DEVELOPING A SOFTWARE PLATFORM FOR ONLINE DATA PROCESSING

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Abstract: This article describes a software platform (developed using freeware and open source software) which must be able to centralize data in real-time using the Internet, from sensors used to measure environmental parameters like temperature, humidity, pressure, light intensity, air flow and other physical phenomena. The users must be able to see the measured values from sensors by accessing the software platform using an Internet browser from any location.

Key words: software platform, sensors, data acquisition, environmental monitoring, database

1. INTRODUCTION

Certain production processes must take place under special environmental conditions in order to obtain the desired result. To be able to maintain the temperature, humidity, pressure or other physical parameters, it is necessary to deploy sensors (like thermometers, hygrometers, manometers or other types of sensors) and monitor the environment in the location where the production process takes place.

A sensor is a device used to detect and measure physical phenomena and convert it into an electronic signal (Brayner et al., 2008). The sensors from the monitored location must be able to connect to a central computer by special interface adapter, wireless, Bluetooth or other connection type and send data automatically.

The sensors are provided by the manufactures with a software package for downloading, viewing and filtering the measured values. The aquired data is usually stored inside the sensor internal memory and sent to a database (MySQL, Microsoft Access, Microsoft SQL, FoxPro), or text files (*.txt) at intervals of time. If several sensors from different manufacturers are deployed in the location where the production process takes place, then in order to view the measured values, the end user will access the data using the specific software for the specific sensor from the specific manufacturer. Even if all the manufactures' sensor software export data in text files, the data from the files will have a customized format according to the manufacturer, meaning that it will take a lot of time to centralize data from these files into one file with a global format even if all the sensors measure the same type of physical phenomena (Nicolescu et al., 2011).

This paper describes a solution for automated centralization of data from measured environmental parameters, from different sensors deployed in locations with special environment conditions, into one software platform and centralizing the results in one user interface (Nicolescu et al., 2011).

The original contributions of this research consist in the developing of the management platform for the aquired data manipulation using freeware and open source software. By taking advantage of the data that is automatically inserted in the database, side applications, that make use of environmental parameters values, can be developed.

An example of production process that requires a controlled environment is a mushroom cultivation greenhouse (Figure 1).

To ensure optimal conditions for mushroom cultivation, it is necessary to monitor the temperature, humidity, light intensity and air flow. These parameters are measured using sensors (thermometers, hygrometers, lightmeters, air flow meters) positioned inside the greenhouse according to the cultivation technology.

The greenhouse atmosphere is maintained by an air conditioning installation that adjusts the air flow accordance with the data provided by the sensors.

2. THE MONITORING PLATFORM

For developing the software platform this research suggests using open source and freeware tools (Carniel et al., 2005). The operating system on which to develop the software platform is Linux Fedora Core. The database used to store the measures from sensors is a relational database Oracle XE or in case of

Fig. 1. Virtual prototype of mushroom cultivation production process

Fig. 2. Virtual prototype of mushroom cultivation greenhouse

industrial use, a licensed Oracle 11gR2 is recommended. The software application will be designed with Oracle APEX

Fig. 3. Application server hardware & software architecture

(Application Express) and will generate web pages with tables and graphs with values from the database. The application must generate alarms, notifications, e-mails and phone messages if certain threshold environmental parameters are exceeded.

In figure 3 it is explained how data is received and transmitted between the Application Server and the Client (Kimura & Kanda, 2005):

(0) When a user wants to access the application web page, he/she will type the Internet address in the browser address bar. The request will be answered by a DNS server from the Internet which will point to the static IP address of the ADSL Router. (1) The ADSL Router will transmit the request to the Firewall Computer which will forward (2) the request to the DMZ Computer.

(3) The DMZ Computer will ask the Data Base Computer (4) for the web page. (5) The web page is sent by the Data Base Computer to the DMZ Computer.

(6) The DMZ Computer will forward the answer through the Firewall to the user computer. From (7) to (11) it is explained the data flow inside the private network.

(7) The File Share Server connects to the Internet via Firewall Computer. (8) User computers access data and the Internet by File Server DHCP and DNS.

(9) Backup data from the Database Computer (the ORACLE Database which contain data from sensors).

(10) Backup data from the File Server. (11) Backup data from user computer if necessary.

3. CONCLUSION

By developing a software platform able to centralize data in real-time (using the Internet, from different sensors for environmental monitoring), access is ensured to the data from any location with an Internet connection (work office, home) and data privacy is facilitated by granting access for each user only to records from the sensors that the user owns. Open source software, used to develop the software platform, guarantees that the source code can be improved, modified and adapted by other programmers beside the original developers (Neto et al., 2007).

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