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Proposed control and supervision structure in a Building Management System over the internet

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ABSTRACT: One of the criteria to evaluate and verify the quality of buildings today is the intelligent building management system BMS (Building Management System). In this paper, the control structure and monitoring of electrical equipment in smart buildings are proposed, using PLC communication via the internet and Visual Studio monitoring software.The devices are managed according to the floor of the building under the master-slave control method.

KEYWORDS: Intenet of thing, PLC technology,Smart technology, IntelligentHome, Smart Building

I. INTRODUCTION

BMS system is a synchronous system that allows to control and manage all technical systems in the building such as electricity system, domestic water supply system, ventilation, environmental warning, security, alarm. fire - fire fighting, etc. to ensure that the operation of equipment in the building is accurate, timely, efficient, energy-saving and operating costs are saved. The BMS system is a real-time, online, multimedia, multi-user synchronous system, a microprocessor system including central processors with all computer software and hardware. , input/output devices, area microprocessors, sensors and control via dot matrix.

The diagram of the BMS building management system includes:
• Power distribution station.
• Backup generator.
• Lighting systems
• Air conditioning and ventilation systems.
• Domestic water supply system.
• Fire alarm system, fire prevention.
• Elevator system.
• Sound system.
• Access control system.
• Security system

Some benefits of the BMS system:
- Simpler operation with repetitive programming functions to set up automatic operation
- Reduce operator training time thanks to intuitive on-screen instructions and aids
- Respond to user needs and react to troublesome conditions faster and more efficiently
- Reduce power consumption through centralized management control and power management program
- Manage facilities and assets more efficiently with dynamic reports, maintenance, and automatic alerting
- Flexible programming according to the requirements of each building, organization and expansion requirements
- Improve operations by integrating software and hardware of many sub-systems such as direct digital control (DDC - Direct Digital Control), fire alarm system, security, access control or lighting control...

In the past time, there have been many researches on building management from different angles from control structure to software management, providing optimal features for building operation.In [1] an application of the AT89C52 microcontroller is introduced in the conversion and control of power system input/output and the security of the HVAC system in the building.In [2] proposed a solution to coordinate between Internet waves and Zigbee waves in building system operation on the idea of clustering each group of devices for control.In [3] the author focuses on analyzing the server usage features of MQTT in IoT-related applications for buildings.In [4] focus on architecture and presents a concept of Building Management System (based on SCADA/HMI system) for buildings with large scale automation system. The concept foundation is to

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build a control system database as an extension of Building Information Modelling (BIM) database. In [5] discuss the amount of energy storage for updating of a new building represents an opportunity to estimate the costs that this issue should be considered in efficient buildings. Most old buildings have a lot of energy dissipations due to inappropriate control system and building components. In [6] the author presents a blueprint for the information technology (IT) architecture of smart buildings that builds on top of established software engineering practices.

Thus, it can be said that the study of control and monitoring structures for high-rise building systems is always a topical issue. This paper focuses on proposing a control structure to monitor equipment in the building using PLC and Modbus RS485 sensors through the coordination between Modbus communication and the Internet. Allows to operate the equipment in the building anywhere.

II. PROPOSED SIGNAL COMMUNICATION STRUCTURE FOR SMART BUILDING

The structure of signal communication of smart Building applying IoT technology is proposed as Fig.1. Including the coordination between Moddbus and Internet communication.

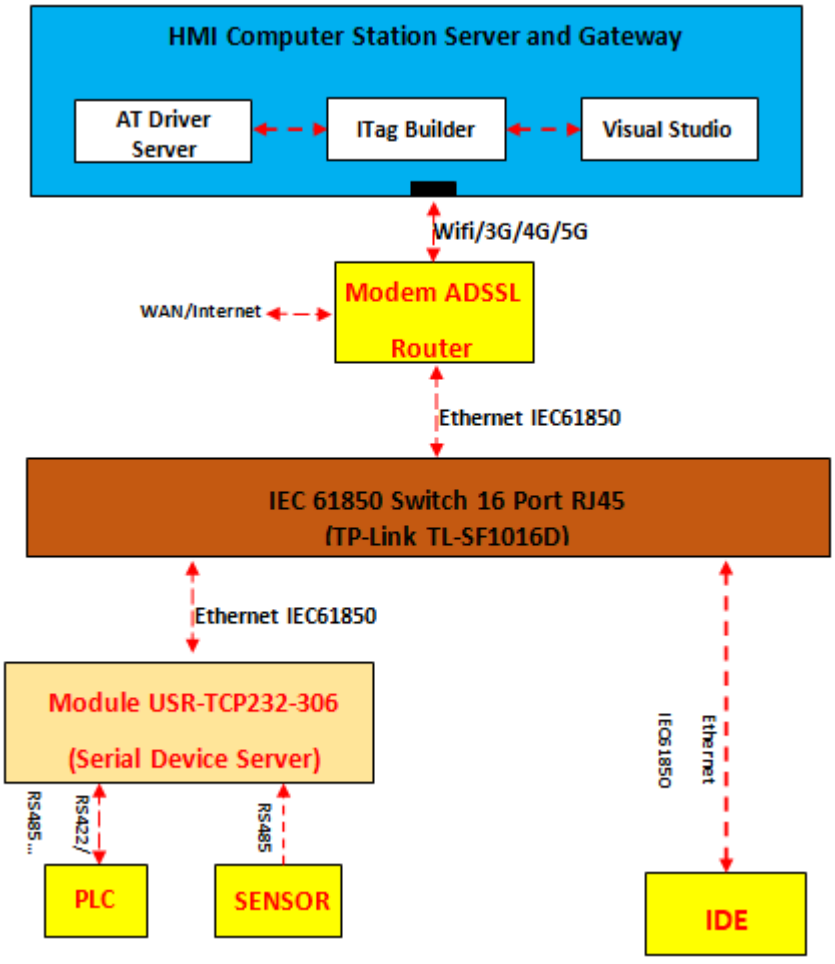

Figure1. Structure diagram for data communication of smart Building

With the structural signal in the management building being output as shown in Figure 1, it can be analyzed as follows: the equipment in the building includes control equipment (PLC), sensors (sensors), electronic devices (IDE)… are interconnected via an Ethernet network (IEC 61850

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standard). In which, sensor sensors are equipped in the house including: light sensor, temperature, humidity, gas, smoke... These sensors collect environmental information and send it to the monitoring interface on the HMI. and at the same time send data to the central controller PLC, which generates control signals for lighting equipment, security equipment and troubleshooting such as: tubes, alarm lights, fans, etc., electrical devices. Smart electronic devices can both play the role of data collection and control functions directly on the device such as: security cameras, electronic fingerprint scanning systems...

Some devices with built-in Ethernet ports can transmit data directly through the TP-Link TL-SF1016D, devices with RS422 or RS485 standards can convert data through the USR-TCP232-306 module before transferring. to the Ethernet line. Then the signals collected via TP-Link TL-SF1016D will be connected to the Internet and sent to the monitoring screen on the computer. The communication data in building management is communicated in two ways flexibly, helping control and monitoring always ensure stability and accuracy… This structure can decentralize the management of the whole house. different levels.

III. CONTROL AND SUPERVISION INTERFACE IN BUILDING MANAGEMENT THROUGH THE INTERNET

In the Fig.2, The construction of the control interface and monitoring of devices in the building is designed on Visual studio software combined with AT Driver Server and ITag Builder software. Through the pre-programmed program on the PLC central controller of each floor, allowing us to visually observe the control parameters, the equipment status in the building and control the equipment. electrical equipment on your computer or Smartphone via internet connection wherever you are.

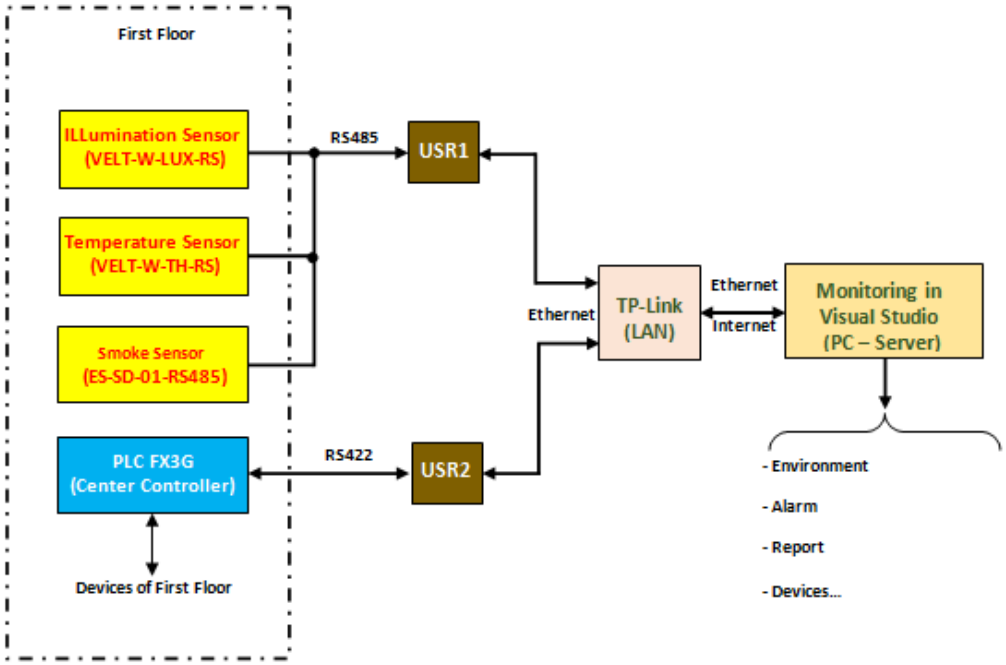

Figure2. Illustrate the connection diagram of single-channel equipment in the proposed internet-based building management system

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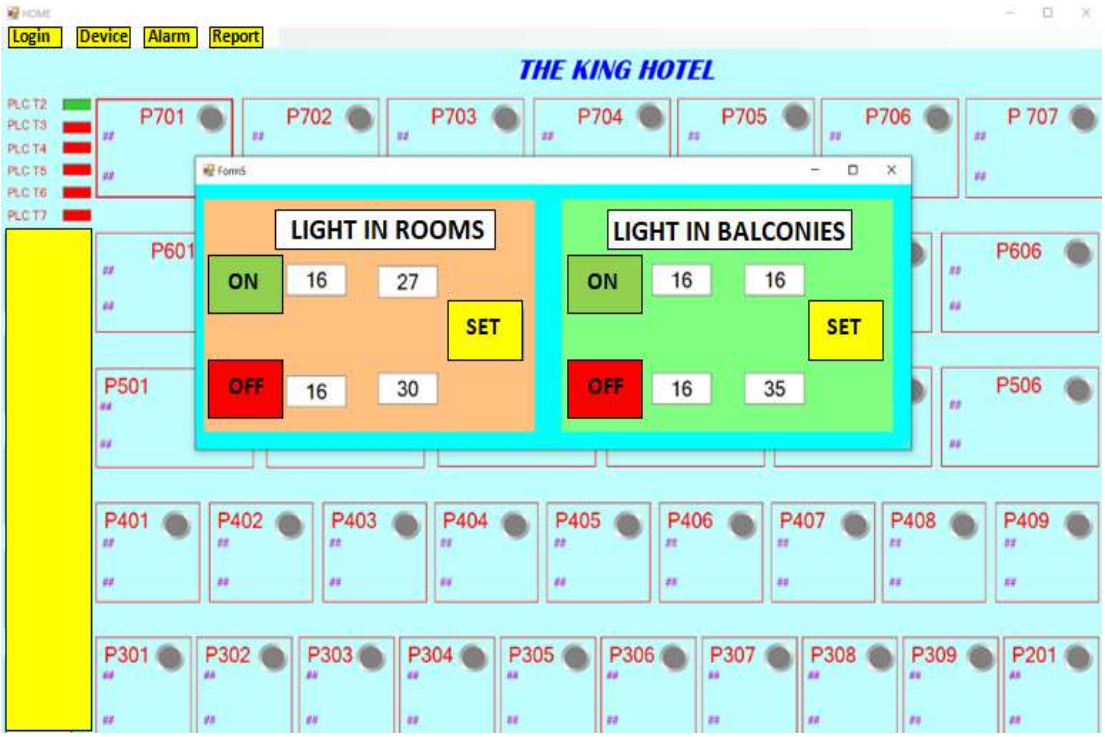

Figure 3. Monitoring interface on the visual studio for Smart Building

IV. CONCLUSION

By performing experiments on real devices, we have verified that we have verified the prioritization of the structured monitoring and control solution output in this paper. With the combination of two types of communication Modbus and Internet has brought a useful application of IoT technology for building management. With the proposed structure, it will allow to operate the equipment in the building reliably and with high stability.

ACKNOWLEDGEMENTS

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REFERENCES

[1]. Waqar Tariq (2012), Abid Mustafa, Zahid Rasoo, S.M.Haseeb, “Building Management System for IQRA University” Asian Journal of Engineering, Sciences & Technology, Vol. 2, Issure 2, pp. 106-109.

[2]. H.V.V.Priyadarshana, W.K.I. Madushanaka , L.L.L. Anuruddha (2017), “Multi-agent Controlled Building ManagementSystem”International Conference on Innovations in Power and Advanced Computing Technologies, 978-1-5090-5682-8 /17/$31.00 ©2017 IEEE, pp.1-5.

[3]. R. Dow, S. Cheng and S. F. Hwang (2016), "A MQTT-based guide andnotification service system" 2016 IEEE 7th Annual InformationTechnology, Electronics and Mobile Communication Conference(IEMCON), Vancouver, BC.

[4]. Grzegorz Hayduk, Paweł Kwasnowski, Zbigniew Mikoś (2016), “Building management system architecture for large building automation systems” 2016 17th International Carpathian Control Conference (ICCC),DOI: 10.1109/CarpathianCC.2016.7501100, pp. 587-594.

[5]. Peyman Yusefi1 , Mohammad Ostad2 , Abolfazl Sadeqi3 (2019), “Building Management System for Supporting the repaired Building”, International Journal of Current Research in Multidisciplinary (IJCRM) , Vol. 4, No. 12, pp. 19-25.

[6]. Bonino Dario, Fulvio Corno, and Luigi De Russis (2014), "A Semantics-Rich Information Technology Architecture for Smart Buildings" Buildings 4, no. 4, doi.org/10.3390/buildings4040880, pp. 880-910.