

Linux-controllers with support of executive system ISaGRAF 5 ++ ACE Target

ISaGRAF 5 ++ ACE Target. Innovative functionality, productivity and openness

There is a short overview of some Linux based controllers with ISaGRAF 5++ ACE Target implemented by experts of FIORD company (Russia, St.-Petersburg, www.fiord.com) that have essentially expanded functionality of standard ISaGRAF 5 (by ICS Triplex ISaGRAF www.icstriplex.com) and increased performance and determinism. ISaGRAF 5 is a comprehensive set of software technologies used to develop leading-edge local or distributed control products. The technology is designed to be scalable, allowing the development of a range of solutions from tiny controllers to large automation systems without having to compromise. ISaGRAF consists of two main components: the Application Workbench and the Runtime Target or Virtual Machine. ISaGRAF Runtime Targets can run on any operating system. The widest used OS for ISaGRAF Target is Linux.

ISaGRAF 5 extensions open path for further development of systems according to real inquiries of users at the expense of usage of open and with detailed documentary interfaces. Basis for ISaGRAF 5 extensions is ISaGRAF 5 ++ ACE Target, the innovative version of the target task. Target system source code processing first of all consisted in usage ACE (Adaptive Communication Environment) library for implementation of system level. It has caused carrying over of ISaGRAF 5 target source code in the environment of C++ language compiler and abstraction from features of operation with various operating systems. What was the result? It's become possible to eliminate various "parasitic" delays and to provide execution time of the task within the limits of one cycle in a mode "Real time" from 5 micro seconds, to raise stability of a cycle with the set execution time.

Linux-controllers of new generation LinPAC-8000 from ICP DAS

Experts of "FIORD" company (Russia, www.fiord.com) have ported ISaGRAF 5 ++ ACE Target to LinPAC-8000 (fig. 1) ... a new generation of Linux-controllers. ISaGRAF 5 is the leading world controller programming technology from ICS Triplex completely corresponds to industry standards IEC 61131-3 and IEC 61149.



Fig. 1 ISaGRAF-controller LinPAC-8000

Besides slots for built in input/output modules LinPAC controllers are equipped with VGA interface, two Ethernet ports, several built in RS-232/485 ports and USB port. Additional units with communication interfaces CAN and FRnet can be installed to expansion slots. Working temperature range for controllers is -25°C to $+75^{\circ}\text{C}$. The difference of this novelty from a first generation of ICP DAS controllers LinCon-8000 is processor performance increasing (about 206 MHz to 520 MHz) and moving to advanced version of an operating system (with Linux 2.4 on Linux 2.6). LinPAC-8000 has a variety of new features. The hot swapping of input-output modules (without switching off) has become the main feature. Besides, controllers have a bus for input-output modules depending on well model 4 or 8 slots. LinPAC provides a connection to

backup power supply line, thus the breakaway on one of lines is signaled with special digital outputs of dry contact type. Controllers have 512 KB EEPROM for contemporary records storage. Programming and customization of LinPAC controllers with executive kernel ISaGRAF5 ++ ACE Target license, is being carried out by means of ISaGRAF 5 Workbench development environment. The executive system supports a driver for built in input-output modules of I-8000 and I-87000 series, DCON protocol driver (for data exchange with external modules of I-7000 series), Modbus RTU\TCP Master\Slave protocols driver, carrying out system of local archives. Due to ISaGRAF 5 controllers programming technology including two industry standards: IEC 61131-3 and IEC 61499, multifunctional controllers of LinPAC-8000 series can be used in industrial automation and building automation systems, dispatching systems on transport, etc. Standard IEC 61499 defines function boxes usage rules in distributed industrial processes, monitoring systems and handles. This standard offers some essential advantages, such as regulation by operation of distributed monitoring system and control by means of events stream, support of data consistency , support of synchronous operations performance between devices, an exception of requirement for synchronization circuits development , and also eases development and further support of reliable monitoring and control systems. One of the most interesting novelties of LinPAC-8000 controllers with ISaGRAF 5 ++ ACE Target executive system is possibility to create local graphic applications. ISaGUI system is intended for support of interactive graphics mapping of real time data directly in executive system ISaGRAF 5 ++ ACE Target. The system is implemented in a form of ISaGRAF virtual device and a package of the special functions which have been built in ISaGRAF 5 Workbench. For graphic interface designing the graphic interface editor GLADE which can work both with Linux and Windows is used.

Smart multifunctional communication controller from MOXA

One more example of controller with ISaGRAF 5 ++ ACE Target is smart multifunctional communication controller of series UC-7400 (fig. 2) from MOXA company intended for interaction of equipment with various communication interfaces, data collection and control of remote input-output units, local archives carrying out, high speed information processing.

UC-7400 series controllers are constructed with RISC Intel XScale IXP422 processor with frequency of 266 MHz, 128 MB RAM and equipped with a wide set of interfaces: 8xRS-232/422/485, USB 2.0 and USB 1.1, 2xEthernet 10/100 Mbps, PCMCIA to connect wireless Ethernet (optionally) cards, CompactFlash. HMI devices are provided with 160x64 pixels LCD display and 5 buttons keypad. UC-7400 series controllers include preinstalled MontaVista Linux operating system, ISaGRAF5 ++ ACE Target executive kernel license with drivers for ModBus RTU\TCP Master\Slave protocols, carrying out system of local archives .



Fig. 2. ISaGRAF-controllers UC-7400 series XScale IXP422 based

Programmable communication controllers FIORD-101 and FIORD-201

ISaGRAF 5 ++ ACE Target is being widely used in products of Russian controller manufacturers. For example, in the programmable communication controller of "FIORD" company (St.-Petersburg, www.fiord.com) FIORD-001, FIORD-101 and FIORD-201 (fig. 3). These controllers intended for data exchange support between various controllers, input-output devices and SCADA systems via RS232/485 and Ethernet. FIORD-201 controller's key parameters: Geode GX1 processor, 266 MHz, 128 MB RAM, 64 MB FLASH disk, Ethernet 10/100 Mbps ports and Ethernet 10 Mbps, 10 serial ports (1 technological RS232 port, 5 RS232 ports, 4 configurable RS232/RS422/RS485 ports), a power supply 18...36V DC, power consumption no more than 25 Watt. Controllers work under Linux and programmed by means of ISaGRAF 5 environment which provides flexible configuration data exchange and processing procedures. Controllers fulfill data exchange via various communication protocols such as Modbus TCP, Modbus RTU, IEC60870-5-101, IEC60870-5-104, FDA-OPC.



Fig. 3 FIORD-201: communication controller with ISaGRAF- of Geode GX1 based

Communication Linux-controllers of a new generation OWEN 304\308

Communication Linux-controllers of a new generation OWEN 304\308 (fig. 4) by Russian company OWEN (Moscow, www.owen.ru) can work under control of ISaGRAF 5 with executive task ISaGRAF 5 ++ ACE Target. OWEN 304\308 controllers are intended for the interaction between equipment with various interfaces and communications protocols. Due to ISaGRAF 5 controllers programming technology which supports two industry standards: IEC 61131-3 and IEC 61499, usage of communication controllers allows to solve such tasks as association of several devices with various interfaces and communications protocols in a uniform network, allocation of console access to the remote equipment, creation monitoring and dispatching systems for technological processes, housing and communal services, engineering systems, buildings, carrying out distributed system of local archives at controller level, integration with SCADA systems by means of an OPC-server. Communication controllers OWEN 304\308 are being constructed on a base of 32 bit RISC processor with ARM9 kernel, 200MHz frequency, have great volume of RAM and EPROM, eight serial RS-232/422/485 ports with maximum speed 921.6 Kbit/s for connection with peripherals, two Ethernet 10/100 Mbps ports for backup data links creation, built in cards-readers for the extension of non-volatile memory by means of replaceable SD cards, two USB ports for maintenance of additional equipment and USB disk drives, real-time clock.



Fig. 4 Communication ISaGRAF-controllers OWEN 304 and 308 on a base of 32 bit RISC processor with ARM9 kernel