IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 2 Issue 4, April 2015.
www.ijiset.com
ISSN 2348 – 7968

Data Gathering through Wireless Sensor Network in Cloud

Sourabh Songar[1], Mrs. R. Annie Uthra[2]

[1] Research Scholar, Department of Computer Science, SRM University, Kattankulathur, Tamilnadu, India

[2] Professor, Department of Computer Science, SRM University, Kattankulathur, Tamilnadu, India

Abstract

This paper introduces a new energy efficient routing protocol for Wireless Sensor Network (WSN) for saving the energy of the nodes as well as integrating WSN with Cloud to improve the efficiency of the sensor nodes, so that the capacity of the node will be reused. The energy efficient route is the shortest distance from source node to the destination node. As WSN have limited processing power, battery life, energy and communication speed. Therefore, reducing battery (power) use to increase the lifetime of the node becomes very important. Also there is a need for a powerful and scalable high performance computing for storing the WSN data. In this scenario, cloud computing is become a promising technology which provide scalable processing power and large data storage capacity with lower cost. By using device cloud we can integrate the WSN with cloud computing which provide an open and flexible platform for monitoring and storing the data from WSN to cloud.

Keywords: *Wireless Sensor Network, Routing, Cloud Computing, Device Cloud.*

1. Introduction

1.1 Wireless Sensor Network

A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to monitor physical or environmental conditions such as temperature, sound, pressure etc. and cooperatively pass their data through the network to a main location [1]. Wireless sensor network applications have been used in important areas like infrastructure monitoring, surveillance of civil construction, military and healthcare [5].

As WSN have vast area of application but it also has some limitation which restricts its application and area. WSN have to face many limitations due to its architecture regarding their communication (like short communication range, security and privacy, reliability, mobility etc.) and resources (like power consideration, storage capacity, processing capabilities, bandwidth availability etc.). However, one of the most important constraints of the sensor nodes is the low power consumption requirement. Indeed, sensor nodes are equipped with limited, generally irreplaceable power sources. Hence, innovative techniques are highly required to optimize energy consumption and sensor network protocols must focus primarily on energy [2].

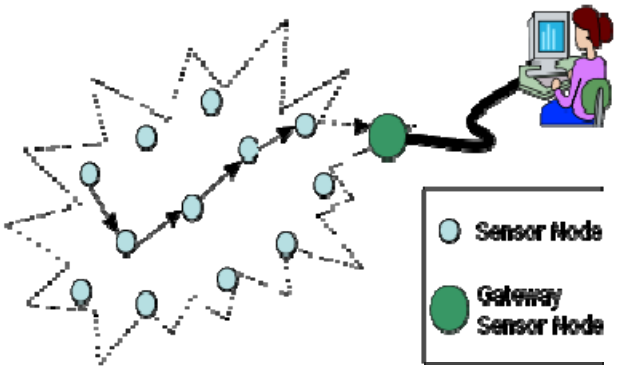

Fig. 1 Wireless Sensor Network

Besides, WSN has its own resources and design constraints. Design constraints are application specific and dependent on monitored environment. Based on the monitored environment, network size in WSN varies. For monitoring large environment, there is limited communication between nodes due to obstructions into the environment, which in turn affect the overall network topology.

1.2 Cloud Computing

Cloud Computing is a novel paradigm for the provision of computing infrastructure, which aims to shift the location of the computing infrastructure to the network in order to reduce the costs of management and maintenance of hardware and software resources. It is a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal

ISSN 2348 – 7968

management effort or service provider interaction. Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the electricity grid) over a network. Cloud is a new consumption and deliver model for many IT based services, in which the user sees only the services, and has no need to know anything about the technology or implementation [4].

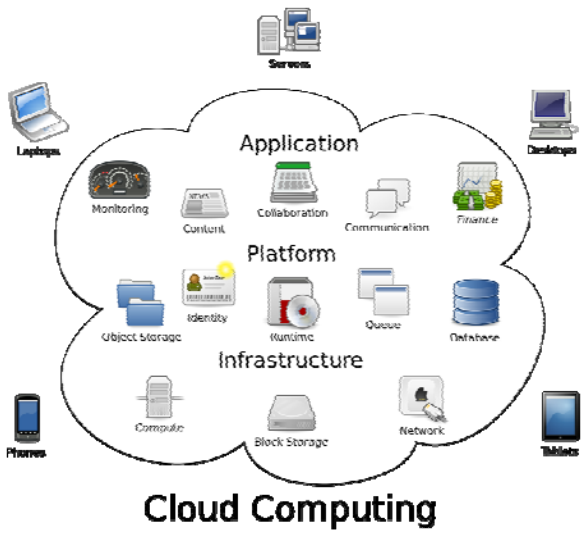

Fig. 2 Cloud Computing

It has a service-oriented architecture in which services are broadly divided into three categories: Infrastructure-as-a-Service (IaaS), which includes equipment such as hardware, storage, servers, and networking components are made accessible over the internet; Platform-as-a-Service (PaaS), which includes hardware and software computing platforms such as virtualized servers, operating systems and Software-as-a-Service (SaaS), which includes software applications and other hosted services. A cloud service differs from traditional hosting in three principal aspects. First, it is provided on demand. Second, it is elastic since users can use the service have as much or as little as they want at any given time and third, the service is fully managed by the provider.By using cloud architecture users can switch to their application by connecting to the server on cloud and start working without any hassle[7].

The paper is organized as follows: Section II discusses about the Existing Wireless Sensor Network System. Section III discusses about Proposed Method for energy efficient routing by combining WSN with cloud. Related Work defined over Section IV and finally conclusion is on Section V.

2. Existing System

In existing model, the Wireless Sensor Networks consists of large number of distributed sensor nodes which are responsible for collecting the data from surroundings. The collected data are processed and then passed from one node to another until it reaches to the sink (sink is the last node in the chain). Sink is a dedicated node with sufficient power that post-processes the data and prepares them for the end users. The sensor nodes often possess limited processing power, capacity, battery life and they are also resource constrained in term of energy, processor, memory, low range communication and bandwidth. The limited battery power is used to operate the sensor nodes and is very difficult to replace or recharge it, when the nodes die. This will affect the network performance.

Although there have been significant improvements in processor design and computing, but advances in battery technology still lag behind. Therefore making energy resource considerations is the fundamental challenge in wireless sensor networks. Consequently, there has been active research efforts are going on for performance limits of wireless sensor networks. The operations by which a sensor consumes energy are target detection, data processing, data transmission and reception. Among others data transmission consumes most of the energy, and it heavily depends on the transmission distance and the transmitted data amount.

3. Proposed Method

The proposed method mainly discusses about cluster head selection for efficient data transmission by reducing the number of hops for transferring the data to base station and also storing the sensed data to the cloud so that the capacity of the sensor node will be reused.

We propose a new energy efficient routing by combining sensor networks with cloud devices to save the energy of the nodes. The key idea here is to reduce the number of transmissions through the sensor nodes. To achieve this idea cloud devices are deployed along with the sensor nodes. The data sensed by the sensor nodes are routed hop-by-hop basis till it reaches the cloud device or the final destination. When the data are reached the cloud device, it can be directly sent to the final destination. This avoids further hops (transmissions) to reach the destination.

ISSN 2348 – 7968

For the energy efficient routing Cluster heads are selected according to the probability of optimal cluster heads determined by the networks. After the selection of cluster heads, the clusters are constructed and the cluster heads communicate data with base station. Because LEACH is only depend on probability model, some cluster heads may be very close to each other and can be located in the edge of the WSN. These disorganized cluster heads could not maximize energy efficiency.

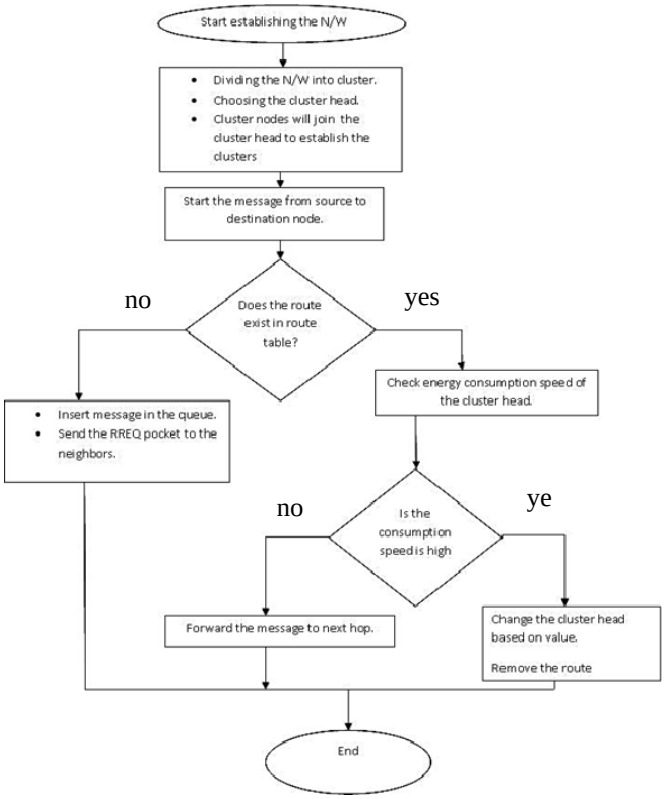

Fig. 3 Cluster Head Selection

To overcome the defects of LEACH methodology, a cluster head election method High Energy First (HEF) algorithm has been introduced. This method proved that the network lifetime can be efficiently prolonged. For mission critical WSN applications, it is important to be aware of whether all sensors can meet their mandatory network lifetime requirements. The High Energy First (HEF) algorithm is proven to be an optimal cluster head selection algorithm that maximizes a hard N-of-N lifetime. Our experiment results show that the HEF algorithm achieves significant performance improvement over LEACH, and HEF's lifetime can be bounded.

Now by using Device Cloud application, we can efficiently transfer the data from WSN to cloud. The sensor nodes are attached to the device cloud server (Etherios). Etherios, a division of Digi International and a Platinum Cloud Alliance Partner to salesforce.com. By using device cloud application we can connect to any device at any time. Etherios cloud connector simplifies integration of any device into the cloud, giving you direct access to critical device data anytime, anywhere. It will also scale the network by connecting the devices to the cloud, whether we have one device or one million devices.

4. Related Work

A performance comparison of three sensor network routing protocols, Rumor routing, Stream Enable Routing (SER) and SPIN (Sensor Protocols for Information via Negotiation) [11] has been done by V.Vasanthi. The recent advances in wireless sensor networks which have led to many new protocols specifically designed for sensor networks where energy awareness is an essential consideration. It is necessary to identify the performance challenges of WSN and analyze their impact on the performance of routing protocols. S Park and S. Y Maeong uses Representational State Transfer (REST) based web service. This service is used as an interoperable application layer that can be directly integrated into other application domains for remote monitoring such as e-health care services and smart environments. The proposed architecture of the system which is divided into three layers sensor layer, coordinator layer and the supervision layer [3]. The sensor layer consists of the sensors that interact with the environment. The coordination layer is responsible for the management of the data received from the sensor network. It temporarily stores the gathered data into buffer and sends it to the Supervision layer at predefined intervals. Finally, the supervision layer accommodates the base station with a web server to connect and publish the sensor data on the Internet. Yuriyama, M., Kushida T. proposes a new infrastructure called sensor -cloud infrastructure which can manage physical sensors on IT infrastructure [6]. The sensor-cloud infrastructure virtualizes a physical sensor as a virtual sensor on the cloud computing. Sensor-Cloud infrastructure provides virtual sensors so the users need not worry about the real locations and the differences of multiple physical sensors. The users can use and control virtual sensors with standard functions. L. Wang and G. von Laszewski gives a perspective study about cloud computing [9]. The Cloud computing, which was coined in late of 2007, currently emerges as a hot topic due to its abilities to offer flexible dynamic IT infrastructures, Quality of Services (QoS) guaranteed computing environments and configurable software services. Cloud

ISSN 2348 – 7968

computing is becoming one of the next IT industry buzz words: users move out their data and applications to the remote "Cloud" and then access them in a simple and pervasive way.

5. Conclusions

We have addressed the issue of energy efficient routing for WSNs of interests and also using cloud computing to efficiently gather the sensed data collected by various sensor nodes. First, the High Energy First (HEF) algorithm is proven to be an optimal cluster head selection algorithm that maximizes a hard N-of-N lifetime for WSNs. Then, we provide the device cloud application which efficiently stores the sensed data from WSN to cloud. Our experiment results show that the HEF algorithm achieves significant performance improvement over LEACH, and HEF's lifetime can be bounded and by using device cloud application we can efficiently store the sensor data to cloud.

Reference

[1] J. Elson and D. Estrin, "Sensor networks: A bridge to the physical world," in Wireless Sensor Networks, C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Eds. Springer US, 2004, pp. 3–20.
[2] G. Anastasi, M. Conti, M. D. Francesco, and A. Passarella, "Energy conservation in wireless sensor networks: A survey," Ad Hoc Networks, vol. 7, no. 3, 2009, pp. 537 – 568.
[3] S Park, S. Y Maeong, R Pyare, S. H Park, S RO Lee, "Integrating Wireless Sensor Network into Cloud Services for Real-time Data Collection," Department of information electronics engineering, ICTC, 2013.
[4] Lan K. T., "What's Next? Sensor+Cloud?" Processing of the 7th International Workshop on Data Management for Sensor Networks, ACM Digital Library, p. 978-971, 2010.
[5] K. Chintalapudi, T. Fu, J. Paek, N. Kothari, S. Rangwala, J. Caffrey, R. Govindan, E. Johnson, and S. Masri, "Monitoring civil structures with a wireless sensor network," IEEE Internet Computing, vol. 10, no. 2, pp. 26–34, 2006.
[6] Yuriyama, M., Kushida T., "Sensor-Cloud Infrastructure - Physical Sensor Management with Virtualized Sensors on Cloud Computing" Network-Based Information Systems (NBiS), 2010 13th International Conference.
[7] L. P. D. Kumar, S. S. Grace, A. Krishnan, V. M. Manikandan, "Data filtering in wireless sensor network using neural network for storage in cloud," Proceedings of the IEEE International Conference on Recent Trends in Information Technology(ICRTIT'11), 2012.
[8] Pavlos Antoniou and Andreas Pitsillides, "Wireless Sensor Networks Controls: Drawing Inspiration from Complex Systems" Networks Research Laboratory, Computer Science Department, University of Cyprus.
[9] L. Wang, G. von Laszewski, A. Younge, X. He, M. Kunze, J. Tao, and C. Fu, "Cloud Computing: A Perspective Study", Service Oriented Cyberinfrastruture Lab, Rochester Inst. of Tech.
[10] Wassim Masri, Zoubir Mammeri, "Middleware for Wireless Sensor Networks: Approaches, Challenges, and Projects", in IEEE int. conf. on Signal Processing and Communications, 2007.
[11] V.Vasanthi1, P.Nagarajan2, B.Bharathi3 and Dr.M.Hemalatha4, "A Perspective Analysis of routing protocols in wireless sensor network", (IJCSE) International Journal on Computer Science and Engineering Vol. 02, No. 08, 2010.
[12] Han Zang, Liang Li, Xiang Lia and Xin fand Yan "A load balancing clustering algorithm for WSN for data gathering" supported by Natural Science Foundation of Henan Province of china (IEEE) 2011.