



Research Article

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Development of cloud computing system based on wireless sensor network protocol and routing

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ABSTRACT

Wireless sensor network consists of a large number of randomly distributed including integrated sensors, data processing and communication unit of small nodes through wireless self-organized network. Cloud computing refers to the delivery of services and the use of pattern, refers to the network to on-demand, scalable way to obtain the desired service. The paper presents development of cloud computing system based on wireless sensor network protocol and routing. Experimental results show that using wireless sensor for cloud computing optimization is efficient.

Keywords: Wireless sensor network, Cloud computing, Internet of things, protocol and routing.

INTRODUCTION

Wireless sensor network is a data centric, some routes between nodes is not needed, so should not be used in the wireless sensor network routing protocol of traditional. Second, the flow of data in wireless sensor networks is many to one, the needed information is generally derived from a regional, after data fusion, to obtain the required information, and then sent to the destination node -- sink node, delivered to the user by its unity.

Wireless sensor network in the physical environment [1]. The changing external environment (such as intermittent, antenna communication link incidents lead to network task load changes) can seriously affect the function of the system, which requires the sensor nodes can change with the environment and timely adjust its working state. In addition, the change of the network topology also requires the system can well adapt to the dynamic changing.

The network layer is equivalent to the human central nervous system and brain, responsible for the transmission and processing of information perception layer, composed of various private network, Internet, cable and wireless communication networks, network management systems and cloud computing platform. The application layer is the network and the user (including people, organizations and other system) interface, it combines with the industry needs, realize the intelligent application of the Internet of things. The industry characteristics of the Internet of things is mainly embodied in the application areas, try the green agriculture, industry monitoring, public security, city management, remote medical treatment, intelligent Home Furnishing, intelligent traffic and environmental monitoring and other industries have the IOT application.

Because the energy of the wireless sensor network node is limited, so the routing protocol must be designed to be energy efficient in the first place, it is an important index to measure the energy efficiency of the routing protocol. Sensor network is not only to choose the path of the message transmission energy consumption of small, but also to consider the network point of view, select the balanced energy consumption of nodes for routing, which can greatly prolong the network life cycle, while the energy of sensor nodes and the bandwidth is limited, but played a dual role

in sensing and routing, so the routing protocol requires the use of minimal resources and costs as much as possible, to provide the most effective data routing function.

2. Research and application of wireless sensor network in Internet of things

Wireless sensor network is a new network technology, which is composed of a large number of randomly distributed include integrated sensors, data processing and communication unit of small nodes through wireless network and self-organized network, all nodes cooperate to complete a specific task. It integrates sensor technology, embedded computing technology, modern network technology, wireless communication technology and distributed information processing technology.

IOT cloud computing platform and intelligent network based on it, can be based on sensor networks using data for decision-making, change the object to control the behavior and feedback. For example, according to the brightness intensity adjusting lamp light, according to the vehicle flow automatic adjust the red green light interval, over the years to focus technology and product development in the mobile Internet and the Internet of things, as is shown by equation (1).

$$P^{(\alpha)}(m|m) = P^{(\alpha)}(m, M) = \prod_{s=1}^M [I - K^{(\alpha)}(m, s)\Psi(m, s)]P^{(\alpha)}(m|m-1) \quad (1)$$

Wireless sensor networks generally use the random deployment of nodes deployment, self-organization network. But the node Properties Limited in WSN, make it possible for the network topology changes dynamically, so the routing protocol WSN has become an important research direction [2]. This paper first analyzes the challenges and classification, WSN network routing protocol.

The physical world network system is composed of various kinds of tangible objects, including wireless sensor, items and computer, the Internet of things; these objects are fully interconnected in physics. Not only that, it is the physical and virtual world to communicate with each other, things can make the physical world information is automatically accepted the virtual world, physical world wisdom and information to be able to communicate with people, to achieve human development wise purposes.

Because most of the nodes only need to have the data transmission function, do not need to have the ability to control, ZigBee technology node from the devices are divided into 3 classes, RFD (reduced function device). RFD memory is small, low power consumption, as the source node in the network, only to send and receive signals, does not play a transponder / function of router, as is shown by equation (2) [2].

$$C(k) = E\{[a(k) - \mu_m(k)][a(k) - \mu_m(k)]^T\} \quad (2)$$

TinyOS is specifically designed for operating system sensor developed. In the TinyOS the program uses the nesC language is the C language and its expansion, to the component / module and TinyOS execution model based on event driven together. The nesC component Module (module) is Configuration (connection configuration file) two. Compiled in modules in the main code, in the connections configuration file in all components and modules are connected into a whole.

The electronic label general preservation of electronic data format, in the practical application, the electronic tag attached to the object surface. The reader is also known as the readout device, electronic data can be non-contact reading and identifying the stored in electronic tags, so as to achieve the purpose of automatic object recognition. Further through the computer and the computer network to realize the object recognition information collection, processing and remote transmission and other management functions, as is shown by equation (3).

$$C_1 = \frac{1}{\sum_{i=1}^n k \left(\left\| \frac{y_0 - X_i}{h_1} \right\|^2 \right) (1 + d(X_i))} \quad (3)$$

The basic components of ZigBee wireless network includes the coordinator (Coordinator) router (router) and the terminal node (end device), the core of these basic components are a complete, with standard IEEE802.15.4 wireless transceiver and the microprocessor (SCM) on-chip system SoC (also known as wireless microcontroller), because the ZigBee 2007 and ZigBee RO software stack is more complex, large memory space and large processing

capacity, therefore, need to wireless microcontroller has the ability, to upgrade to the ZigBee 2007/PRO protocol stack.

Many types of sensors in wireless sensor network has a detectable, include earthquakes, electromagnetic, temperature, humidity, noise, light intensity, pressure, soil composition, the size of moving objects, the speed and direction of the surrounding environment in a variety of phenomena. Given the broad application prospect of micro sensor technology and wireless networking technology for wireless sensor network based on MEMS [3].

$$PV(x) = \frac{1}{y_2 - y_1} \sum_{y=y_1}^{y_2} I(x, y), \quad x \in (x_1, x_2) \quad (4)$$

The processor module is the core of wireless sensor nodes, the node responsible for equipment control, task allocation and scheduling, data integration and transmission and other key task, considering the actual characteristics of the wireless sensor networks, as the central module hardware platform, in addition to the basic performance should have a like singlechip's should also have the characteristics of the network need appropriate: a) as high as possible integration, by the size limit, the module must be able to integrate more of the key components of the node.

3. Development of cloud computing system based on wireless sensor protocol and routing

The sensor node energy and storage capacity is very limited. Because of the observed object within or near the deployment of a large number of sensor nodes, a node data may and other nearby nodes collect data because the data sampled by sensor nodes are the same or similar, the redundant information, the transmission of data will consume a large amount of energy of nodes, it is not necessary to these data are sent to the sink node. This requires routing protocol with data fusion capability, in order to improve the bandwidth utilization [4]. Nodes in wireless sensor network most nodes unlike traditional Ad hoc network in a kind of fast moving.

System TCP/IP protocol stack sensor network similar to the traditional Internet network, including the physical layer, data link layer, network layer, transport layer and application layer, five layer protocol, compared with the traditional Internet protocol stack in addition, protocol stack sensor network also comprises a power management platform, mobile platform management and task management platform, as is shown by equation (5).

$$\hat{r} = \sum_{i=N_1}^{N_2} d^*(i) x^H(i) \quad (5)$$

Service Oriented Architecture (SOA) abstract out the service architecture of IT, its function to coarse-grained services form, each of the services will clearly show the business value, then, these customers (probably in the company, it may also be a company's business partner) you can get these services, the specific technology regardless of the background to achieve. Further, if the customer can find and bind the available services, so the IT system in these behind the services can provide greater flexibility. SOA emphasizes the service first; business and IT alignment, and construct the flexible thought, and these can be very good to help cloud computing changes in demand rapid response service platform. So consider the use of SOA and cloud computing combined, give full play to their respective advantages, to provide a more open EPC middleware architecture perfect.

The LEACH protocol selects a random sensor node as a cluster head nodes, random to ensure that the data transmission between cluster head and base station energy consumption cost evenly allocated to all sensor nodes. The selection principle is: each sensor node randomly generates a random number between 0, 1, if the random number is less than the value T, and then the node to be the cluster head node.

The sink node is a fixed or mobile nodes, have more energy, more powerful data processing power and storage capacity. The sink node will be controlled from an external network receives commands sent to the sensor nodes within the detection area, as well as the data transmission of sensor nodes to the external network, the external network transmits to the server. Server is used for receiving the detection region of the data, the user can remote access server, so as to obtain the target state information and the realization of the configuration and management of sensor network, release detection task and other functions, as is shown by equation (6).

$$H_e = - \sum_{l=0}^{L-1} P(l) \log_2 p(l) \quad (6)$$

The SPIN21 protocol is mentioned three basic handshake negotiation mechanism. (1) a randomized mechanism. When the gradient has multiple link at the same time, nodes are randomly selected, the extended SPIN22 protocol is the default resource reminder mechanism based on the agreement, when resources are plentiful, the use of the SPIN22 is the three handshake negotiation mechanism; when the resource is below a preset value, it will reduce the number of involved in data transmission. On the whole, SPIN21 and SPIN22 are simple and efficient protocol, without maintaining per neighbor state.

The cloud infrastructure delivery and usage patterns, through the network to on-demand, easy extension ways to obtain needed resources; generalized cloud computing service delivery and usage patterns, through the network to on-demand, scalable way to obtain the desired service. This service can be IT and software, Internet, but also other services. The core idea of cloud computing, the computing resources connected by a network of unified management and scheduling, constitute a computing resource pool to users on demand service.

4. Experiment and Analysis

NS is a scalable, simulation tools to configure and programmable time driven, which is composed of REAL simulator development. In the NS design, the use of C++ and OTCL two programming languages, C++ is a relatively fast running speed but slow language, C++ language is used to implementation of network protocol, prepare simulation engine the bottom of the NS; OTCL is slower, but can quickly convert the script language, just and C++ complementary, so the OTCL language is used to all kinds of parameter configuration simulation, simulation of the whole structure.

Wireless sensing circuit consists of sensor, amplifier and modulation circuit, completed the measured non current to the power conversion, and a preliminary processing, such as signal shaping, amplification, and then sent to the general circuit, analog quantity to amount of data conversion and processing after appropriate to the wireless transceiver module, wireless transceiver module and the wireless transmission [5]. General signal processing circuit and wireless transceiver module receives the power supply part of the sensor nodes, to provide the required energy.

Sensor network routing protocols, such as routing protocol for multiple energy aware, directed diffusion and rumor routing query based routing protocol, GEAR and GEM routing protocol based on geographic location, routing protocols SPEED and ReInForM to support QoS. Sensor network MAC protocol should first consider the energy saving and scalability, then considering fairness, efficiency and real-time performance. In the MAC layer of energy waste is mainly manifested in the idle listening, not receiving the necessary data and collision retransmission.

Directed diffusion is a data center and the routing mechanism based on the query, the biggest feature is the introduction of the concept of network gradient, and the communication mechanism of local routing algorithm in wireless sensor network. The ant population model in biology network gradient thought itself source, generally defined as attribute value and direction. Attribute values can be based on the data rate, power or geographic information to determine the direction, the neighbor nodes by the receiving node to send interest, guide data diffusion, as is shown by figure 1.

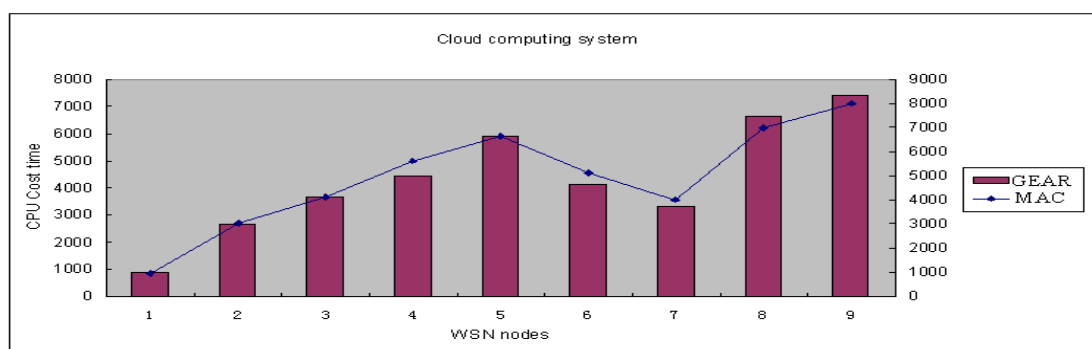


Fig. 1. Comparison results of development of cloud computing system based on MAC with GEAR

A routing protocol cluster structure, and it is cluster structure capable of data fusion in the cluster head, reduce the amount of data transmission to the whole network. The basic idea of LEACH protocol is through the random cyclic selection of cluster head, the whole network energy load average assigned to each sensor node, which can reduce the network energy consumption, improve the survival time of the entire network to it.

CONCLUSION

Strategy of cloud computing security is more users, each user is safe, because so giant user group, each corner to cover the Internet, as long as a web site was hung horse or a new Trojan virus, and you will immediately be intercepted. The paper presents development of cloud computing system based on wireless sensor network protocol and routing. These routing protocols for wireless sensor networks is designed based on the specific application environment, in different conditions, different protocols exhibit different properties, therefore, cannot say what kind of protocol optimization.

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