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GPRS Based Environmental Condition Monitoring By Using WSN

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Abstract—The Internet of Things (IoT) provides a virtual view, via the Internet Protocol, to a huge variety of real life objects, ranging from a car, to a teacup, to a building, to trees in a forest. Its appeal is the ubiquitous generalized access to the status and location of any "thing" we may be interested in. Wireless sensor networks (WSN) are well suited for long-term environmental data acquisition for IoT representation. This paper presents the functional design and implementation of a complete WSN platform that can be used for a range of long-term environmental monitoring IoT applications. The application requirements for low cost, high number of sensors, fast deployment, long lifetime, low maintenance, and high quality of service are considered in the specification and design of the platform and of all its components. Low-effort platform reuse is also considered starting from the specifications and at all design levels for a wide array of related monitoring applications.

Key words: Microcontroller, GPS, Zigbee Module, Sensors, WIFI, GPRS.

Introduction

MORE than a decade ago, the Internet of Things (IoT) paradigm was coined in which computers were able to access data about objects and environment without human interaction. It was aimed to complement human-entered data that was seen as a limiting factor to acquisition accuracy, pervasiveness, and cost. In fact, WSN solutions already cover a very broad range of applications, and research and technology advances continuously expand their application field. This trend also increases their use in IoT applications for versatile low-cost data acquisition and actuation.

Among the IoT application domains, the environmental/earth monitoring receives a growing interest as environmental technology becomes a key field of sustainable growth worldwide. Of these, the open nature environmental monitoring is especially challenging because of, e.g., the typically harsh operating conditions and difficulty and cost of physical access to the field for deployment and maintenance. The generic WSN platforms can be used with good results in a broad class of IoT environmental monitoring applications. However, many IoT applications (e.g., those in open nature) may have stringent requirements, such as very low cost, large number of nodes, long unattended service time, ease of deployment, low maintenance, which make these generic WSN platforms less suited.

This paper presents the application requirements, the exploration of possible solutions, and the practical realization of a full-custom, reusable WSN platform suitable for use in lowcost long-term IoT environmental monitoring applications. For a consistent design, the main application requirements for lowcost, fast-deployment of large number of sensors, and reliable and long unattended service are considered at all design levels.

Various trade-offs between platform features and specifications are identified, analyzed, and used to guide the design decisions. The development methodology presented can be reused for platform design for other application domains, or evolutions of this platform. Also, the platform requirements are flexibility and reusability for a broad range of related applications was considered from the start. A real-life application, representative for this application

domain, was selected and used as reference throughout the design process. Finally, the experimental results show that the platform implementation satisfies the specifications.

I. The Hardware System

Micro controller:

This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

Liquid-crystal display:

LCD is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

II. Design of Proposed Hardware System

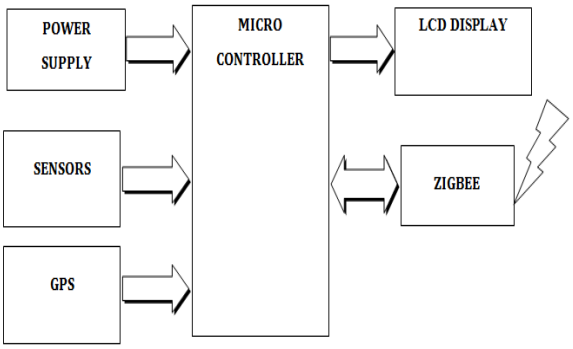


Fig: Node section

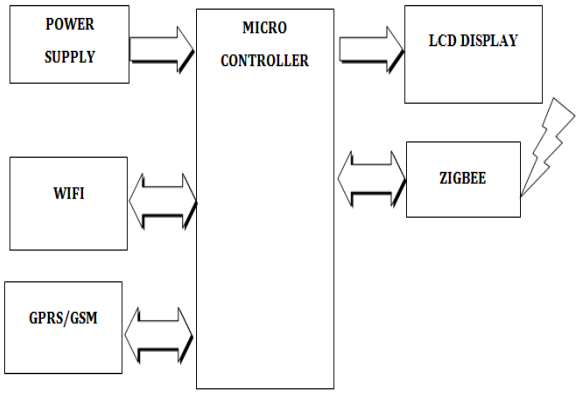


Fig: Monitoring section

The design of entire system consisted of two part which are hardware and software. The hardware is designed by the rules of embedded system, and the steps of software consisted of three parts. Zigbee based wireless technology which consists of transmitter at the site location and receiver at control panel. Information received at the receiver will be send to the webpage in monitoring section along with availability through WIFI. So the people living at home with internet connection can see the received data, also the people who are connected to WIFI of this network can obtain information. The system uses a compact circuitry built around LPC2148 (ARM7) microcontroller Programs are developed in Embedded C. Flash magic is used for loading programs into Microcontroller.

III. Board Hardware Resources Features

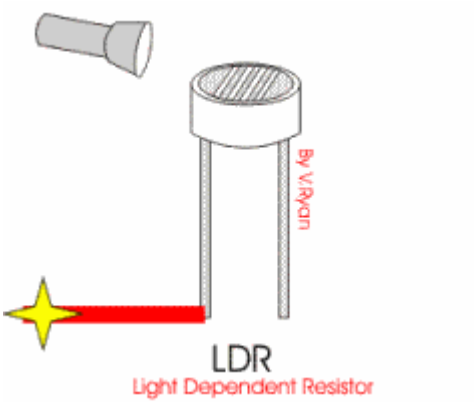
THERMISTOR:

Thermistors are one of the most commonly used devices for the measurement of temperature. The thermistors are resistors whose resistance changes with the temperature. While for most of the metals the resistance increases with temperature, the thermistors respond negatively to the temperature and their resistance decreases with the increase in temperature. Since the resistance of thermistors is dependent on the temperature, they can be connected in the electrical circuit to measure the temperature of the body.

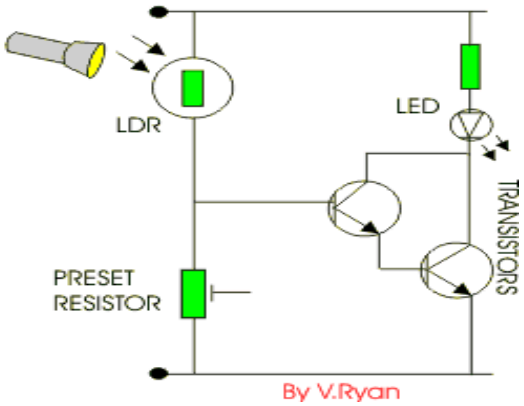
LDR:

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.

The animation opposite shows that when the torch is turned on, the resistance of the LDR falls, allowing current to pass through



This is an example of a light sensor circuit: When the light level is low the resistance of the LDR is high. This prevents current from flowing to the base of the transistors. Consequently the LED does not light. However, when light shines onto the LDR its resistance falls and current flows into the base of the first transistor and then the second transistor. The LED lights on. The preset resistor can be turned up or down to increase or decrease resistance, in this way it can make the circuit more or less sensitive.



CO2 SENSOR:

A carbon dioxide sensor or CO_2 sensor is an instrument for the measurement of carbon dioxide gas. The most common principles for CO_2 sensors are infrared gas sensors and chemical gas sensors. Measuring carbon dioxide is important in monitoring indoor air quality,

ZIGBEE:

Zigbee modules feature a UART interface, which allows any microcontroller or microprocessor to immediately use the services of the Zigbee protocol. All a Zigbee hardware designer has to do in this ase is ensure that the host's serial port logic levels are compatible with the XBee's 2.8- to 3.4-V logic levels. The logic level conversion can be performed using either a standard RS-232 IC or logic level translators such as the 74LVTH125 when the host is directly connected to the XBee UART. The below table gives the pin description of transceiver. Data is presented to the X-Bee module through its DIN pin,

and it must be in the asynchronous serial format, which consists of a start bit, 8 data bits, and a stop bit. Because the input data goes directly into the input of a UART within the X-Bee module, no bit inversions are necessary within the asynchronous serial data stream. All of the required timing and parity checking is automatically taken care of by the X-Bee's UART.

GPS:

Global Positioning System tracking is a method of working out exactly where something is. A GPS tracking system, for example, may be placed in a vehicle, on a cell phone, or on special GPS devices, which can either be a fixed or portable unit. GPS works by providing information on exact location. It can also track the movement of a vehicle or person. So, for example, a GPS tracking system can be used by a company to monitor the route and progress of a delivery truck, and by parents to check on the location of their child, or even to monitor high-valued assets in transit.

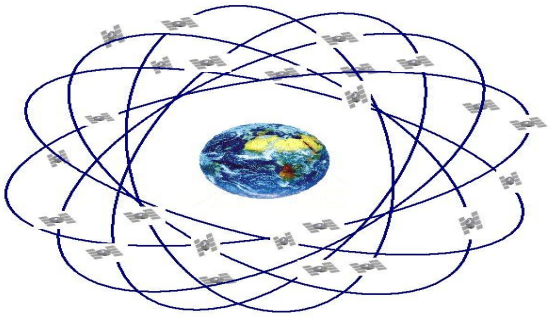
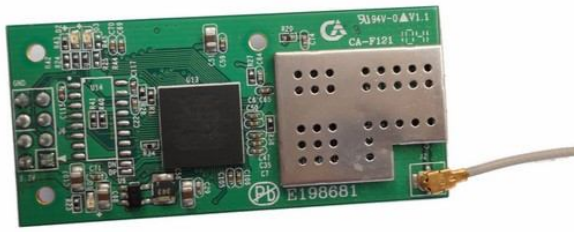


Fig: GPS location tracking

A GPS tracking system can work in various ways. From a commercial perspective, GPS devices are generally used to record the position of vehicles as they make their journeys. Some systems will store the data within the GPS tracking system itself (known as passive tracking) and some send the information to a centralized database or system via a modem within the GPS system unit on a regular basis (known as active tracking) or 2-Way GPS.

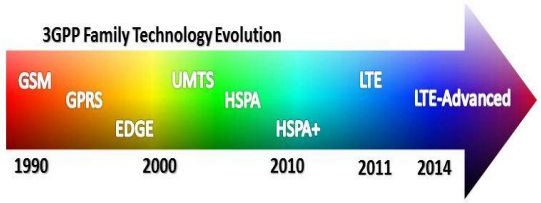
Wifi



VSD03 is the new third-generation embedded Uart Wifi modules studied by VSDTECH. Uart-Wif is an embedded module based on the Uart serial,according with the WiFi wireless WLAN standards, It accords with IEEE802.11 protocol stack and TCP / IP protocol stack， and it enables the data conversion between the user serial and the wireless network module. through the Uart-Wifi module, the traditional serial devices can easily access to the wireless network. The module supports quick networking by specifying channel number. In the usual course of wireless networking, devices would first scan automatically on the current channel, in order to search for the network(or Ad hoc) built by the target AP. This module provides working channel configuration,when the channel of the target network is known, users can specify the working channel directly, the networking time will be reduced from 2 seconds to about 300 milliseconds,then quick networking is achieved.

GPRS:

General Packet Radio Service (GPRS) is a packet-data technology that allows GSM operators to launch wireless data services, such as e-mail and Internet access. As a result, GPRS provides operators with the ability to use data to drive additional revenue. GPRS is often called a 2.5G technology because it is a GSM operator's first step toward third generation (3G) and a first step in wireless data services



Although GPRS is a data-only technology, it helps improve GSM voice capacity. When an operator

deploys GPRS, it also can upgrade to a vo-coder, a new type of voice coder that turns voice into digital signals before they pass across the wireless network. The vo-coder uses Adaptive Multi-rate speech transcoding (AMR) technology, which can handle twice as many simultaneous voice calls as a network that uses the old vo-coder. As a result, GPRS allows GSM operators to accommodate additional voice traffic without the expense of acquiring additional spectrum.

GPRS supports peak download data rates of up to 115 kbps, with average speeds of 40 to 50 kbps, which is comparable to other 2.5G technologies, such as CDMA2000 1x. GPRS speeds are fast enough for applications such as Multimedia Messaging Service (MMS) and a web browsing experience comparable to a wired dial-up modem. GPRS also allows customers to maintain a data session while answering a phone call, which is a unique and exclusive feature to GSM. GPRS also provides an always-on data connection, so users do not have to log on each time they want data access. The packet architecture also means that users pay only for the data itself rather than for the airtime used to establish a connection and download data.

GPRS is the most widely supported packet-data wireless technology in the world. Like GSM, GPRS supports international roaming so customers can access data services whether they are at home or abroad. When users travel to areas that have not yet been upgraded to GPRS, they still can access many data services via circuit-switched GSM.

IV. CONCLUSION

WSNs are traditionally considered key enablers for the IoT paradigm. However, due to the widening variety of applications, it is increasingly difficult to define common requirements for the WSN nodes and platforms.

This paper addresses all phases of the practical development from scratch of a full custom WSN platform for environmental monitoring IoT applications. It starts by analysing the application requirements and defining a set of specifications for the platform. A real-life, demanding application is selected as reference to guide most of node and platform solution exploration and the implementation decisions.

All aspects of the WSN platform are considered: platform structure, flexibility and reusability, optimization of the sensor and gateway nodes, optimization of the communication protocols for both in-field and long range, error recovery from communications and node operation, high availability of service at all levels, application server reliability and the interfacing with IoT applications. Of particular importance are IoT requirements for low cost, fast deployment, and long unattended service time.

All platform components are implemented and support the operation of a broad range of indoor and outdoor field deployments with several types of nodes built using the generic node platforms presented. This demonstrates the flexibility of the platform and of the solutions proposed. The flow presented in this paper can be used to guide the specification, optimization and development of WSN platforms for other IoT application domains

V. REFERENCES

[1] G. Werner-Allen, K. Lorincz, J. Johnson, J. Lees, and M. Welsh, “Fidelity and yield in a volcano monitoring sensor network,” in *Proc. 7th Symp. Operat. Syst. Design Implement.*, Berkeley, CA, 2006, pp. 381–396.

[2] G. Barrenetxea, F. Ingelrest, G. Schaefer, and M. Vetterli, “The hitchhiker’s guide to successful wireless sensor network deployments,” in *Proc. 6th ACM Conf. Embedded Netw. Sensor Syst.*, New York, 2008, pp. 43–56.

[3] R. Szewczyk, J. Polastre, A.Mainwaring, and D. Culler, “Lessons from a sensor network expedition,” *Wireless Sensor Netw.*, pp. 307–322, 2004.

[4] G. Tolle, J. Polastre, R. Szewczyk, D. Culler, N. Turner, K. Tu, S. Burgess, T. Dawson, P. Buonadonna, D. Gay, andW. Hong, “A macroscope in the redwoods,” in *Proc. 3rd Int. Conf. Embedded Netw. SensorSyst.*, New York, 2005, pp. 51–63.

[5] L. Bencini, F. Chiti, G. Collodi, D. Di Palma, R. Fantacci, A. Manes, and G. Manes, "Agricultural monitoring based on wireless sensor network technology: Real long life deployments for physiology and pathogens control," in *Sensor Technol. Appl.*, Jun. 2009, pp. 372–377.

[6] S. Verma, N. Chug, and D. Gadre, "Wireless sensor network for crop field monitoring," in *Recent Trends Inf., Telecommun. Comput.*, Mar. 2010, pp. 207–211.

[7] Y. Liu, Y. He, M. Li, J. Wang, K. Liu, L. Mo, W. Dong, Z. Yang, M. Xi, J. Zhao, and X.-Y. Li, "Does wireless sensor network scale? A measurement study on GreenOrbs," in *Proc. IEEE INFOCOM*, Apr. 2011, pp. 873–881.

[8] M. Kuorilehto, M. Kohvakka, J. Suhonen, P. Hmlinen, M. Hnnikinen, and T. D. Hmlinen, *Ultra-Low Energy Wireless Sensor Networks in Practice*. New York: Wiley, 2007.

[9] C. Hartung, R. Han, C. Seielstad, and S. Holbrook, "FireWxNet: A multi-tiered portable wireless system for monitoring weather conditions in wild land fire environments," in *Proc. 4th Int. Conf. Mobile Syst., Appl. Services*, New York, 2006, pp. 28–41.

[10] G. Barrenetxea, F. Ingelrest, G. Schaefer, M. Vetterli, O. Couach, and M. Parlange, "SensorScope: Out-of-the-box environmental monitoring," in *Inf. Process. Sensor Netw.*, Apr. 2008, pp. 332–343.

[11] N. Kotamäki, S. Thessler, J. Koskiaho, A. Hannukkala, H. Huitu, T. Huttula, J. Havento, and M. Järvenpää, "Wireless in-situ sensor network for agriculture and water monitoring on a river basin scale in southern Finland: Evaluation from a data user's perspective," *Sensors*, vol. 9, no. 4, pp. 2862–2883, 2009.

[12] S. Burgess, M. Kranz, N. Turner, R. Cardell-Oliver, and T. Dawson, "Harnessing wireless sensor technologies to advance forest ecology and agricultural research," *Agricultural Forest Meteorol.*, vol. 150, no. 1, pp. 30–37, 2010.

[13] S. Tennina,M. Bouroche, P. Braga, R. Gomes, M. Alves, F. Mirza, V. Ciriello, G. Carrozza, P. Oliveira, and V. Cahill, "EMMON: A WSN system architecture for large scale and dense real-time embedded monitoring," in *Embedded Ubiquitous Comput.*, Oct. 2011, pp. 150–157.

[14] T. Watteyne, X. Vilajosana, B. Kerkez, F. Chraim, K. Weekly, Q. Wang, S. Glaser, and K. Pister, "OpenWSN: A standards-based low-power wireless development environment," *Trans. Emerg. Telecommun. Technol.*, vol. 23, no. 5, pp. 480–493, 2012.

[15] K. Aberer, M. Hauswirth, and A. Salehi, Global sensor networks, EPFL, Lausanne, Switzerland, Tech. Rep. LSIR-2006-001, 2006.

[16] M. Corra, L. Zuech, C. Torghele, P. Pivato, D. Macii, and D. Petri, "WSNAP: A flexible platform for wireless sensor networks data collection and management," in *Environ., Energy, Struct. Monitor. Syst.*, Sep. 2009, pp. 1–7.

[17] C. Jardak, K. Rerkrai, A. Kovacevic, and J. Riihijarvi, "Design of largescale agricultural wireless sensor networks: email from the vineyard," *Int. J. Sensor Netw.*, vol. 8, no. 2, pp. 77–88, 2010.