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A Prototype of Server's Temperature Monitoring System Using ADAM and ADAMView

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Abstract

Computer and network equipment is designed to operate within a fairly temperature range. Server, for example, requires comprehensive monitoring to ensure reliable operation. Therefore, this paper proposed a system prototype called Server's Temperature Monitoring System (SerTSys) as an alternative solution to allow the user to be notified of changes in temperature of the server as they happen. This system has been developed using ADAMView, ADAM 6018-8-channel Thermocouple Input Module, ADAM 6060 6-channel Relay Output with DI Module together with the temperature sensor, switch and fan. Exploration prototype model is applied for this system. As a result, this system will retain the real time temperature, current time and the date. When the temperature of the server is too high or too low, the system will notify through alarm, switch on the emergency fan and produce reports.

1. Introduction

Temperature monitoring systems are built purposely for monitoring, reporting and alerting on temperature. Most of the monitoring systems are implemented automatically where the systems are constructed by electronic devices and the sensor is attached to the control unit with low voltage wire or using the narrowband radio frequency. In this case, computer and network equipment is designed to operate within a fairly temperature range. Server is one of the examples of the equipment that requires comprehensive monitoring to ensure reliable operation. While operated, it will produce a high temperature from time to time; therefore it will give a big impact to the server.

Normally, the measurement and control of the temperature and humidity is very important in some application. For instance, the measurement of the server room's temperature. The environmental conditions that remains as stable as possible need to be established. According to Denis Laverty [4], air conditioning units are complex and have a tendency to fail suddenly. As a consequence, special temperature monitors for air conditioning are complex and expensive and usually not in the control of the person in charge. However, monitoring of the room's temperature is not enough. The server itself needs to be monitored as well. Therefore, following on the study made by [3], we proposed Server's Temperature Monitoring System (SerTSys) prototype using ADAM and ADAMView as an alternative mechanism for monitoring temperature since there is no such application using ADAM and ADAMView is used for server monitoring purposes. This prototype applied ADAMView with two ADAM's modules; ADAM 6018 and ADAM 6060 together with the temperature sensor, switch and CPU fan act as the server fan. As a result, this system is able to record the real time

temperature in a desire period of time via a control centre, on the alert alarm, switch on the emergency fan, and produce useful reports.

This paper is organized with the following sections: Section 2 presents the related work and Section 3 depicts methodology applied. Section 4 illustrates implementation of the prototype and finally, the paper is concluded in Section 5 with some suggestions for future work of SerTSys.

2. Related work

The need to monitor the temperature in various applications has existed many years and various technologies have been applied in order to establish the monitoring mechanism.

According to Shan [6], it is a mandatory requirement to keep records of the air temperature in vehicles used in the primary distribution of quick-frozen foodstuffs. Automatic air temperature monitoring equipment should be fitted to all refrigerated delivery vehicles [6]. Unfortunately, difficulties exist in wiring between temperature recorders and sensors in vehicles such as trailer-tractor. To solve this problem, Shan provides a solution which is wireless temperature sensors using Bluetooth.

As stated by David Rubin [3], a temperature sensing transmitter is created that broadcasts its data over the power lines to a PC which acts as the receiver and presenter of the temperature. The project was designed to facilitate the monitoring of the temperature from a remote location. The project is made up of two distinct components, the temperature sensing transmitter and the central receiver. The temperature sensing transmitter samples the current temperature, and then transmits the data over the power line to the central receiver. The central receiver, a PC, then reads the data off the power line and displays the current temperature on the screen. However, the project is unable to demonstrate a temperature that is constantly changing.

Based on the reviewed systems, SerTSys prototype is suggested as an alternative solution in monitoring the server's temperature. This system allows the user to be notified of changes in temperature as they happen. Depicted in Figure 1 below is the SerTSys architecture whereby this prototype system utilizes the ADAM modules such as ADAM 6018, ADAM 6060 with the temperature sensor, switch and fan.
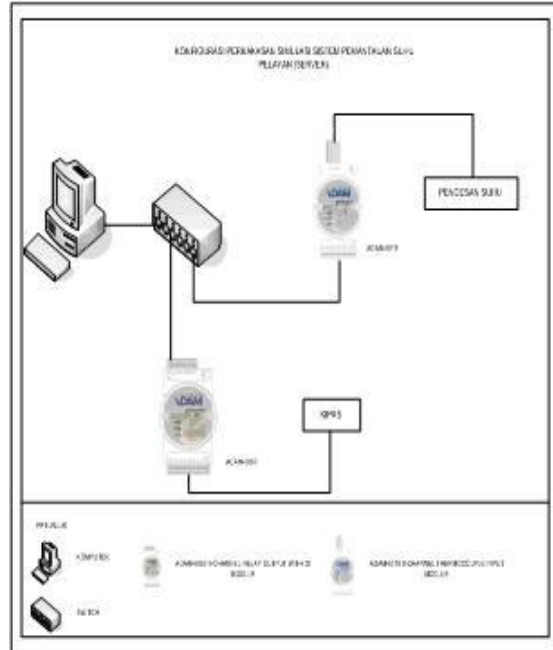

Figure 1. SerTSys architecture

The ADAMView software version 4.25 is used to control all sensors which attached to ADAM 6018 and ADAM 6060. Any configuration can be set depends on the technician's requirements, for example, to set the sensor active time frame and the numbers of computers to be used. The ADAM's modules configuration will be controlled by ADAMView 4.25 software, located at one centered computer.

ADAMView version 4.25 is not just to control the hardware; its function is also to be the database especially in recording the real time temperature, time and the date. Furthermore, this ADAMView software can detect any device which is not functioning very well.

Following on the study made by [3], we propose SerTSys prototype using ADAM and ADAMView as an alternative method in monitoring the server's temperature because there is no such application using ADAM and ADAMView. This prototype applied ADAMView with two ADAM's modules; ADAM 6018 and ADAM 6060.

3. Methodology

The development of this system is based on Prototype Exploratory Methodology which consists of several phases whereby each phase has its own function. There are three phases involved such as Information Gathering Phase, Prototype Development Phase and Prototype Testing Phase as illustrated in Figure 2 below.

There are two main types of Prototype Methodology such as Exploratory and Throw-Away. However for this project, Prototype Exploratory Methodology is selected because this method is appropriate for incomplete user and represents the whole function and critical section where it is complicated to understand. This model allows developer to modify the system at the real development system phase based on user requirement in testing phase.
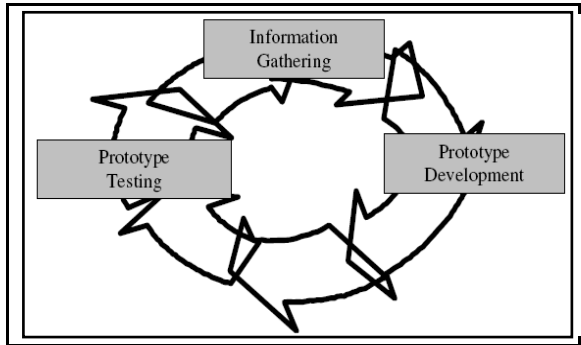

Figure 2. Prototype exploratory diagram [5]

The prototyping method activities are described in Table 1 below.

Table 1. Prototype exploratory methodology activities

Phase	Activities
Information Gathering	1. Determine the project scope and the main objective. 2. Performed lots of research from several resources such as books, journals, articles and internet surfing regarding other security and monitoring systems also ADAMView and ADAM technology.
Prototype Development	This phase allow developer to build up and prepare the system. There are several activities involved in this phase such as : 1. Determine specification system's frame, flow chart development, interface development and hardware and software installation and configuration. 2. This phase started after all the information has been analyzed. This phase also responsible to produce actual system based on the design using ADAMView, ADAM 6018, ADAM 6060, temperature sensor, switch and fan.
Prototype Testing	Finally the prototype is built and tested with person in charge of the computer laboratory regarding its functionality and usability testing. This is an iterative process; therefore the system has been tested, modified and monitored regarding to users' requirement.

4. SerTSys

The prototype which we call SerTSys (Server 's Temperature Monitoring System) is an education-based application which is developed using combination of hardware (ADAM 6018, ADAM 6060, temperature sensor, switch and fan) and software (ADAMView). ADAM modules and ADAMView are applied in SerTSys in order to adapt such new technology to be used in monitoring system. It is based on the Ethernet-enabled data acquisition and control module works as an Ethernet I/O data processing center. ADAM 6000 series is capable to receive input and output (I/O) data from the sensor and generate real time value to the nodes in a network whether it is an Intranet or Internet. Installation and configuration of the ADAM modules and ADAMView software used in this prototype are guided through [1] and [2].

Depicted in the Figure 3 below are the hardware installed for SerTSys prototype. ADAM 6018 8-channel Thermocouple Input Module will be connected to the temperature sensor so that the current value of the temperature can be read. The value then will be sent to the computer through RJ45 cable.

Figure 3. ADAM modules

Software used in this prototype is ADAM -5000 TCP -6000 Utility, Advantech Modbus TCP OPC Server and Adam View. CryptoMite Encrypt software used to encrypt the temperature reading to be stored in logfile which is depicted in Figure 4.


Figure 4. CryptoMite-Decryption interface

ADAM -5000 TCP -6000 Utility is used to configure the ADAM modules. This software will automatically search the ADAM modules which are ADAM 6060 6-channel Relay Output with DI Module and ADAM 6018 8-channel Thermocouple Input Module.

An OPC server driver which is shown in Figure 5 lets devices, such as ADAM and other I/O devices, communicate with a wide range of HMI/SCADA software packages residing on a host. In this system, this OPC server is used to read and get the data from ADAM 6018 and ADAM 6060. Then, the data is allowed to be displayed in the Display Designer in ADAM View.
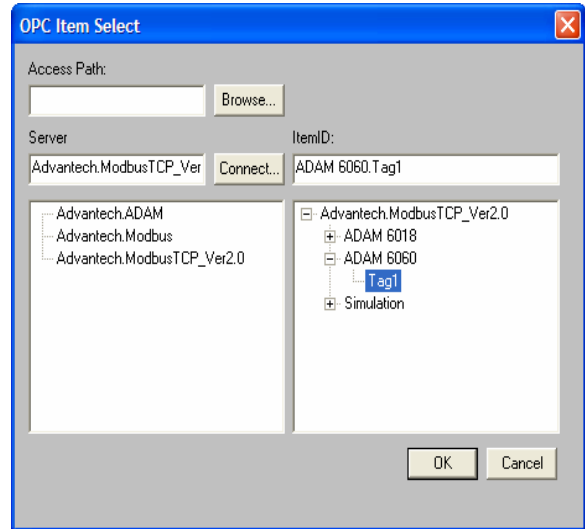

Figure 5. OPC server

ADAMView has the ability to provide advanced programming features and tools while maintaining ease of use. A library of Icon Blocks representing data acquisition and control, mathematical and control functions is provided through Task Designer. Display Designer provides a variety of graphic objects to design monitoring and control displays. Report Designer features a configurable format design utility and scheduler to generate reports automatically. In addition to the features listed above, ADAMView's built-in VBA compatible programming tools strengthen its ability to perform complex calculation or analysis.

SerTSys using ADAMView and ADAM is a user-friendly monitoring system prototype because it is designed based on a simple interface but included most important functions, such as the historical trend of the temperature, current temperature display, alert display and so on. Task flow of the system prototype is depicted in Figure 6. There is one thermocouple Input module used in the prototype indicated by one DI in task designer which received input from the temperature sensor. Data is sent by the DI to the log file whereby the file is formatted with multiple columns in which each column represents logged data from different DI block.
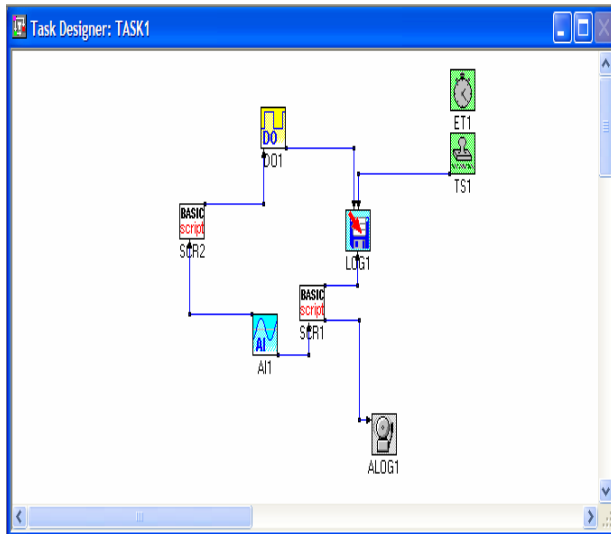
Figure 6. Task flow for SerTSys

As a result, this system will retain the real time temperature, current time and the date. All the reading is recorded every second. When the temperature of the server is too high or too low, the alarm connected to ADAM 6060 will be rang. This process will alert the person in charge of the server to formulate appropriate actions. If impairment occurred towards the server, the person in charge can refer to the recorded data and an analysis can be done to examine the condition of the server.

The reading can be read from the historical trend of the system which is shown in Figure 7.

Figure 7. SerTSys main interface

5. Conclusion

SerTSys is a system prototype that is able to record the real time temperature of a server in a desire period of time via a control centre, automatically record the time and date while the server is running, on the alert alarm, switch on the emergency fan and produce useful reports. By developing this system, it could be able to perform as an alternative method for server monitoring system.

However, SerTSys has its limitations whereby it works as a standalone application. Therefore, SerTSys can be improved to be able to run in network. Other than that, this system can be upgraded by adding the Global System for Mobile Communication (GSM) to launch the automatic generated Short Messaging Services (SMS).

6. References

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