Integration Key Technology Of Smart Parts

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Abstract. The Smart parts are the trend of the development of IOT, which means the parts have the wisdom nodes, and use wisdom nodes to record all kinds of parts description information or run state. Smart parts can to solve the smart device access, control, and information conversion and transmission problems under complex environment. It can greatly improve the security, reliability and scalability of the system. This paper focuses on the key technology of the research of wisdom part in intelligent building information conversion. First, analysis the integration trends of intelligent building systems concluded that the IP bus is one of the main directions of the future of intelligent buildings applications. Second, based on preliminary studies of wisdom part, propose the three key techniques of the wisdom parts in the intelligent building information conversion technology, and then gives the realization method. Third, designed and implemented the wisdom LED energy-saving lamps. It will eventually be used in library study room lighting upgrade project. Practice shows that the method can greatly reduce the difficulty of construction and save system test time. Practice shows that the energy-saving of new lighting system effective. Theoretically for the new technology could bring more than 30% of the energy-saving effect.

Introduction

Intelligent building is the product of the application of modern IT technology, which will be used to provide greater security for property, work and life better comfort and more features. Intelligent building is usually constituted by a number of subsystems, such as the communications automation (CA), office automation (OA) system and building automation (BA). There is variety of existing international open fieldbus standard, the Lonworks, BACnet, CAN, EIB, Ethernet bus widely used in the field of building automation [1]. Intelligent buildings usually have many special buses, such as, for video, alarm or control fieldbus. Multi-bus coexist greatly increase the difficulty of the construction of intelligent buildings and maintenance costs. Ethernet bus meets the demand for data transmission, video intercom systems, video surveillance systems, smart home system and media services system. Ethernet bus is conducive to all kinds of information integration and extensions. POE (Power over Ethernet) technology also achieve low-power devices, flexible access and deployment.

In order eventually to achieve the intelligent building information Integration and unified. This paper studies how to realize the intelligent building various types of equipment PnP (Plug and Play). We research wisdom parts information integration, specific implementation method, with the use and maintenance of relevant information integration in the wisdom of parts effective. Eventually a feasible options of smart parts used in smart buildings was given.

Wisdom Part Application

Intelligent buildings there are a variety of fieldbus[2]. The coaxial cable usually used in video surveillance. The RS-485/RS-422 and other serial data bus usually were used in control signal. While the IP interface device application increasing widely. Integration and unity of the intelligent building all kinds of information is one of the key technologies for intelligent building applications.

The Smart parts are the trend of the development of IOT technology[3-4], which means the parts have the wisdom nodes, and use wisdom nodes to record all kinds of parts description information or run state[5-6]. Figure 1 is shown wisdom part application in intelligent building information integrated. Multi-bus matching technology, object-oriented packaging technology and information transfer and conversion based on the Smart Agent technology are the key technologies of the wisdom parts application.
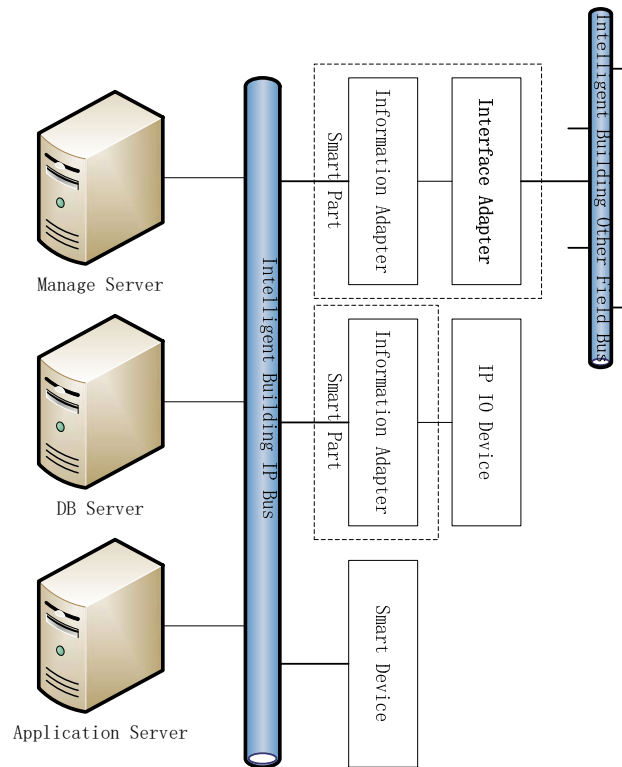

Figure 1. Wisdom part application in intelligent building information integrated
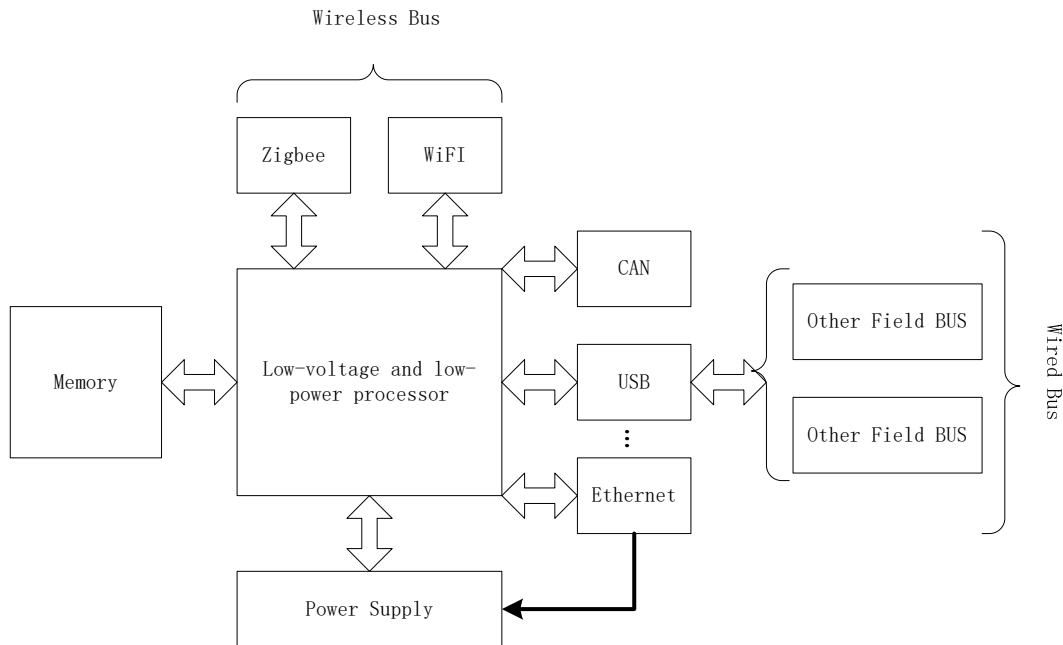
Multi-bus Matching Techniques

Figure 2. Multi-bus matching gateway prototype

Multi-bus matching gateway prototype is shown in Figure 2. POE technology was used to provide power for the gateway (Wisdom parts Interface Adapter). STM32F107Vx chip is selected for the development of a universal interface adapter (gateway). Universal adapter (gateway) supports a variety of interfaces, such as Ethernet, CAN, USB, ZigBee and WiFi. Available USB interface extension, for example, choose the market commonly USB card expansion gateway 2G/3G wireless data communication function. For intelligent buildings most common fieldbus optional USB interface conversion card can be used to achieve interconnection. Multi-bus gateway provide bus flexible interconnect under electrical level.

Object-oriented Information Packaging Technology

Object-oriented package include properties, methods and events. JSON (JavaScript Object Notation) is a subset of JavaScript object represents. The syntax is a lightweight data interchange format based on the JavaScript syntax standard. JSON is text format independent of language suitable for network transmission. It has a simple syntax may easy to read and write, but also easy for machines to parse and generate. XML (Extensible Markup Language) is a technique that allows user to define the owner markup language, it usually used to tag data, define data types.

Compared with XML, the advantages of JSON file were smaller easy-to-network transmission, easy JavaScript processing. However, XML has the advantage of self-describing and scalability. Combine the advantages of two formats, using XML to describe the wisdom part object definition metadata information, and using the JSON description wisdom part property and status information.

Through XML object definition, program can fetch objects defined attributes, methods, and events of the wisdom LED light, which can achieve platform and network independent, transmit freely.

Smart Agent-based Information Transmission and Conversion Technology

Design Intelligence parts Universal Smart Agent (Smart Agent) components. The component has autonomy, interactive, reactive and proactive characteristics. Smart agent provides network services via SOAP (Simple Object Access Protocol) protocol.

In this paper, the smart part universal smart agent object was designed. Wisdom part properties, methods (functions) and events can be automatically extracted by analysis the XML format object metadata defined information. On demand of need the smart agent can extract or generate the JSON format data to describe the wisdom part state. Special wisdom parts object can also be achieved through inheritance smart agent object.

Smart Parts Application in Library Upgrade

Figure 3 shown upgrade diagram for library by used of smart parts. Including wisdom LED lights and wireless gateway. The static wisdom nodes of two-dimensional code can be used to obtain the parts main basic information. Implementation steps are as follows: Scanning the two-dimensional code → Identify two-dimensional code → Obtain basic parts information retrieval number or keyword →Query product information data stored in server by retrieve number or keyword →Get the product information. The IOT dynamic wisdom nodes used to detect parts operation status. Its operating parameters can be adjusted remotely through the network. In addition IOT can also be self-organizing wireless communication network in the region to support the moderate rate of data transmission.

Figure 4 shown the wisdom parts of experiment. It is used in the school library smart energy saving. Static wisdom dimensional code node is shown in Figure 6 (a), it contains the user concerned about information, such as the product models, specifications, voltage, power, and other critical information. Figure 4 (b) is shown a dynamic smart node, which selected ZigBee CC2530 chip development. It have voltage, current, and brightness, sound, infrared human body sensors and other sensors. With self-diagnosis and fault alarm function, ease for management.

Figure 5 is shown the wisdom LED energy-saving lights network register and workflow. When access network wisdom LED energy-saving lamp automatically register parts object type information to the application servered. The smart parts defined object metadata which was stored interior with the XML format would sent to the application server. Smart lights complete initialization according to the accept of application server initialization commands. Based on a comprehensive analysis of the predefined policies and environmental sensing parameters automatically control the LED lights work state. It can also accept control commands sent through the network remotely.
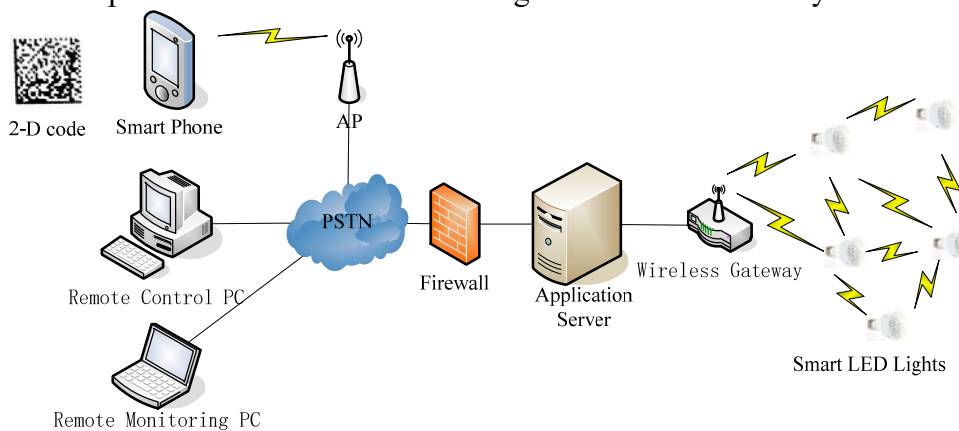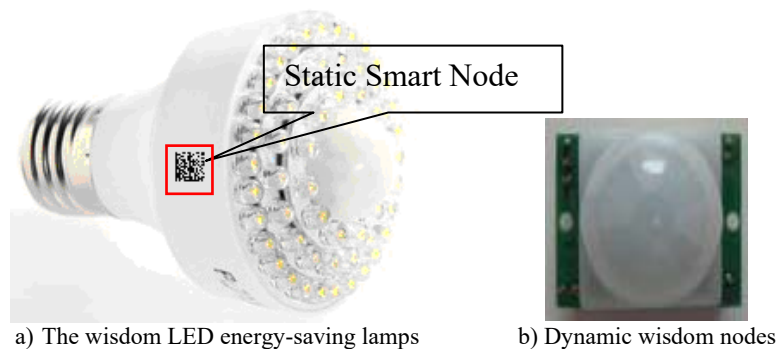

Figure 3. upgrading programs for library use smart parts

a) The wisdom LED energy-saving lamps   b) Dynamic wisdom nodes
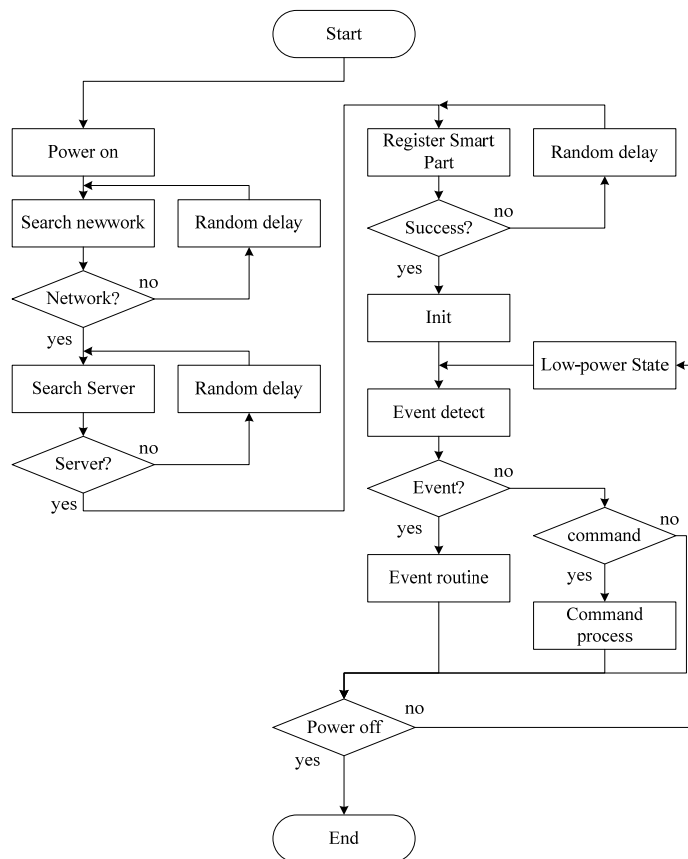Figure 4. the wisdom parts of experiment

Figure 5. the wisdom LED energy-saving lights network register and workflow

Applications the key technology of wisdom part, such as multi-bus matching techniques, object-oriented information package and Smart Agent-based information transmission and conversion. It made wisdom parts equipment PnP efficient access intelligent building system. Automatically convert all kinds of wisdom parts information for platform-independent text information. Provide a flexible object-oriented uniform data information access and network transmission method. We use 30 wisdom 10W LED lamps to replace the original study room 30 40w fluorescent lamps. Energy-saving strategies were used to achieve the automatic control of lighting. Practice shows that the wisdom LED energy-saving lamps can very easily be used in study room lighting upgrade project. After upgraded, the study room can achieve 83.5% of the lighting energy saving effect. Exclude the lamp power factor can achieve 34% energy-saving lighting effect. Theoretically for the new technology could bring more than 30% of the energy-saving effect. Build the foundation for future in-depth study of lighting energy conservation and control.

Conclusion

The wisdom part is the successful application of information technology and IOT. Smart parts can to solve the smart device access, control, and information conversion and transmission problems under complex environment. It can greatly improve the security, reliability and scalability of the system. This paper focuses on the key technology of the research of wisdom part in intelligent building information conversion. Designed and implemented the wisdom LED energy-saving lamps, which were used in library study room lighting upgrade project. Practice shows that the method can greatly reduce the difficulty of construction and save system test time. Practice shows that the energy-saving of new lighting system effective. Theoretically for the new technology could bring more than 30% of the energy-saving effect.

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