Web-based Building Energy Consumption Monitoring and Conservation Service

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Keywords: Web; Building Energy Saving; Energy Monitoring; Conservation Service

Abstract. Building in operational use energy consumption including energy consumption of buildings in the course of the lighting, refrigeration equipment, power equipment and services, gas, water, elevators and the like. In energy-efficient buildings, not only to emphasize energy conservation technology, but also need to dig the whole building energy monitoring and management, so as to form the overall building energy consumption of energy-saving programs. ODBC and web-based technologies to enable the effective monitoring and building energy management. Web-based building energy monitoring and energy services platform can make full use of networking technology, will affect building energy consumption data management system as well as larger storage devices and management, analysis and processing, and use, from the point of view of energy efficiency optimization, to achieve the overall operation of building intelligent online monitoring, processing, and energy-saving models predict that provide openness energy services, greatly enhance the operation and management level of the entire building and energy efficiency utilization levels.

Introduction

The ultimate goal is to achieve energy-saving building construction to reduce the number of actual energy consumption, energy consumption should be based on actual data as a precondition evaluate energy efficiency in buildings. The actual energy consumption should be the only criteria for evaluating building energy efficiency [1]. Only the development of sub-division of the measurement principle, determine the horizontal and vertical comparison of judging indexes, in order to further develop energy quota management, and ultimately build a scientific energy management system, the national building energy-saving operation management system implemented to achieve large-scale public buildings energy saving target [2-3].

Therefore, the need to establish a national building energy consumption monitoring platform networking, accurate given office buildings and buildings, and even residential buildings and other civil end-use energy consumption of specific data, understand the specific characteristics of China's building energy consumption, including energy development and changes features, characteristics of energy types, energy breakdown characteristics, climate and environment effects on building energy consumption and building Function of building energy consumption. Development of Web-based intelligent building system technology architecture uses open standards building intelligent integration system as the core, each optimized combination of building intelligent subsystems, architecture system work together, building on the existing energy-saving and energy management. By water, electricity and gas consumption, real-time monitoring of key equipment monitoring, tariff analysis, statistical analysis of household breakdown and other means to promote the development trend of managers and energy costs have an accurate grasp proportion develop targeted energy-saving strategies in nature, so that the energy-saving target decomposition to the various sectors, in order to make clear the responsibility of energy conservation.

Web Key Technology Overview

Three-tier B/S architecture is the original application module and display client side separately, put it on a Web server alone composition layer, simply install the browser on the client, so the client's pressure will be greatly reduced, the load evenly distributed to the Web server, eliminating the C/S two-story structure uneven load drawbacks, three B / S structure and the Internet can be easily tied up and improve the scalability of the system has a simple user interface, supports a variety of network structure and heterogeneous platform, easy to manage and use, low input characteristics [4-5]. Three-tier B / S architecture shown in Figure 1.

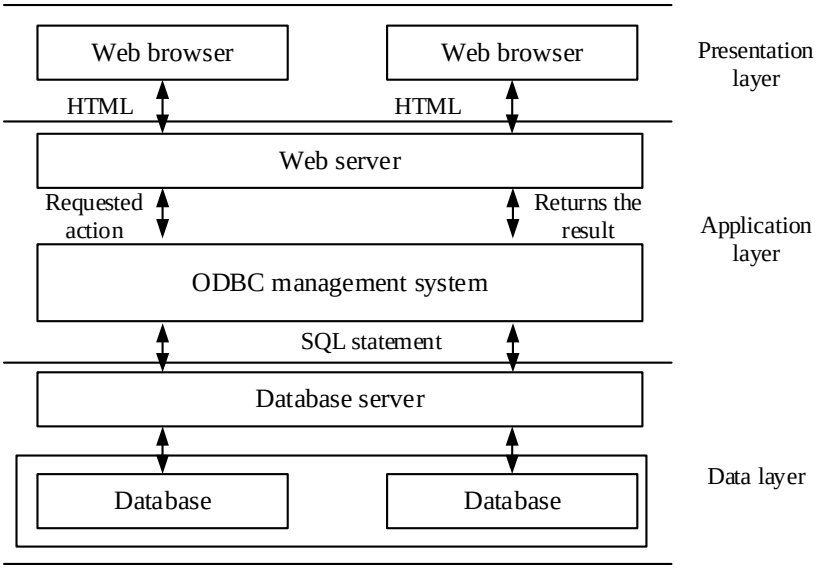

Figure 1. Three-tier B / S architecture diagram

Intelligent buildings are interconnected heterogeneous databases through ODBC technology, which can be achieved between the different subsystems integrated data sharing, information exchange, the global event for integrated scientific management. So ODBC is the intelligent building system integration provides an important technical means. If you want to access the intelligent subsystem provides a way ODBC database interface data required to provide detailed information, including database tables and fields detailed descriptions.

Building energy consumption monitoring hardware systems

Building energy consumption monitoring system refers collectively through the construction and installation of energy metering device, using local or remote transmission means of collecting energy consumption data, consumption data to achieve on-line monitoring and dynamic analysis of the decision-making capabilities of the hardware and software systems [6-7]. Building energy consumption monitoring system hardware topology shown in Figure 2.

Inside the building, to be installed for the building energy consumption monitoring electricity, heat, cold, flow, water and other parameters of the data collection instruments, building user-level modules exist in many forms.

1) Cable Connection: new buildings, distribution is relatively concentrated, not affect the construction of the building users, optional instrument more categories, the majority of data collection instruments currently supporting RS485 interface, competitively priced, can be RS485 cable connection.

2) Wireless Connection: existing buildings, the presence of dispersed energy point, a wired installation may affect the normal use of the building users, can be used to facilitate construction of a wireless manner, the drawback is the high cost of instrumentation.

3) The combination of wired and wireless ways: wired and wireless methods have advantages and disadvantages, and sometimes simply can not adapt to the use of a particular form of the current

situation. If a building has centralized power distribution room, and refrigeration room far away, clearly requires building owners can not affect building exterior lay hidden cables, if all the instruments are wirelessly sudden increase in the cost of the project, this time can be used in combination wired and wireless mode. This way, the wireless transmission module plays the role of transparent transmission, no effect on the intelligent gateway communication program.

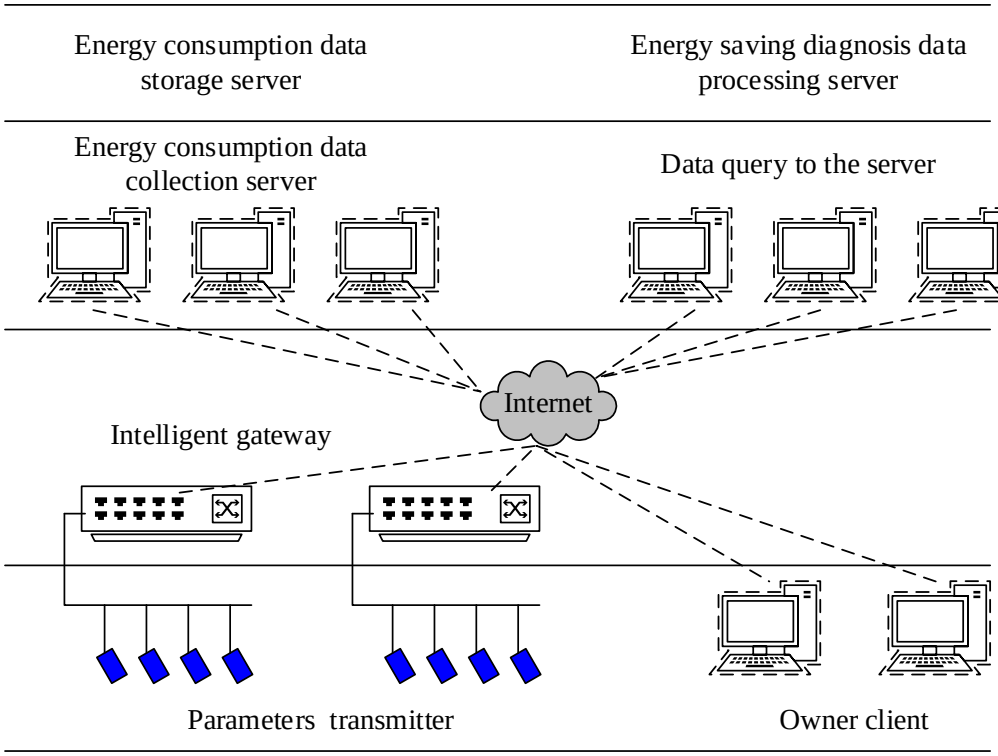

Figure 2. Building energy consumption monitoring system hardware topology

Energy consumption data collection and transmission equipment is mainly intelligent gateway, is a communication interface subsystem Energy Monitoring and Information Center floor data collection server connection. According to the data collected can be divided into Bus transparent transit, bus transit transit acquisition and star collection type.

Web-based building energy monitoring and energy services platform

Build a web-based building energy monitoring and energy services platform can accurately obtain the energy consumption of buildings, and provide a reliable source of data for the establishment of energy management systems. Mainly for the type of energy used in buildings, terminal usage, the situation consuming equipment (including refrigeration, heating, lighting, ventilation, shading devices, etc.), as well as various types of energy usage, quantity and energy costs, by A way to achieve real-time automatic acquisition of buildings in real-time collection and change analysis, can provide the necessary data basis for energy-saving diagnosis. The energy services platform architecture as shown, it mainly consists of information perception, transmission network, data processing and application services layer 3 composed of four layers. Information perception layer is mainly collected building energy consumption data, reliable transmission network transport layer mainly energy consumption data, data processing layer is mainly on energy consumption data processing, including data storage, mining, forecasting and other operations, application service layer provides a variety of services, and to achieve energy-saving process feedback control, intelligent control purposes.

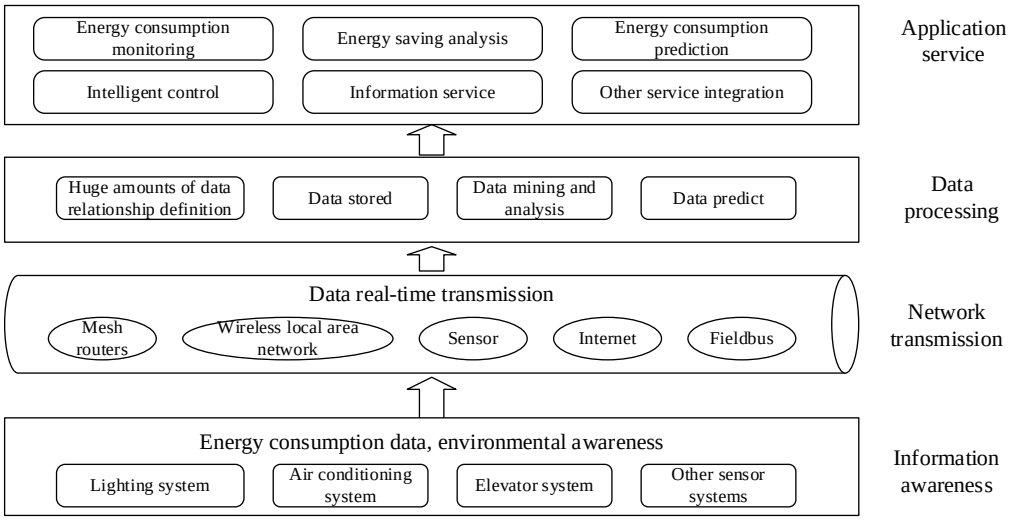

Figure 3. Architecture of web-based building energy monitoring and energy services platform

Information perception. Information perception layer by deploying various types of sensor nodes and intelligent instrumentation equipment, building energy consumption lighting systems, air conditioning systems, elevator systems, hot water systems, indoor shading system monitoring, and building internal environmental parameters (such as temperature, humidity, light intensity, CO2 concentration, etc.) for real-time dynamic acquisition, lay the foundation for intelligent decision-making and control building energy efficiency.

Network transmission. Network transport layer is formed by large-scale wireless multihop networking heterogeneous network convergence networks, sensor networks, Fieldbus, multi-source sensor nodes anytime, anywhere network access and connectivity, while meeting large-scale heterogeneous mix of different services within the network range Qo S data transmission requirements specified for the various types of heterogeneous network environment awareness information transmission and control command upper system provides real-time and reliable transport services.

data processing. In the process of building energy consumption monitoring, sensor data generated by the different uses of different data characteristics have isomerization. With the use and deployment of a variety of sensors, the system will generate a large number of structured, semi-structured and unstructured data. Data processing layer for these isomerization effective data modeling and integration, efficient storage and analysis of mining, laying the foundation for building energy-saving intelligent decision control and information services.

Application services. Application service layer in information perception, transmission and data processing network three levels, based on building energy consumption can be achieved in real-time centralized remote monitoring and intelligent control; building energy composition, trends, key energy-consuming equipment, power factor such as a comprehensive analysis of the formation of energy-saving strategies and programs; building energy consumption accurately predict; providing open government, the public, a large share of building energy consumption data, significantly enhance the operation and management level of the entire building and energy efficiency utilization levels, promoting social energy conservation.

Conclusion

This paper proposed WEB-based building energy monitoring and energy services platform, the system covers all types of energy-consuming equipment in building energy consumption data, information perception, transmission network, data processing and application services. Through the construction of various types of energy-consuming equipment energy consumption data for comprehensive analysis and processing, building energy consumption monitoring, energy analysis, intelligent control, energy forecasting and information services, significantly enhance the operation and management level of the entire building and energy efficiency utilization levels, thus laying a

foundation for the establishment of urban building energy management system to address energy conflicts and building energy efficiency.

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