data is stored in data bases. These data bases are highly secured and are open for top army personal. Since we can't expect the inflow of human traffic and the moment of the enemy near the border. Time to time update of new data is important in this operation.

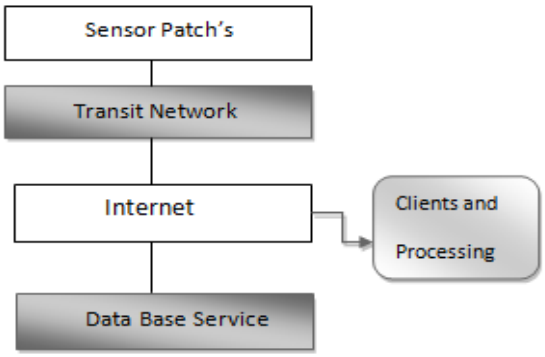

Figure 1: System architecture for Border monitoring

III. SYSTEM ARCHITECTURE

The system architecture for Border monitoring has several levels. The basic level of the architecture consists of Sensor Nodes. These nodes sense the relevant data in its surroundings then computes the data and performs basic signal processing. Sensor nodes are designed as sensor patches which are scattered in the area to be sensed. The sensor nodes relay their data through the sensor patch to the network gateway. The gateway is responsible for relaying that data to base station. The base station provides WAN connectivity and other basic services needed to operate the whole system. The base station connects to database replicas across the confidential networks which can only be accessed by authorized personnel. Finally, the data is displayed to army personnel through any number of user interfaces. Mobile devices with authentication pin may interact with any of the networks irrespective to the place from where it is accessed. These nodes are so minute and have limited power which is provided by a battery in the module. The sensor node module is programmable and provides facilities like storage of data, bi-directional communication, encryption of data, etc. These nodes can communicate with each other. Now the data that is being relayed to other levels is needed to be stored to avoid data loss. So the data is stored at each level in this architecture. The data from the base station is uploaded in to the internet at the same time the data is encrypted and could only be decrypted is the Authentication Pin is given. The data in the internet can be accessed in two ways which are the data is directly displayed on the authorized gadgets that are already registered in the database or by mobile gadgets by inputting Authentication Pin. In this way the data is protected and loss of data is avoided by maintaining data replicas. Other criteria like power requirements and budget are also need to be considered in designing the architecture.

3.1 The Working of Border Monitoring System

The communications between the sensors, cluster network, and base station is carried through three functioning layers, they are: Transport layer, Network layer and Data layer.

[1] **Transport layer:** In transport layer the data taken from sensor nodes and send it to gate way (cluster). Here we are using bi directional communication from sensor to gate way. Because of bi-directional communication the cluster takes the nearest sensor node which is at nearer distance. The distance between gateway and sensor node is greater than the near nodes. If a sensor node receives any signal it transmits to the nearer gateway and bidirectional communication takes place with the adjacent sensor. Sensors require different modes of energy for operation, since different sensors sense differently according to their surrounding environment. So we use many number of high voltage batteries connected, this power supply is sent to the DC converter to give uniform voltage to the nodes. Different nodes signals have different end-to-end rate adjustments. Each signal has its respective protocol to be implemented and it is finally transmitted to buffer circuits, node price, and channel load in detector network. The power is conserved by eliminating unnecessary communication between the nodes.

[2] **Network layer:** All the data from the sensors is processed in gateway network and finally transmitted to the base station. In this layer we don't use a bidirectional communication since it leads to direct communication between the cluster networks and affects the network availability. So we use unidirectional communication systems. Each cluster has different energy requirements as their functionality depends on their received signal. Using all the gateway networks at a time may result in loss in network availability. So we use relay switches which operate at specific intervals of time. This reduces the impact on the network and is available for important data transactions.

[3] **DATA LAYER:**The database system which is the core of the whole system is responsible for processing data and display the result. The base station currently uses SQL database. The database stores time-stamped readings from the sensors, border status of individual sensors (e.g., sensor locations). The Border database is replicated every few minutes over the wide-area satellite link to the database

IV. CONCLUSION

Border monitoring represents an important class of sensor network applications. Because end users are ultimately interested in the sensor data, the sensor network system must deliver the data of interest with confidentiality. Due to limited power supply to the nodes its efficiency is adversely affected. So, power budgeting strategies are adopted and the performance of the whole system is improved which makes it a reliable system. With the advancements in networking data loss is avoided and the data can be retrieved and protected from unauthorized access. It is the best way when compared to the surveying. It collects the border data accurately and automatically and sends the data to emergency decision making station. In present day modern applications it is very use full in sending data to automobile drivers in the extreme conditions like accidents, drastic climatic conditions etc. these information may be used by the drivers to respond quickly to these dangers.

REFERENCES

[1] Cerfcube embedded Strong ARM system.http://www.intrinsyc.com/products/cerfcube/.Intrinsyc Corporation, Vancouver BC Canada.

[2] J. G. T. Anderson. Pilot survey of mid-coast Maine seabird colonies: an evaluation of techniques. Bangor, ME, 1995. Report to the State of Maine Dept. of Inland Fisheries and Wildlife.

[3] J. D. Barrick, J. A. Ritter, C. E. Watson, M. W. Wynkoop, J. K. Quinn, and D. R. Norfolk. Calibration of NASA turbulent air motion measurement system. NASA Technical Paper 3610, Langley Research Center, Dec. 1996.

[4] A. Cerpa, J. Elson, D. Estrin, L. Girod, M. Hamilton, and J. Zhao. Habitat monitoring: Application driver for wireless communications technology. In 2001 ACM SIGCOMM Workshop on Data Communications in Latin America and the Caribbean, San Jose, Costa Rica, Apr. 2001.

[5] B. Chen, K. Jamieson, H. Balakrishnan, and R. Morris. Span: An energy-efficient coordination algorithm for topology maintenance in ad hoc wireless networks. In Proceedings of the 7th ACM International Conference on Mobile Computing and Networking, pages 85–96, Rome, Italy, July 2001.

[6] R. W. Clay, N. R. Wild, D. J. Bird, B. R. Dawson, M. Johnston, R. Patrick, and A. Sewell. A cloud monitoring system for remote sites. Publications of the Astronomical Society of Australia, 15(3):332–335, Aug. 1998.

[7] A. El-Hoiydi. Aloha with preamble sampling for sporadic traffic in ad hoc wireless sensor networks. In Proceedings of IEEE International Conference on Communications, New York, NY, USA, Apr. 2002.

[8] D. Estrin, L. Girod, G. Pottie, and M. Srivastava. Instrumenting the world with wireless sensor networks. In International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2001), Salt Lake City, UT, May 2001.

[9] D. Estrin, R. Govindan, J. S. Heidemann, and S. Kumar. Next century challenges: Scalable coordination in sensor networks. In Mobile Computing and Networking, pages 263–270, 1999.

[10] K. Fall. Delay-tolerant networking for extreme environments. http: //www.cs.berkeley.edu/~kfall/extreme-talk.pdf,Nov. 2001. Presentation at UCSD.

AUTHOR BIOGRAPHY

Gundu Siva Sankar was born in 1991 in Krishna District. He is currently pursing B.Tech Electronics degree from K L University. He is interested in Tele- Communication and Networking.

Suresh Angadi is presently working as a Asst.Professor in department of electronic and communications at K L University. He received his B.Tech degree in electronics and communication in G.V.P College of Engineering, vizag, 2007 and completed M.Tech in Maulana Azad National Institute of Technology (NIT-Bhopal) in 2009, Bhopal. His reach area is communication.