УНИВЕРЗИТЕТ „ГОЦЕ ДЕЛЧЕВ“ – ШТИП
ФАКУЛТЕТ ЗА ИНФОРМАТИКА

ГОДИШЕН ЗБОРНИК
2012
YEARBOOK
2012

ГОДИНА 1 МАРТ, 2013 VOLUME I

GOCE DELCEV UNIVERSITY – STIP
FACULTY OF COMPUTER SCIENCE

ГОДИШЕН ЗБОРНИК
ФАКУЛТЕТ ЗА ИНФОРМАТИКА
YEARBOOK
FACULTY OF COMPUTER SCIENCE

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WEB БАЗИРАН СОФТВЕР ЗА SCADA АПЛИКАЦИИ INTEGRAXOR

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Апстракт. Во овој труд ќе биде претставен развој на пилот проект на SCADA софтвер базиран на web апликација преку пример на автоматизирано прозводство на слатки во една слаткарница. Самиот процес на производство се следи и контролира далечински со помош на софтверот InegraXor од било која точка во светот со користење на Interent конекција или од мобилен телефон при што предуслов е да се има Android оперативен систем. На тој начин може да се управува со самата рецептура на производството но и да се следи процесот на пакување на финалниот производ. Во овој труд апликацијата е развиена со поврзување кон одредени виртуелни портови но со редефинирање на портот може истата да биде поврзана и со реален процес преку програмибилни логички контролери (PLC) и сензори. Со развојот на микороконтролерите, сензорите и актуаторите овие апликации стануваа се поприсутни и излегуваат надвор од рамката на индустриската применливост.

Клучни зборови: системи за далечинско и дистрибуирано управување, автоматизација на производство, SCADA софтвер, web апликации

WEB BASED SOFTWARE FOR SCADA APPLICATIONS INTEGRAXOR

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Abstract: In this paper is presented development of pilot project of web based SCADA software. Application enables automated production of candies for one candy shop. The process of production is monitored and controlled remotely by the aid of the software IntegraXor from any part of the world where Internet connection is available or from the mobile phone in case that Android operative system is available. Consequently the recipe for production is controlled but as well as the process of final product packaging. In this paper application is developed by connecting it to virtual ports but by redefining the port itself it can by connected to the real-time process through programmable logical controllers (PLCs) and sensors. Development of microcontrollers, actuators and sensors has led to width spreading of this kind of applications and they are exceeding the frame of industrial application.

Keywords: systems for remote and distributed control, automation of production, SCADA software, web applications

22 Introduction

This paper presents the development of WEB application by using software package IntegraXor, software basically aimed for development of SCADA applications. IntegraZor is currently used in several areas of process control in thirty eight countries with the largest installations in U.K, U.S.A, Australia, Poland, Canada and Estonia. Integraxor SCADA software can be used for control of Peltier cooler a solid-state active heat pump which transfers heat from one side of the device to the other side against the temperature gradient. In this paper is presented developed application for SCADA controlled process of manufacturing of candies according to previously prescribed recipe as well as their final packing using software IntegraXor [1] . Recipe can be changed at any point of time from anywhere in the world where internet connection is available by the aid of software IntegraXor or even from the mobile phone where Android application is available. Paper presents the most important steps of software configuration and graphical animation which lead to fully configured system for control and data acquisition – SCADA. Application is developed by connecting to virtual ports but by redefining the port itself it can by connected to the real-time process through programmable logical controllers (PLCs) and sensors.

IntegraXor is web based software with option like SVG graphical visualization and animation, possibility for connection with field devices in real time with protocols like Modbus, OPC. Similar like other SCADA software it has alarms, log report, ODBC data base. It is designed by using web technologies in order to be created one complete tool for building sophisticated and intelligent real time systems. In order project to be built some pre conditions should be satisfied i.e. IntegraXor software must be installed as well as Adobe SVG viewer and Inscape SAGE. Presently IntegraXor 3.7 can be installed on Microsoft Windows XP (and latter versions) or on Microsoft Widows Server (and latter versions). Also on the computer must be available Microsoft Internet Explorer 8.0 or latter versions. Optionally as web browser can be used Mozilla Firefox 3.5 or Google Chrome 3.0. License for IntegraXor software is needed only for run-time systems. As web based product IntegraXor uses HTML and Javascript as programming language.

23 System configuration

SCADA systems are Systems for Supervisory Control and Data Acqusition, which means that these are the systems basically aimed for simultaneous measurements of process parameters, their monitoring and control. System has the functionalities of gathering process information, transmit them to the

master terminal unit, conduct necessary analysis and commands and consequently display them on the computer screen (one or more). Control can be performed automatically or through interactive commands placed by the operator. System is consisted of:

- Master Terminal Unit
- Remote Terminal Unit (RTU) or Programmable Logic Controller (PLC)
- Software for supervision and control of process information

PLC has number of available inputs/outputs (I/O) which are connected to sensors and actuators. By the aid of I/O , PLC reads the process threshold parameter, analog measured values and variables such us temperature and pressure as well as the position of rotating parts. Parameters and variables are stored in the PLC in the memory registers, each stored with the unique memory address. Data from the memory registers are available to the outside devices and systems through communication ports built into the PLC. In most common cases PLC has the nine pin serial port connected to Modbus as one of the communication protocols. Optionaly it can be Ethernet port or other field buses. IntegraXor is the tool for development of SCADA human-machine interface (HMI) and it has the communication drivers for direct data exchange with PLC through the communication port. In order IntegraXor to be connected to the PLC port must be created and it must be marked with a digital tag with adequate address of the tag for example 10001. Independently form the PLC IntegraXor can communicate with other devices such as robots and drivers which are supported by communication protocol and port. On Fig. 1 is presented basic network structure of IntegraXor.

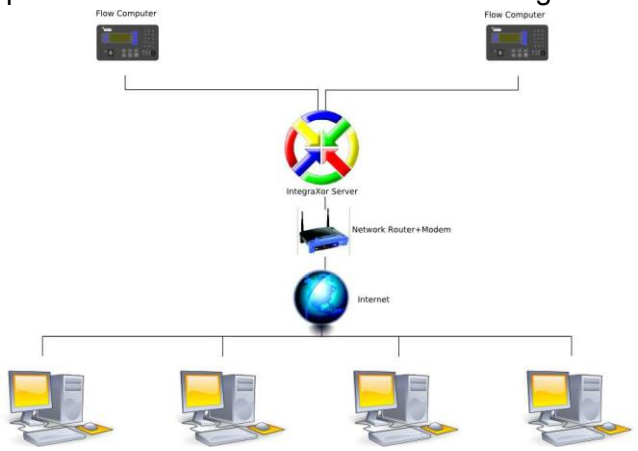

Figure 1. Basic network structure of IntegraXor

3. Software configuration

3.1 IntegraXor Editor and IntegraXor Server

IntegraXor is consisted of two programs:

- IntegraXor Server which is the operative , real-time program
- IntegraXor Editor , program where applications are created , devices are defined , connections to the process, PLCs etc.

On Fig.2 is presented basic layout of the project in IntegraXor Editor. Basic subfolder like: General, Timer, Port , Device, Tag, Database, User, Alarm, Script and Screen are defined. In “General” project name is set and web browser. Subfolder Port contains the PLC devices where tags are input. One port can have one or more devices connected to itself while one device can have from few to few thousand tags connected to the device. In subfolder Device there is a possibility to have one virtual device which is not connected to the process and allows input of tags which are not I/O. This virtual device is used for our application.

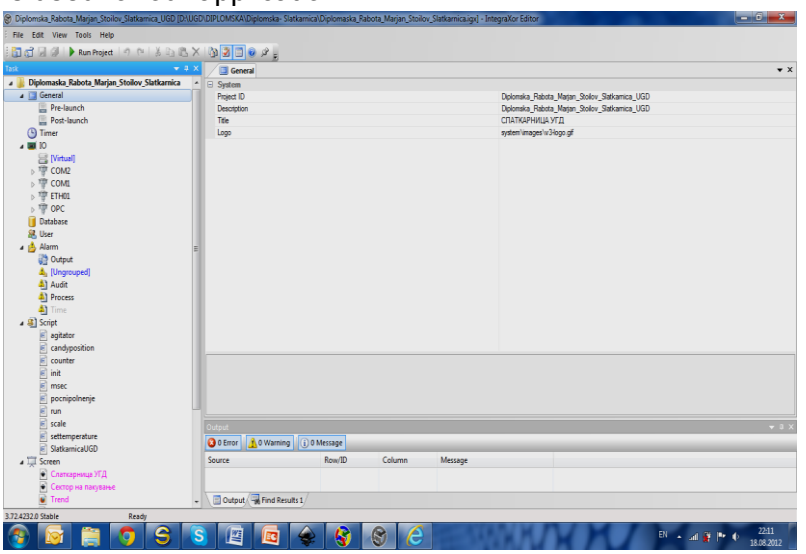

Figure 2. Window of the project in IntegraXor Editor

Tags have tree hierarchical structure. Tag is under the Device and Device is under the Port. In case that Tag should not be connected to any field device that Tag is connected to virtual device. Database is used for recording the logs (logs are all activities in the system which are recorded).The project folder generates the file with extension .mdb operating under Microsoft Acces which allows all project data and parameters to be analyzed. User subfolder creates system users which are allowed to enter the system with password. Alarms are connected with tags and their definition is according to project requirements. Program language (Script) which SCADA uses is on the base of standard JavaScript. In subfolder Screen user interface is created. For this purpose another application is used Inkscape +Sage. Inscape is software for picture editing. From project window in IntegraXor Editor the project is run by

pressing the button “run project” which enables staring of IntegraXor Server which is the window for supervision and monitoring of all physical parameters (Fig. 3). IntegraXor Server enables supervision of tags for example in our application “level_syrup”. By double clicking on parameter value, the new value can be set – 10.5. If the process is stopped this value is recorded in data base.

3.2 Graphical animation

Human-machine interface (HMI) is created in program Inkscape+SAGE. It is graphical editor where numerous pre-prepared elements for graphical animation are available. For example for our reservoirs for syrup we can use rectangular element. By right click on chosen element we can select Object

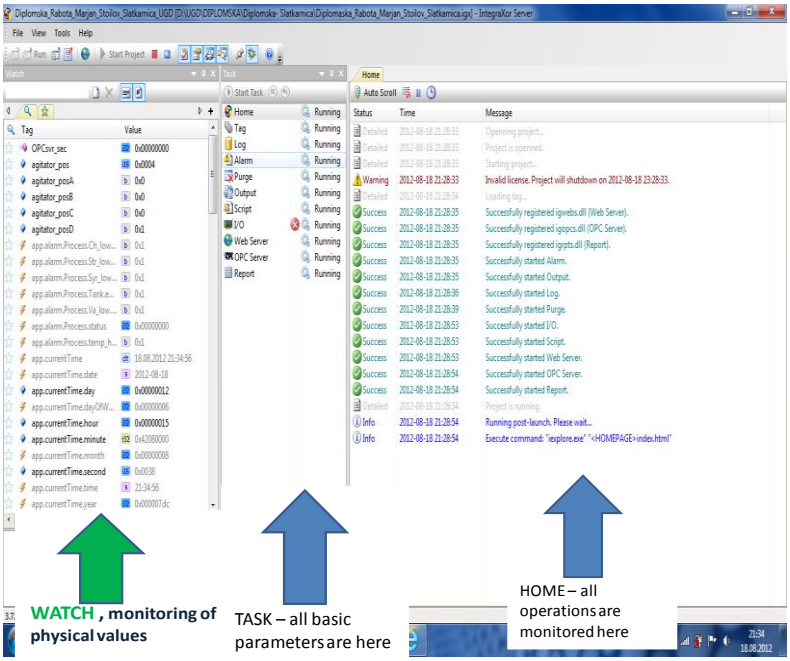

Figure 3. Window of the project in IntegraXor Server

Properties and further on we can select “Bar” animation. In the field of “Bar” animation we input “app.currentTime.second” in the tag field. This tag “app.currentTime.second” is an internal tag which contais the time in seconds. In the field for minimum value 0 is input and in max field the value of 59. Consequently for our application four reservoirs are created with set tags in “bar” animation from minimum 0 to maximum 100. Web buttons are widely used in the animation. Most often used buttons are Start, Stop, Run, Open and Close. We will explain the process of creating the button which represents the filling of reservoir up to the value of 100. We draw rectangular

element. By right-clicking we select Object Properties. We select “Set” animation and we input level_vanila. In the field under name Source we input the value of 100. We use the text tool in order to give the button name “Full”.

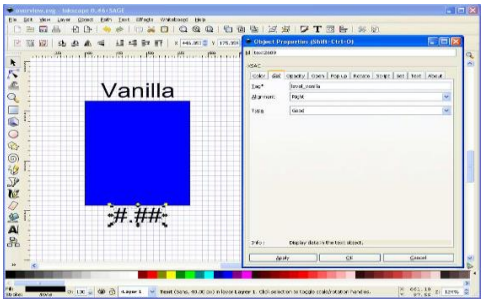

Figure 4. Window for creating graphical animation

3.3 Alarm configuration

Alarms are used in order to inform the SCADA user that allowed limit values are exceeded. Configuration of alarms is done in Project Editor. For example if level of vanilla is bellow 20, we want alarm to be switched on. In the project is input following alarm according to the description given in Figure. 5

Name	va_lo
Message	Vanilla tank level LOW
Log To	mdb
Tag Name	level_vanilla
Trigger By	Compare Value
Condition	Less Than (<)
Compare Item 1	20

Figure 5. Alarm configuration

4. Results of SCADA configuration

As a result of software configuration and development of graphical application SCADA system for automated production of candies under prescribed recipe is developed [2]. On Fig. 6 is presented starting screed on our HMI in this SCADA application with four reservoirs containing different materials for cooking and we have different buttons for control of our application.

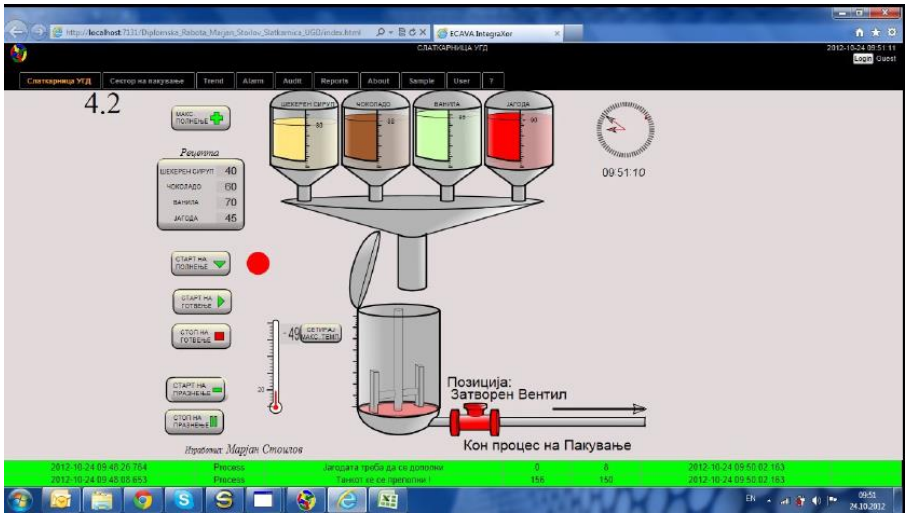

Figure 6. HMI interface of application-starting screen

The limit values of reservoirs are set, receipt for cooking is set and by pressing the button “Start of filling” all reservoirs are filled to maximum level. In the same time tank for cooking is empty and maximum temperature for cooking is set to 49°C. By pressing the button with recipt four reservoirs are emptied according to the prescribed receipt and the adequate mix of materials is in put into the tank (Fig. 7).

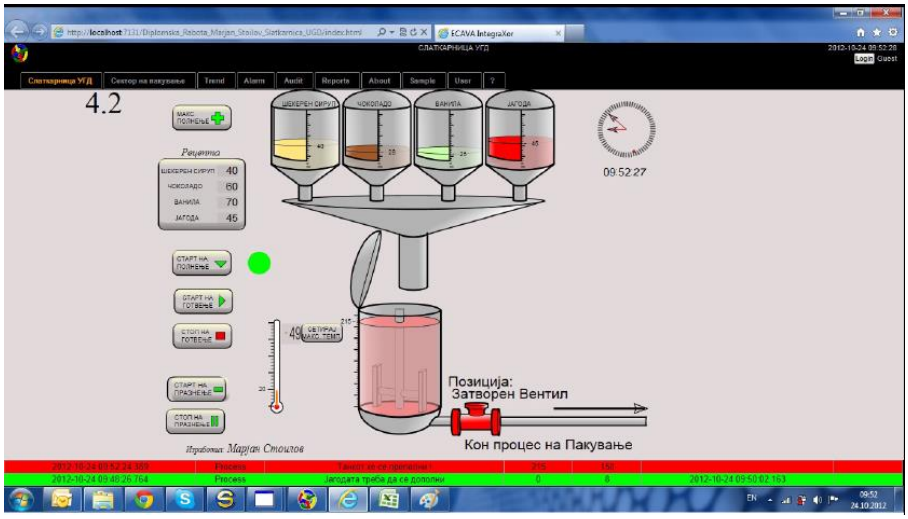

Figure 7. HMI interface of application-start of cooking

After the main tank is filled by pressing the button “start of cooking” the tank is closed and cooking starts according to the receipt and prescribed temperature. The button “stop of cooking” stops the process of cooking. Afterwards main tank is emptied by pressing the button “Start of empting the

tank”. Then main valve from Fig. 7 is opened and the main tank is emptied. So the whole process can be repeated once again for the next cycle of production with the same or adequately altered receipt.

5. Conclusion

In this paper is presented development of one SCADA application for industrial process using the application software for SCADA systems IntegraXor. Application is developed for candy factory where automatic filling of tank for cooking is performed under prescribed recipe. In order application to be developed software IntegraXor Editor is used where application is configured with all ports, alarms and parameters. Program execution is performed in software IntegraXor Server where all important parameters for the process are monitored and commands executed. Since this SCADA software is a web based application it can be used anywhere where internet connection is available, enabling fully control of industrial process from anywhere in the world, independently of the geographical position of the factory.

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