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Remote Data Acquisition

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Abstract - *This paper informs us about the remote Data Acquisition system in which concept of remote data monitoring was implemented using different sensors like RTD for temperature measurement, Linear Potentiometer for length measurement and Voltage measurement was also implemented. We used a DAQ card and Web-Access SCADA software to implement the entire remote DAQ system from scratch. In today's world the ability to monitor data remotely helps industries save time and money and it also leads to increased productivity of the employees. Web-Access application is used in the mobile device to display the data remotely on the mobile device using the same hotspot.*

***Key Words*: Remote Data Acquisition System, Resistance Temperature Detector (RTD), Linear Potentiometer, Web-Access SCADA, Mod-scan 32, ADAM DAQ card.**

1. INTRODUCTION

Data acquisition (DAQ) is the process of measuring an electrical or physical phenomenon such as voltage, current, temperature, pressure, or sound with a computer. A DAQ system consists of sensors, DAQ measurement hardware, and a computer with programmable software. Compared to traditional measurement systems, PC-based DAQ systems exploit the processing power, productivity, display, and connectivity capabilities of industry-standard computers providing a more powerful, flexible, and cost-effective measurement solution [1]. Data acquisition involves gathering signals from measurement sources and digitizing the signals for storage, analysis, and presentation on a PC.

Data acquisition systems come in many different PC technology forms to offer flexibility when choosing the system. We can choose USB, wireless and Ethernet data acquisition for a test, measurement, and automation applications [2]. Data acquisition hardware acts as the interface between the computer and the outside world. It primarily functions as a device that digitizes incoming analogue signals so that the computer can interpret them. Internet embedded technology makes data transferring and accessibility around the globe possible where a machine could communicate with a computer in performing its operation [3]. The idea of wireless data transmission is to provide device simplicity instead of a wired system and lower cost for long range communication [4]. In some cases, the frequent human site visit is not permissible due to a number of factors such as safety, rough terrain, huge cost per visit, weather condition and danger wildlife. To overcome the issues, a long-term long-range wireless monitoring system, which required low maintenance, is essential to be established [5].

In today's Internet of Things (IoT) era, the sensor data sampling can be live fed into website and can be accessed anywhere as long as internet access is permissible [6]. In taking the advantage of today's technology achievement, an unmanned monitoring system can be established in order to overcome the stated difficulties. On top of that, by establishing the real time monitoring system, the human site visits for configuration and maintenance could be minimized. Hence, project and manpower costs could be also minimized. In this research project, a real time remote data monitoring sensors device is developed along with web-based data acquisition (DAQ) system for user friendly data access [7].

2. SOFTWARE REQUIREMENT

2.1 Mod-Scan 64

Modscan64 is used to monitor data coming from other device with Modbus protocol. As ADAM 4017 is using RS-485 transmission mode we have used RS-485 to USB convertor and then we used Modscan64 to monitor the data coming in from ADAM module. Now as ADAM has 16-bit ADC it converts the analog data using that ADC and sends to the computer reading it. We can read the data in Modscan64 and in Web Access too. To connect the Modscan64 we will select connection->connect, then we will set the comport and the baud rate, data bits and other important information. And we are using RTU Protocol for communicating with ADAM 4017+. And after pressing OK we can see data in real time on Modscan64. It is very important to keep the baud rate, parity, word length and stop bit same in ModScan and ADAM 4017+.

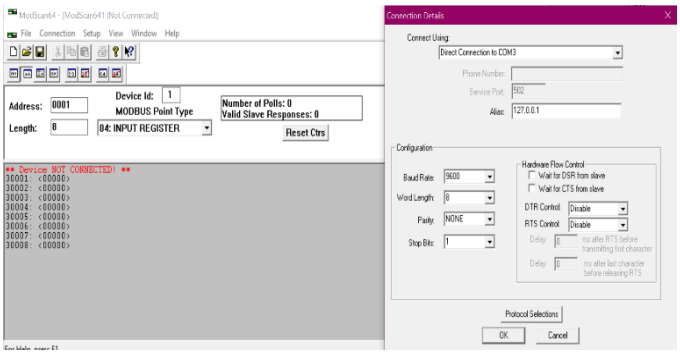
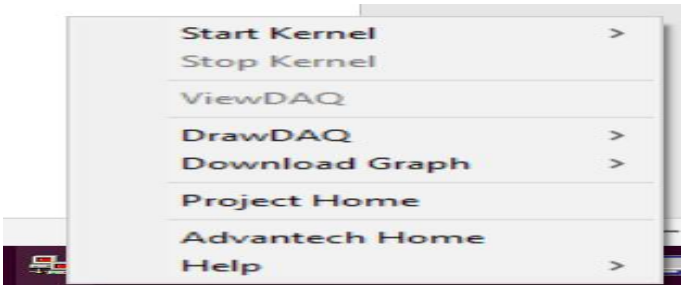


Fig -1: ModScan 64 Setup Window

2.2 Web-Access SCADA

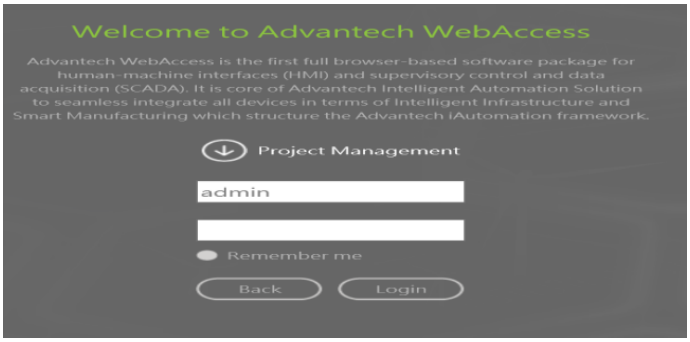
We are using Web-Access to create a simple SCADA to display data and also to send data of several sensors to the Smart phone app. The steps to create the project using Advantech Web-Access are as described below. After reboot, you should see the Web-Access Icon in the taskbar next to the system clock.

To open Web-Access run webvrpcs.exe and after clicking on Web-Access icon click project home from taskbar icon as shown in the image.



Fig–2: Web-Access Startup Menu

So, an internet explorer webpage will open after that click on Project management, then click login.



Fig–3: Web-Access Dashboard Panel

After that to create a new project fill up the details, then click Submit for a new project.

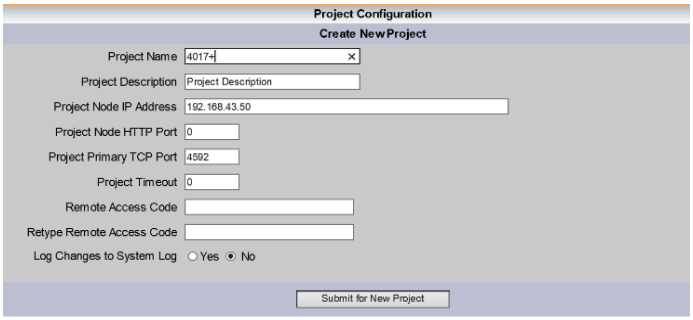


Fig – 4: Web-Access Project Configuration window

Then click configure to enter the project created. After that click on Add SCADA node. Then after giving name to that SCADA node hit submit.

Fig – 5: Advantech Web-Access Project Manager Window

SCADA Node is created; click "Add Comport". Then after providing the essential information we can hit submit this step is really important cause if any one information about Comport will be wrong then there will be error while executing the program.

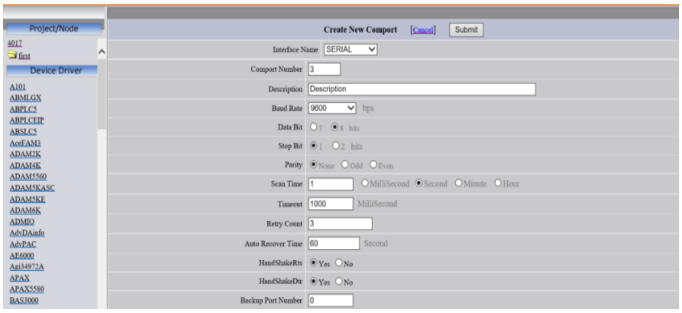


Fig – 6: Comport Window

After adding comport click on that comport then click "add device"

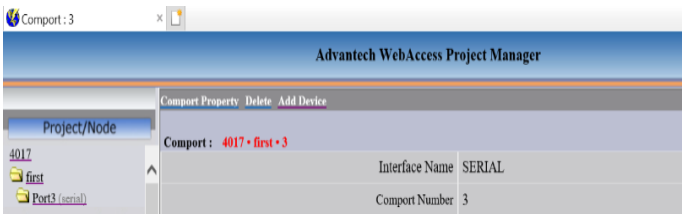


Fig – 7: Add a new device window

We will use "Modi-con" in device type. For ADAM 4017+. Then after filling name of device click submit.

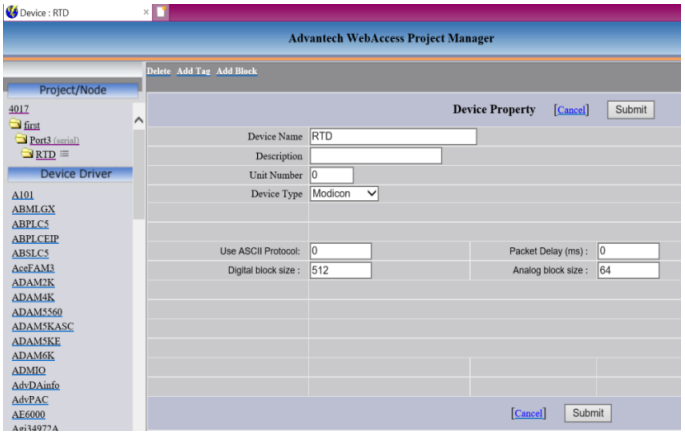


Fig –8: New Device Property Panel window

Then click on "Add Tag". And then after providing name to that tag, assigning the address to that tag and selecting its data type hit submit.

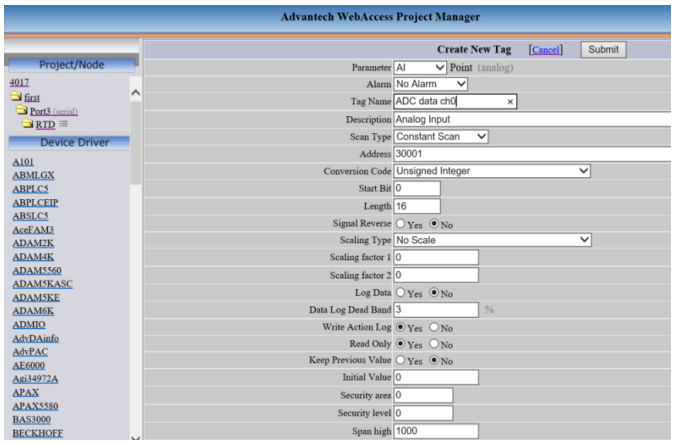


Fig – 9: Create New Tag Window

Then to DrawDAQ click the Web-Access icon and then click "drawDAQ". And then select your project created. Then select the Widget you need and assign a tag to that widget and to recognize the Widget write a text below that tag.

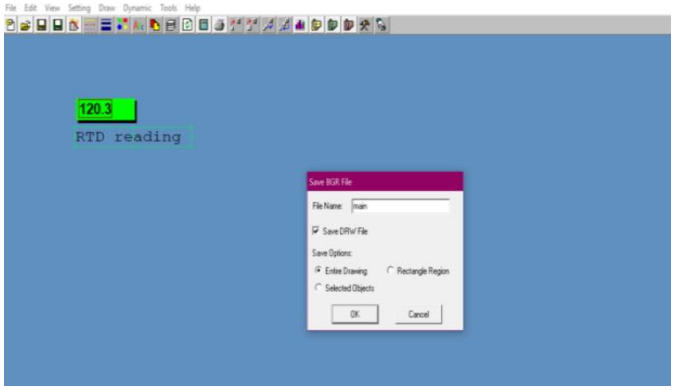


Fig – 10: SCADA Window

After that save the DAQ and provide it a name. Then go back to internet explorer web page and click on the created SCADA node, then click on "Download" to download the project created.

Fig – 11: SCADA Node Start-up Window

Then click on start node->submit to start the node. After starting the node click on start view.

Then we can enter Username and Password and see the system we created. Now after taking the data from 16-bit ADC of ADAM to calibrate it we will take several readings and with the help of Excel we will plot a graph and derive linear equation.

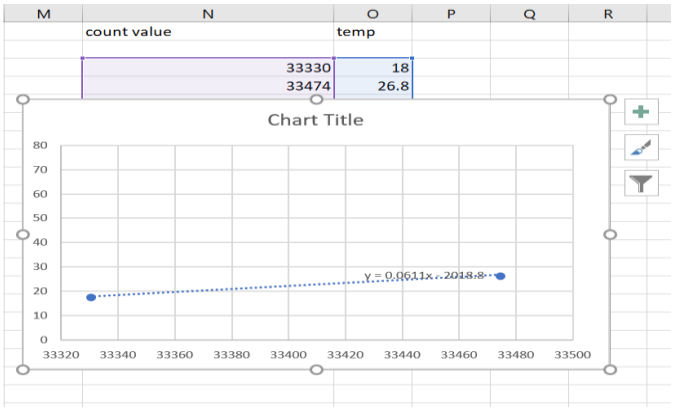


Fig – 12: Obtaining Linear Equation

Then from the tag we created we will enter the equation that we got in the Web-Access as shown in the image. We will enter the equation using the Linear MX+B scaling and then by providing M and B values.

So, after calibrating the RTD sensor we can get the output directly in terms of real time temperature. And the very same way we calibrated the Linear Potentiometer to measure length and the Voltage measurement was built in the DAQ card.

3. HARDWARE IMPLEMENTATION

This section tells about the interfacing of sensors with the Data Acquisition device using Remote DAQ technology. The software platform used is Web-Access SCADA, where all the variables are defined and an application known as Dashboard which will do the scaling operation and displays the data using the Remote DAQ.

Fig – 13: Hardware Setup

The Web-Access software is also responsible for communication between hardware and software. Requirements of this remote DAQ system are as shown in the Figs. are defined in two main parts –

(1) Hardware requirements- RTD (PT-100), Linear Potentiometer (0-10V), probes, ADAM 4017+, RS485 to USB converter, Thermometer and Kettle.

(2) Software requirements- Basic Operating System, Modscan64, Web-access DAQ, Web-Access APP.

The outcome of the remote DAQ system are - Multi User operated system, Remote Location Monitoring, Real time data logging, Online DAQ, Remote Fault Detection of sensors. Implementation of Remote DAQ system: The DAQ card plays an important role in real time monitoring of the sensors data. SCADA is created on the local computer and in the mobile devices using Web-Access. We created different variables in web-access to convert the 16-bit ADC output in the Linear Scale.

Remote DAQ: The mobile device is used to monitor the sensors data remotely using Web-Access application. Different variables are observed remotely by connecting the mobile device and the computer with the same network, now start the program and connect the mobile device with the IP address to observe the data in real time.

4. CONCLUSION

Efficient real time data monitoring of the system and the sensors is very popular among the operators, as it saves their time and also allows them to improve their productivity. A single mobile device or multiple mobile device can access the data remotely simultaneously in real time, and they can also perform some basic SCADA functions with the help of Web-access software. The user can also identify the fault remotely using the mobile device only.

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