An XAML Approach for Building Management System Using WCF

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Abstract. Building Automation is one of the critical issues in recent scenarios. The process of Building Automation is called as Building automation System (BAS). The BAS includes different kind of information that enables to work towards intelligent building system. There was a Web Services technology for integrating different BAS but it supports only HTTP protocol which is stateless. This paper presents the next generation internet technology Windows Communication Foundation (WCF) to integrate different building automation systems in the development of BAS. WCF includes various contracts which writes and reads Building Automation Control Network (BACnet) data points from BACnet network. These contracts will be called by other enterprise applications for realize BAS integration and get real-time data on BACnet network as a facilities Management. BMS will be applied in a BAS which consists of BACnet network. The applications use sensors, actuators and controllers for controlling Building Management System (BMS). This paper presents a Service Oriented Architecture (SOA) for BMS using WCF and Extensible Application Markup Language (XAML) which will provides client side GUI for BMS reused for different kind of applications. Finally, it discusses about challenges in providing security to BMS.

Keywords: Service Oriented Architecture, Building management system, Building automation system, Windows Communication Foundation, XAML.

1 Introduction

The building management systems used to monitor and control building facilities in BASs. Desktop and Web based BAS have been developed. How ever using traditional Web, Desktop applications same code has to rewritten for each application. Here single XAML is reused between desktop, mobile, browsers and based upon the type of device the application will run. In simple XAML used for seamless user experience of mobile, web and desktop applications. The BAS must be loosely coupled so that the controllers can communicated with any other application. It is difficult to for integration across BASs which may adopt different communication protocols e.g., Lon protocol, bacnet protocol and integrating BAS with existing enterprise applications. Emerging Windows Communication Foundation based on Service Oriented Architecture will solve the problems.
BAS explains functionalities provided by building control system, which is a computerized, intelligent network of electronic devices, designed to monitor and control the mechanical and lighting systems in building. American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) and Organization for the Advancement of Structured Information Standards (OSAIS) are international organizations to promote the development of service oriented architecture in BAS domain. A Building Automation System (BAS) is an example of a distributed control system. Modern Building Automation System do not only provide improved comfort but offer significant energy cost savings, especially in office buildings and production halls, because of intelligent control systems such as lighting and sunblind functions. The main application of Building Automation System is to increasing user comfort at minimum operational cost and get optimized control schemes for Heating, Ventilation and Control Systems (HVAC), shading and lighting.

In this paper, Windows Communication Foundation and XAML used for developing next generation of BMS. Windows Communication Foundation allow to build distributed and loosely coupled systems E.g. BASs. It will support different types of protocols like tcp, udp. It is stateful protocol. The proposed BMS will applied to an intelligent building whose BAS is within a BACnet network. A set of Windows Communication Foundation endpoints which can read write BACnet data points from the BACnet network based on the BACnet protocol stack. The Windows Communication Foundation service which is installed in the controller can be invoked XAML easily.

The rest of the paper is organized as follows: Section II describes the related work and Section 3 presents the description of architecture of BAS integration based on Windows Communication Foundation. Section 4 describes the proposed development of BAS using Windows Communication Foundation. Section 5 describes challenges in providing security in Building Automation System. Finally, conclusions are presented in section.

2 Related Work

The approaches that have been profoundly established they are standard communication protocol and cross-protocol gateways not met the desired expectations. There is a need for building systems and services integration [9]. There exists individual automated building systems for Heating Ventilation and Air conditioner system and current solutions are not satisfactory level for integrating Building Management Systems [10]. The task of building automation and communication Infrastructure that is necessary to required to address integration problems [11].

Sensors will get the HVAC details those details can be accessed by integrated building systems or enterprise applications using service oriented architectures web service[1]. Web services can be installed on controllers for providing communication across different protocols[2]. Using AJAX and web services installed on controller can provide asynchronously retrieve data from controller using web services[4]. Enterprise-wide architecture, for facilities management automation provides BMSs and building automation and control systems will access to additional information that will enable building to be used more effectively [12].