Siemens Simatic

for Control Engineering

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1   Siemens

Figure 1: The logo of Siemens

Siemens AG is the largest engineering company in Europe. The principal divisions of the company are Industry, Energy, Healthcare, and Infrastructure & Cities, which represent the main activities of the company. The company is a prominent maker of medical diagnostics equipment and its medical health-care division, which generates about 12 percent of the company's total sales, is its second-most profitable unit, after the industrial automation division.

Siemens and its subsidiaries employ approximately 349,000 people across nearly 190 countries and reported global revenue of approximately €75 billion in 2013. The company has been the subject of a number of controversies in its history.

2   Simatic

SIMATIC is the name of an automation system which was developed by the German company Siemens. The automation system controls machines used for industrial production. This system makes it possible for machines to run automatically. Depending on the needed function of the machine you have to upload the right program on your Simatic unit. This unit is kept in a control cabinet near the machine.

The Simatic contains two main types of products: Software and Hardware solutions.

2.1   Software

SIMATIC WinCC is a supervisory control and data acquisition (SCADA) and human-machine interface (HMI) system from Siemens.

2.1.1   SCADA

System control and data acquisition - is a system operating with coded signals over communication channels so as to provide control of remote equipment or collect data in real time and show an information about the monitoring object. SCADA systems are used to monitor and control physical processes involved in industry and infrastructure on a large scale and over long distances. A SCADA system usually consists of the following subsystems:

Figure 2: Siemens Simatic IPC

- Drivers, servers or IO - programs that provide communication with SCADA industrial controllers, counters, ADC and other input and output devices.

- Real-time system - a program that provides the processing of data within a certain time cycle with the priorities.

- Human-Machine Interface (HMI) - a tool that provides data about the process to a man operator, that provides to the human operator to control the process and to manage it.

- Graphic Design program for the development of man-machine interface.

- Logic control system - a program that provides execution of user programs (scripts) logic control in SCADA-system. Set of editors for its development.

- Real-time database - a program that ensures the preservation of the history of the process in real time.

- Alarm Management System - a program that provides automatic control of technological developments, to classify them in the category of normal, warning or alarm, and event handling by the operator or a computer.

- Report Generator - program, which provides creating custom reports on technological developments. Set of editors for their development.

- External interfaces - standard communication interfaces between SCADA and other applications. Typically, OPC, DDE, ODBC, DLL, etc.

WinCC is written for the Microsoft Windows operating system. It uses Microsoft SQL Server for logging and comes with a VBScript and ANSI C application programming interface.

SIMATIC WinCC in the Totally Integrated Automation Portal (TIA Portal) is part of a new, integrated engineering concept which offers a uniform engineering environment for programming and configuration of control, visualization and drive solutions. It is one software for all HMI tasks. SIMATIC WinCC V7 is still available for more complex applications with Plant Intelligence solutions or redundant architectures, while WinCC Open Architecture addresses solutions with highly customer-specific adaptation requirements, including on non-Windows platforms.

Benefits

- Innovative configuration interface based on the latest software technologies.

- Comprehensive library concept for user-definable objectsand faceplates.

- Intelligent tools for graphical configuration and mass data handling.

Compared to WinCC flexible, which has set the standards in engineering for years, configuration efficiency has been further increased, particularly if further TIA components such as the SIMATIC S7 Controller are part of the automation solution. The perfect interaction with STEP 7 in the TIA Portal prevents multiple entries and guarantees consistent data management at all times.

2.1.2   Simatic Step 7

The software from Siemens for the development of automation systems based on programmable logic controllers (PLC) Simatic S7-300 / S7-400 / M7 / C7 and WinAC. For Simatic S7-200 there is its own product STEP 7 MicroWin. The software has a Multilanguage pack for an interface (English, German, French, Italian, Spanish and Russian). With this program, an operator can do the set of work to create or service the automatic system based on Simatic PLC.

STEP 7   utility works with a project, it allows configuration PLC and network in the industry. STEP 7 software significantly boosts efficiency in all of your automation tasks. Whether for configuring hardware, establishing communications, programming, testing, commissioning and service, documentation and archiving, or operational and/or diagnostic functions, the software sets the benchmark in its field.

An integrated program editor performs the controllers programming in three main languages:

- LAD - Language ladder

- FBD - Function block diagram language

- STL - Language Instruction List

  And additional languages:

- SCL - structured control language, syntax close to Pascal

- GRAPH 7 - language management process sequence

- HiGraph 7 - language-based control of the state graph of the system

- SFC - the language of state diagrams

Ability to monitor the current state of the program that is available using any programming language, provides not only debugging software, but also troubleshoot the equipment in the connected devices, even if it has no diagnostic tools.

2.2 Hardware

Simatic hardware contain two main types of devices: Industrial PCs and PLC.

2.2.1 Industrial PC

An industrial PC is an x86 PC-based computing platform for industrial applications.

Industrial PCs offer different features than consumer PCs in terms of reliability, compatibility, expansion options and long-term supply.

Industrial PCs are typically characterized by being manufactured in lower volumes than home or office PCs. A common category of industrial PC is the 19-inch rackmount form factor. Industrial PCs typically cost considerably more than comparable office style computers with similar performance. Single-board computers and backplanes are used primarily in Industrial PC systems. However, the majority of industrial PCs are manufactured with COTS motherboards.

2.2.2 PLC

A programmable logic controller is a digital computer used for automation of typically industrial electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines.

The main principle of the PLC is in handing the signals from the connected sensors and distribute command's signals through output modules from the application to the actuators.

Simantic S7-200   is designed for building automation systems of low and medium complexity. The main features of the controller are:
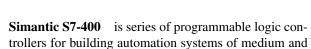
- Simple in an installation, programming and maintenance.

- Relatively cheap

- Compact

- Solution for simple and relatively complex tasks

- Works autonomously or as intelligent slave systems Distributed IO.

The controller is used in an automation of small systems, like single machine-tools, purification systems, automatic gates, lifts, conveyor lines.
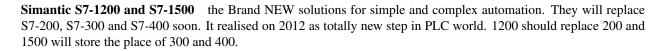
Simantic S7-300   an average performance PLC family of controllers developed by Siemens AG. It has several advantages against S7-200:

- Advanced modular structure

- Local and distributed IO

- Wide range of interfaces (MPI, PROFInet, AS-i, BACnet, MODBUS TCP)

- Support at the operating system level functions providing work in real time, hardware interrupts, processing hardware and software errors

- Scalable in case of modernization

A small factory or some unites of big one for example assembling line can be managed by S7-300.

Figure 3: Simatic S7-300

Simantic S7-400   is series of programmable logic controllers for building automation systems of medium and high complexity. It contains all the features of S7-300, but more flexible and suitable for really complex projects. Can be used as a main control system for whole factory.

Simantic S7-1200 and S7-1500   the Brand NEW solutions for simple and complex automation. They will replace S7-200, S7-300 and S7-400 soon. It realised on 2012 as totally new step in PLC world. 1200 should replace 200 and 1500 will store the place of 300 and 400.

2.3   Features

The main advantages of the solution are:

- Visualization of a technical process (Graphic Designer)

- Configuration of micro controllers connections from different manufacturers (Tag Management)

- Data acquisition report system (Report Designer)

- Possibilities to work with other applications using SQL, ODBS, OLE interfaces

- Redundancy - duplication of critical components or functions of a system, to increase reliability of the system (backup, fail-safe)

- Compatible with MS SQL Server and Windows

- Great opportunities using ActiveX

- Simatic Step 7 utility

Redundancy is the duplication of critical components or functions of a system with the intention of increasing reliability of the system, usually in the form of a backup or fail-safe

3 References

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