

# » Application Story «

VME, CompactPCI® and PICMG® in Transportation



## Full steam ahead for Poland's railways

**Kontron supplies complete hardware platform based on multiple VME, CompactPCI® and PICMG® 1.3 system configurations for the Siemens Sp zo.o. railway control system in Poland**



As part of an extensive modernization program, the Polish railway network is being upgraded with a custom designed state-of-the-art embedded control system that meets the highest international safety standards. Underlining the important trend towards single-source embedded suppliers, Siemens Sp zo.o. in Poland and the Warsaw University of Technology outsourced the development of the entire hardware platform to Kontron who supplied a control system platform based on multiple VME, CompactPCI® and PICMG® 1.3 system configurations.

In a drive to modernize the country's transportation infrastructure, the Polish authorities are upgrading the electronics on the railways with a new control system based on state-of-the-art embedded computer technology. The new system, called ILTOR-2, is already in place on some routes and improves the speed, quality, reliability and safety of railway transportation for both passengers and goods. This major project is a co-operation between the Warsaw University of Technology, Siemens Sp zo.o. in Poland and Kontron and is an excellent example of the growing trend towards embedded vendors that offer not only embedded computer components, but also the engineering and manufacturing services for providing complete, tailor-made platforms based on different embedded computing standards from a single source.

## Modular design for maximum flexibility

ILTOR-2 is split into two broad control levels – a management level for visualization, high level control and diagnostics and a field/automation level control system that is responsible for carrying out fundamental technical control functions as well as obtaining information on the status and location of rolling stock. A modular system design based on standard components is used at each level. This not only simplifies and accelerates future system expansion but also gives ILTOR-2 a tremendous amount of versatility: Different modules can be implemented or omitted as required, enabling the system to be quickly and cost-effectively adapted for use on main lines and branch lines as well as urban transport systems such as trams and metros.

## VME bus for field control

The modular design dictates the use of different embedded hardware platforms for implementing the individual modules. For field level control, Kontron delivered several embedded computing racks containing multiple 3U VME CPU and I/O boards (see box). The racks are located in the unmanned remote control centers that are responsible for up to 10 control points (level crossings, signals, points etc.) along a designated section of track. They collect and process information on the position and speed of the trains as well as the status of lights, signals and points etc. from wayside sensors and automatically change the status of control points as required. The VME systems also act as interfaces



between the control points and the Siemens interlocking system that are connected via Profibus. The interlocking system is especially designed for railway control and is an extremely important safety critical feature, ensuring that no signals can be given to a train unless the track is clear for use. It guarantees the correct interaction of thousands of I/Os and is a significant technical achievement for rail transport safety, complying with SIL-4 (Safety Integrity Level 4), the highest railway safety standard. As well as Profibus interfaces, the VME systems also provide Gigabit Ethernet ports for cross-protocol communication and full network integration, enabling field level parameters to be transmitted to the dispatch centers at the management and control level. Transmission is via fibre optic cables for optimal protection against electromagnetic interference. Twisted pair cables provide the redundancy and back up transmission required for rail transportation systems.

## CompactPCI® platforms for management level

Whereas the remote control centers direct trains to the right platform at a local station, the dispatch centers are responsible for getting trains safely to their final destinations, from Warsaw to Krakow for example. For the dispatch centers, Kontron supplied multiple units of its rugged 3U CompactPCI® CP-Pocket platform as well as KISS 4U Silent Industrial Servers (see boxes). The Kontron CP-Pockets are used for operating and monitoring purposes, enabling operators to graphically follow the movement of rolling stock and enter commands to adjust control points. Kontron equipped the versatile CompactPCI® platforms with the right combination of processor boards, graphic controllers and Fast Ethernet controllers from its own portfolio to suit the specific requirements of the visualization, processing and communication tasks.

## Advanced diagnostics

For system diagnostics, Kontron delivered multiple KISS 4U industrial servers based on a Kontron PICMG® 1.3 slot CPU board. With their shock protected drive bays and hot swappable fans that contribute to a MTBF of more than 50,000 hours, the Kontron KISS servers are the ideal complement to the rugged VME and CompactPCI® boards and systems. Connected to the system via Ethernet and capable of supporting multiple monitors, the KISS servers are continuously online and enable technicians to graphically monitor all system parameters. Unlike most diagnostic systems that offer only online functionality, the KISS based system is able to store and recall historical parameter information for faster trouble shooting and minimal system downtime which adds to overall system safety.

## Everything from a single source

On large projects like ILTOR-2 that require a variety of different embedded boards and platforms, OEMs are constantly looking for ways to relieve the project management burden. This is why Siemens Sp zo.o. in Poland wanted to work together with a single partner capable of

delivering all boards and fully integrated platforms from a single source. This not only simplifies project management, enabling Siemens Sp zo.o. to concentrate fully on their core competences, but also ensures faster time to delivery for the ILTOR-2 hardware platforms. Moreover, Kontron had already developed and delivered a VME and CompactPCI® based system for the Warsaw Metro and so had the experience required for tailoring a system to the specific needs of the Polish railways.

## System testing

In addition to supplying the embedded hardware platforms, Kontron also works closely with Siemens on the 3 stages of rigorous system testing. When each new hardware platform is delivered, Kontron and Siemens technicians conduct initial functional tests with simulated input data to ensure correct hardware functionality. The tests take place at the specially constructed Siemens test center in Poland. The second phase is functional testing in the presence of the Polish National Safety Authority to obtain the required national certification. After passing this Factory Acceptance Test (FAT), the system is ready for the final test phase - field testing.

ILTOR-2 has already passed the field test phase and is up and running on selected sections of track. Thanks to the modular design based on standard, proven components from a single source supplier, Poland now has a cost-effective, state-of-the-art embedded control system that is well set to meet the various needs of its railway infrastructure, both today and well into the future.

### KISS 4U Kontron Industrial Silent Server



The Kontron KISS 4U system has been designed with flexibility in mind and can accommodate PICMG 1.0, PICMG® 1.3, ATX and Dual Xeon/64-bit based motherboards, as well as PCI Express ATX motherboards in a housing that can be used as a tower, desktop or 19" rack mounted chassis. For the ILTOR-2 system, the Kontron KISS 4U with a PICMG 1.3 PCI 690 motherboard based on the Intel® Core™ 2 Duo processor and Intel 945GM chipset with up to 4GB of DDR2 RAM offered the performance for running the advanced diagnostic software and the interfaces (2 x USB 2.0, 2 x Gbit Ethernet, 2 x RS232 and VGA amongst others) for communication with the ILTOR-2 system and connecting displays, keyboard and mouse.

### High performance VME CPU board



As a safety critical system, ILTOR-2 needs to process and forward information in an acceptable time frame. This is why Kontron implemented the field level control system with high performance Kontron VMP3 CPU boards based on the high end PowerPC MPC8541 that provides a generous 1520 MIPS at a clock speed of just 660 MHz. With its highly integrated RISC architecture CPU, the Kontron VMP3 offers impressive computing power. It also delivers on reliability – a MTBF of almost 130,000 hours ensures approximately 15 years of fault-free continuous operation, 24 hours a day, 7 days a week. Depending upon the required module, Kontron also implemented racks with the 3U Kontron VM62 VMEbus Single Board Computer and the Kontron VMP60 CPU board and communication engine.

### CP-Pocket-Box



The CP-Pocket is a rugged, versatile and cost-effective system platform that can be equipped with a variety of processor and I/O cards to suit the needs of individual applications. For the ILTOR-2 system, CP-Pockets equipped with the Kontron CP306-V CompactPCI® CPU board with 1.3 GHz Intel® Celeron® M processor provided the right price-performance ratio. The Kontron CP332 graphic controller with dual DVI

and VGA provides the required graphics performance for multi-screen display and the Kontron CP341 Fast Ethernet controller offers LAN connectivity for receiving information and transmitting commands.

## Kontron engineering and design services

Kontron's comprehensive customization, engineering and project management services are especially designed to enable OEMs, system integrators and designers achieve faster time to market for their applications in the transportation, defense/aerospace, industrial automation, energy, telecommunication, medical, POS/POI and infotainment markets. Kontron's dedicated global business units work closely with customers to design and manufacture tailor-made, application-ready OEM platforms ranging from VME and CompactPCI® systems, industrial servers and Box PCs to pre-integrated and fully tested ATCA and MicroTCA™ platforms as well as rugged Modular Embedded Computers (MEC) amongst others. In developing a customized solution, Kontron draws upon its comprehensive portfolio of standard, off-the-shelf products that includes Computer-on-Modules, boards and mezzanines, HMIs and Panel PCs as well as systems and platforms. Using standard, off-the-shelf components and platforms minimizes development

costs and accelerates time-to-market. Production takes place at Kontron's advanced testing and manufacturing facilities that are ISO 9001 and ATEX-certified to ensure consistency and the highest level of quality in products and services on a global basis. Each Kontron business unit has specialist expertise in its respective vertical market to ensure that all OEM platforms are designed and produced in accordance with the highest international certifications and standards. Kontron also organizes and coordinates rigorous product testing of prototype and series products at independent testing laboratories. Long-term availability management and EOL management round off the project management services that cover the entire value-added chain, enabling customers to free up the maximum amount of internal resources in order to concentrate on their core competences, reduce total cost of ownership and ensure fastest time to market of their products.

## About Kontron

Kontron designs and manufactures standards-based and custom embedded and communications solutions for OEMs, systems integrators, and application providers in a variety of markets. Kontron engineering and manufacturing facilities, located throughout Europe, Americas, and Asia-Pacific, work together with streamlined global sales and support services to help customers reduce their time-to-market and gain a competitive advantage. Kontron's diverse product portfolio includes: boards and mezzanines, Computer-on-Modules, HMIs and displays, systems, and custom capabilities.

Kontron is a Premier member of the Intel® Embedded and Communications Alliance.

For half-a-decade now, Kontron has been named a VDC *Platinum Embedded Board Vendor*. Based entirely on user feedback, industry professionals evaluate vendors on over 45 non-product related criteria. Kontron is only one of two companies to receive the Platinum award 5-years running.

Kontron is listed on the German TecDAX stock exchange under the symbol „KBC“.

For more information, please visit: [www.kontron.com](http://www.kontron.com)

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