Research on Architecture and Key Technologies of the Internet of things

Qing Mi, Zhen-tao Ni and Xiao-duan Wang

Informatization Department, Hebei Academy Of Governance, Shijiazhuang, 050000, China

Abstract. The present era is the information age, is the era of network. The life of people more and more cannot do without network. Through the network platform, can learn, reading, shopping etc.. Following the Internet, and the emergence of a new term "the Internet of things". Different things with the network, it is a kind of network information technology, the promotion of the role of the development of the network, is the future development trend of the network, so the research of system structure and technology of the Internet of things are highly regarded in various fields. This paper analysis the problem of system structure and technical aspects of the Internet of things.

Introduction

The Internet is a network of physical systems, is the systematic process of integrated treatment effectively involves network requirements, network information acquisition in the life of the people. With the development of times, the Internet of things based on the structure and technology of the system will become the direction and trend of the future network development, causing more and more attention of domestic and foreign media and academia. At present, the Internet of things is still in the early stages of development, the system structure and the technology also has many flaws and shortcomings, therefore, system structure and technology only effective analysis, research and management of the Internet of things, in order to have a better development prospects.

The community in a relatively short period of time for the Internet of things has generated a great deal of attention, many people believe that things may have on human society, produced huge influence to people's daily life. Whether at home or abroad, the research and development of the Internet of things is just beginning, location and feature about Internet of things there are still some confusion of concepts, the system model and structure of the Internet of things is not the formation of the standard, the research and development of the Internet of things there is blindness to some extent in domestic.

Architecture of the Internet of things

To thoroughly research of the architecture of the Internet of things, the application system and application examples must first study the Internet of things has been constructed. The Internet of things has been in storage and logistics, to prevent counterfeit products, intelligent building, street management, smart meters, city water network and other infrastructure, medical care and other fields has been applied.

It is necessary to point out that at present there is no unified do comparative analysis on these architectures, nor on these implementation methods hierarchical induction, but not the implementation methods of the system structure and corresponding up. So now people networking in the development of system is difficult to choose which kind of system structure and implementation method of using as reference.Therefore,currently the world's most R & D personnel personnel from their own needs, the design of the different architecture of the Internet of things, and in these architecture under the guidance of realizing the service mechanism of different with different communication protocols and software technology, so that the current establishment of Internet of things system with specific certain which not only increases the the Internet of things system development difficulty! Is not conducive to the future cross borders, integration and information fusion system of cross industry and cross between the field, not conducive to the establishment of a true "to achieve the objects and objects, the Internet of things system for information exchange and communication between objects and people. For this reason, the

formation can guide the future of Internet of things system design and the realization of the unified method is one of urgent research field at present, the problem of Internet of things.

The existing architecture of the Internet of things

In published IOT application system architecture at the same time, many researchers have also published several of the Internet of things, such as item of the world wide web (Web of Things, WoT) architecture, which defines a kind of application of the Internet of things, think of the World Wide Web Service embedded into the system, can use the web service the simple form of the use of the Internet of things. This is a user centered architecture of the Internet of things, trying to put the Internet application structure of the success of the World Wide Web oriented information acquisition, transplanted to the connection of things online, to simplify the information dissemination and access to the Internet of things.

Autonomous system structure as shown in Figure 1 of the Internet of things, including the data plane, control plane and management plane, knowledge, data plane is mainly used for forwarding data packets; control surface to surface through the data sending configuration message, data throughput and reliability optimization of surface; complete view of knowledge provide information throughout the network, and refining as network system of knowledge, is used to guide the control surface adaptive control; management face the coordination and management of data plane, control the interaction surface and knowledge, provide a IOT of self-study ability.
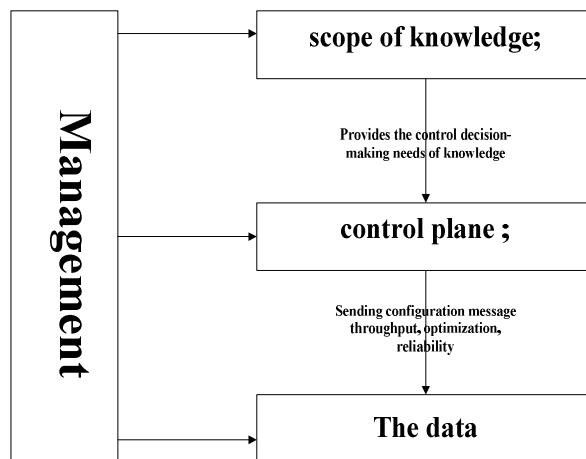

Figure 1.Independent architecture for the Internet of things

Here the independent feature is composed of STP/SP protocol stack and intelligent layer to replace the traditional TCP/IP protocol stack, as shown in Figure 2, where STP and SP respectively represent the smart transport protocol (Smart Transport Protocol) and intelligent protocol (Smart Protocol), smart layer IOT node is mainly used for STP/SP consultation between interactive node selection, for optimization of wireless link on the communication and data transfer between heterogeneous networking equipment, meet the needs of network.
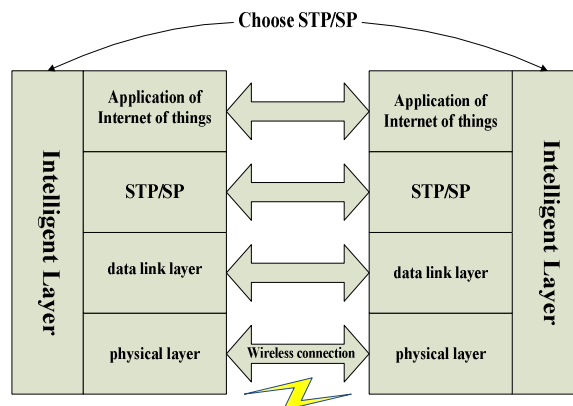

Figure 2.The protocol stack architecture of the Internet of things independently

Stack is independent the architecture for Internet of things are more complicated, and can only be applied to computing resources richer IOT nodes.

A study of related technology of the Internet of things

Internet can be regarded as "intelligent items" the Internet of things, in the complex network environment, intelligent items can be self organization mode to establish a collaborative intelligent model is more advanced, the connection mode between items decided to calculate intelligent goods system demand network and gateway side, and also determines the state and business model intelligent items on the flexibility to configure.Vazquez connection mode and others will be divided into three kinds of goods:

(1) Direct connection. Intelligent items directly access network is connected with other objects and server. The connection mode is relatively high for intelligent items in computing and networking aspects of demand on the gateway. The demand is low. On the node and the business model configuration is not very flexible.

(2) Gateway auxiliary connections. Intelligent items through the gateway and other items connected to the remote server. The connection mode of intelligent items in computing and networking aspects of demand is relatively low, the gateway of demand is relatively high, the node and the business model configuration is very flexible.

(3) The server aided connection. Intelligent items of a public local server and remote server support convergence. Computation ability and the gateway is connected through this connection mode of the intelligent goods requirements low, networking capability of intelligent items requirement is relatively high. On the node and the business model configuration is very flexible.

Figure 3 shows the connection mode of intuitive sketch, the distinction between gateway auxiliary connections and server aided the connection of these two kinds of modes is the intelligent items of the need to communicate directly with the gateway, and the latter in the intelligent items can also communicate with the local support server to relay mode. However, on the whole,! Two kinds of intelligent items connection mode are connected via intermediate devices, so then we refer to the two connection mode are collectively referred to as the gateway connection mode.
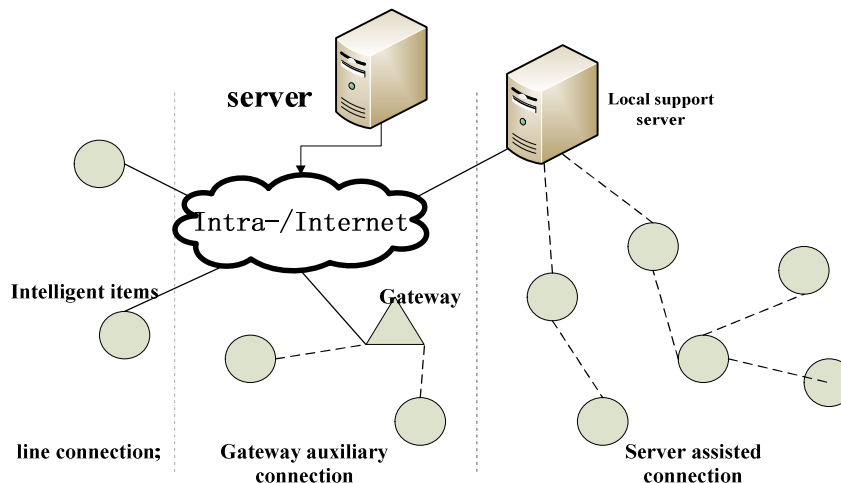

Figure 3.Article connection mode

Because the intelligent items ubiquitous, generally intelligent items computing and networking ability is limited, therefore the present common connection mode is the gateway. In this connection mode, gateway is the core device to realize the goods Internet. Has put forward a variety of IOT gateway, such as home gateway host identification label gateway and Tompros et al. Gronbaek presents

A study of related technology of the Internet of things

Through the above introduction of Internet of things technology but a system of technology diversification and complicated, we have the following analysis of the Internet of things in the

perception layer, support layer, transport layer and application layer in the four aspects of technology research.

The perceptual layer transfer the information collected to the transport layer, transport layer through the network infrastructure timely access information analysis and processing, if the information needs to be stored, the transport layer can play its storage function it stores information; otherwise, the information transmitted. As the gateway to the Internet transport layer multiple access complex, and the use of communication technology, the Internet gateway access storage or transmission of information, so, in order to process information more effectively, the transport layer much more complex software application protocol.

The support layer is the role of the integration of the upper layer analysis of information transmitted, provide an effective network platform for the user. So, in order to achieve this goal, is composed of many intelligent equipment composition system support layer, cloud computing equipment and mass network storage equipment etc.. Thus, processing, storage and integrated system structure and related technology of the Internet of things will be able to realize the information. Effectively on goods to goods, items, access, person to person between the information analysis, processing, integration.

The establishment of the IOT application system

Because of the particularity of the Internet of things, the Internet of things applications and systems need to be divided into two stages: establishment of establishment of IOT application platform, the establishment of the IOT application system.

In the design and implementation of Internet of things in the process of application of middleware, application platform service interface standard reference things related field, if it is the application of a new Internet of things, can be in the design and implementation of Internet of things in the process of extraction and application of middleware, implementation independent part, form the standard service interface technology of the platform of IOT applications field.

After the establishment of the IOT application middleware, we can design and implementation of the IOT application system, including the basic application system and application specific system, as shown in Figure 4. The basic application system can include product naming management system, the goods identity authenticity verification system, the Internet of things system management, application specific system may include a storage management system and building monitoring system, environment monitoring system.
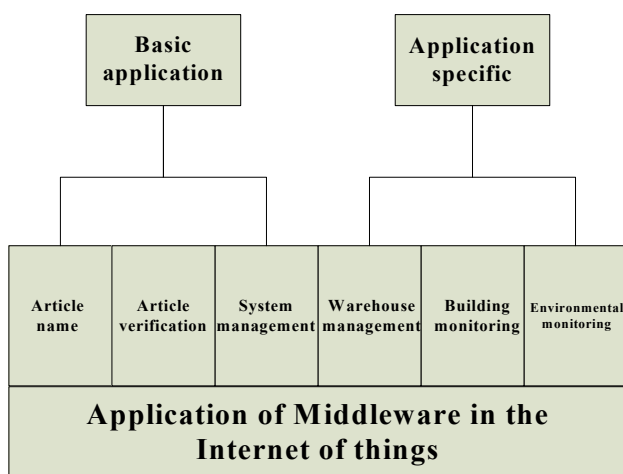

Figure 4.The logic structure of the application of the Internet of things

Conclusion

With the continuous progress and development of information technology, the research and development of IOT architecture and technology is the future direction of scientific development, but also the direction of exploring the scientific research personnel. The broad and profound structural system of the Internet of things and design, want to get results in the complex network

structure and design, must be proficient in embedded system and network system, to achieve a IOT of timely and effective processing of information integration and become the target of network platform. However, attention should also be paid to the safety and reliability of the Internet of things. For different areas of the Internet of things the establishment of security authentication mechanism, avoid and ignore the safety and reliability of the Internet of things networking structure and technology development party or production institutions eager to hope for success, to the users cause unnecessary losses. The structure and technology as long as have the determination and perseverance of the further research and development of the Internet of things, will achieve the final success.

References

[1] SHA Lu,i GO PALAKR ISHNA N S, LIU Xue, etal Cyber Physical System s A New Frontier[C]// 2008 IEEE International Conference on Sensor Networks Ubiquitous and Trustworthy Computing (sutc 2008). June 2008: 1-9

[2] WOLFW. Cyber physical Systems[J]. Computer 2009 ,42(3) : 88-89

[3] EASWARAN A, LEE Insup. Compositional schedu lability analys is for cyber physical system s [J] . SIGBED Review,2008, 5 (1): 11-12

[4] TAN Ying, GO DDARD S, P R EZ L C. A prototype architecture for cyber physical system s[J] . SIGBED Review,2008 ,5(1) : 51-52

[5] YAN Bo, HUANG Guangwen. Supply chain information transmission based on RFID and internet of things [C]//ISECS International Colloquium on Computing, Communication, Control and Management 2009(4):166 – 169

[6] M.Conti, S.K.Das, C. Bisdikian, M. Kumar, L.M. Ni, A. Passarella, G. Roussos, G. Tröster, G. Tsudik, F. Zambonelli, Looking ahead in pervasive computing: challenges and opportunities in the era of cyber-physical convergence, Pervez. Mob. Comput. 8 (1) (2012) 2–21.

[7]   Bin Liu, Shu-Gui Cao. Machine   Learning and Cybernetics [C]. International Conference on Machine Learning and Cybernetics. Guilin, China, 2011. 40- 44.

[8] Arnon Rosenthal, Peter Mork. Cloud computing: A new business paradigm for biomedical information sharing [J]. Future Generation Computer Systems, 2010, 26(7): 947- 970.