

» Application Story «

ThinkIO / KIM in Communications



Compact IPC protects high-performance antennas New Rohde & Schwarz antenna protection system uses PC-based controller and USB sensors



For a new antenna protection system for high performance transmitting stations, electronics company Rohde & Schwarz integrated a compact DIN rail PC as a key component. The modular, durable, and open x86 development platform combines the analysis of sensors connected via USB with the transmitter control via I/O interfaces.

With the goal of complete DVB-T (Digital Video Broadcast terrestrial) coverage throughout Europe by 2012, a large number of analog terrestrial transmission towers are to be upgraded to broadcast digital signals. The network providers, which are responsible for the broadcasting of programs for each program provider, must also bear the responsibility for the long-term operation of DVB-T. Their obligation includes providing the infrastructure to broadcast programs, and the operation of transmitters and antennas. It is essential for network operators to ensure the long-term and trouble-free operation of transmitter stations, because damage to the antennas can cost millions of dollars and cause several months of transceiver outage. The cause of a defective antenna can, for example, lie in the unintended power overload of a transmitter. Therefore, network operators as well as manufacturers of antennas, cables, and transmitters are all interested in protection to detect such inadvertent power overloads in time and take protective measures such as disconnection of faulty transmitters.

For these customers, the electronics company Rohde & Schwarz now provides a solution that was first used in a customer project in the UK for the conversion of 50 high-power transmitter stations (from 1kW HF) to DVB-T and is now available as a standard product. The system solution features an open PC-based control based on long-term available standard hardware and easy-to-integrate USB power sensors.

It started with a long wish list

The list of requirements that the new protection system needed to meet was extensive: highest reliability, system availability, accuracy, and stability, fast response times for the detection of power overloads, and robustness against external disturbances, e.g., EMC. Moreover, the system should be as compact as possible and be flexibly configurable. Additionally, the objective was to integrate the R&S NRP-Z11 power sensors via USB, which can detect signal changes very quickly, and are mounted via a directional test coupler to the antenna cables. When a pre-defined performance threshold is exceeded, the control would switch off the appropriate DVB-T transmitter via interlock relays. In order to best utilize the limited space available in the transmitting stations, the layout of the control electronics should also be as compact as possible. Also, in addition to providing connectivity for USB-capable power sensors, it should ideally provide a suitable I/O system for switching the relay. Since the lifetimes of antennas and sensors are measured in years (the sensors have a MTBF of 80 years, for example), the control system should also provide a long operating life in order to guarantee the long-term reliable operation of the transmitting stations. Ideally, the control should be PC based. PC-based controls have the advantage that the various automation tasks such as measurement and control as well as visualization and remote management can all be handled on one hardware platform. In addition, PC technology provides the ideal platform to easily integrate the USB sensors.

Furthermore, the use of an embedded Linux was also required. This would allow the use of specific Linux derivatives optimized for automation tasks, resulting in a robust solution. In addition, the Linux source code is assured long-term availability, guaranteeing that adjustments could be made for decades. The widespread availability of development tools for embedded Linux, as well as for x86-technologies also facilitates and speeds up software development.

Not every IPC was suitable

As the list of requirements increased, the number of viable PC-based system platforms simultaneously decreased, as few IPC systems with modular I/O of high granularity are available for OEM applications. The majority of the available COTS (commercial off-the-shelf) IPCs are compact systems with relatively limited expandability. This becomes especially clear when it comes to integrating an I/O assembly. Obstacles arise, for example, from the lack of matching I/O terminals for the DIN rail, and a lack of Linux support. Also, OEMs usually fail to provide a proper API for each respective development environment.

In the ThinkIO from Kontron, Rohde & Schwarz ultimately found a turnkey embedded IPC platform that is designed specifically for OEMs, and meets all stated requirements. Designed for industrial applications, this compact DIN rail PC not only provides the required interfaces such as USB for the sensors and I/Os for the relays, but also features a MTBF of 94,000 hours (> 10 years). The compact IPC is only 236 mm x 100 mm x 70 mm (including the WAGO I/O interface module) and a robust, real-time capable embedded Linux based on the industry standard OSADL is also included.

Not every IPC was suitable

Designed to be mounted in a standard 19-inch rack, the overall concept of the "R&S TS4506 Power Measurement System" is straightforward. Four power sensors per antenna are coupled via a USB hub to two redundant ThinkIOs each (one for the main antenna and one for the reserve). The sensors physically measure the RF power in dBm which is then digitized and transmitted via USB to the ThinkIO, which analyzes the data. If the preset threshold power limit has been exceeded, the ThinkIO initiates the shut-off sequence of the DVB-T transmitter through the interlock relays (WAGO 750-517). At the heart of the system, the ThinkIO continuously processes the data which are delivered via an Ethernet switch to a Kontron Intelligent Minicomputer (KIM). The KIM handles data collection as well as visualization of the system status via a web interface and reports alarms to the control center by the installed SNMP agent. In addition, the system is also supported by the Kontron RPD1151, a local KVM (keyboard-video-mouse) switch with 15-inch TFT display, keyboard, and touchpad, which is housed in a space-saving 19" 1U drawer. In addition, the system is integrated with two uninterruptible power supplies and an InterSeptor, which is used as a temperature gauge to see whether ice may

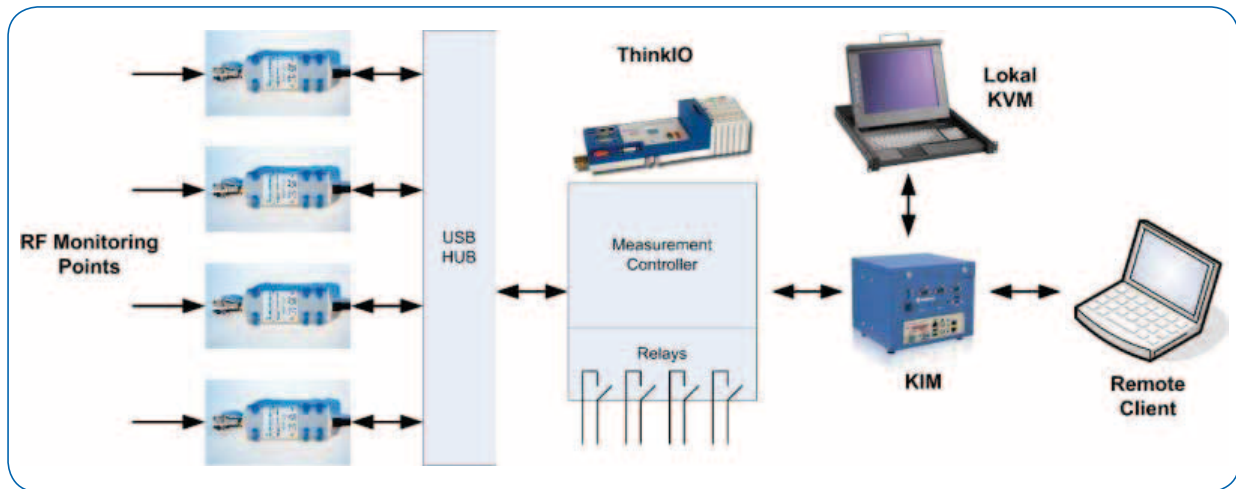


Figure 1: Schematic representation of the ThinkIO integration

have changed the properties of the antenna. In summary, network operators as well as antenna, cable, and transmitter manufacturers benefit from the R&S TS4506 as a standard turnkey system with high reliability, flexible configuration possibilities, and long product support.

KONTRON INTELLIGENT MINICOMPUTER



The ultra-compact (214 x 196 x 153 mm), KIM (Kontron Intelligent Minicomputer) multifunctional box PC family of products is freely scalable in processor performance up to an Intel® Core™ 2

Duo with PCI Express for high end applications.

These long-term available and versatile minicomputers are based on Kontron's mini-ITX embedded motherboard family and offer a free PCI slot for customized expansion cards. The KIM is used in commercial IT applications and in embedded markets such as gaming, medical, POS, and test & measurement.

The onboard graphics processor independently controls up to two flat panels on dual channel LVDS and dual DVI ports. All KIM versions come with an onboard 3D graphics chipset; internal AGP or PEG slots provide additional interfaces via ADD2 cards.

All KIM minicomputers offer 6 x USB 2.0, 3 x Ethernet (10/100/1000 Mbps), 4 x RS232, 1 x Firewire, PS/2, LPT, and an external VGA port as standard interfaces, regardless of chipset and processor. An internal 3.5" slot provides space for a SATA hard drive. Top-quality solid state media such as compact flash and SSD can also be used as storage mediums.

KONTRON THINK I/O



The Kontron ThinkIO family integrates current PC technology with a modular I/O system in a compact, industrial design. The DIN rail PC is available

in a rugged aluminum enclosure with either an Intel® Pentium® M, or with an Intel® Celeron® M, which features an extended temperature range of 40 to +70 °C. The ThinkIO Duo model also offers Intel® Core™ Duo processor performance and fanless design, along with a Profinet RT Controller, Profibus DP, and CANopen master functionality.

The passively-cooled, EMC-safe, shock-, and vibration-proof ThinkIO provides a Compact Flash socket for data storage and for backup purposes, and standard PC interfaces (2x USB, DVI analog and digital, and 1x serial). Two independent (fast) Ethernet ports, optically isolated digital I/O (24 V DC), and optional field buses (Profibus, CANopen, or DeviceNet interfaces) enable integration with both modern and traditional industrial networks. Due to the industry-standard form-locking connection terminals on the granular Wago I/O System 750 and 753 intelligent terminals, the standard ThinkIO product is able to achieve a high degree of freedom in the design of application-specific configurations. In addition to traditional analog and digital interfaces, variants such as AS-i bus, SSI and incremental encoder, and serial interface modules with RS232 and RS485 interfaces can also be mounted on the rail.

Operating system support is offered for Windows XP Embedded and Linux. SoftSPS real-time Linux is also optionally available.

Conclusion

The robust and compact ThinkIO embedded IPC offers OEMs such as Rohde & Schwarz the chance to reduce their time-to-market significantly by building on an open platform. Thus, they can concentrate on their core competencies, such as software development and application system & portfolio integration. Due to the highly available, flexible, and robust design, the total cost of ownership achieved by the end customer is also reduced. The openness of the development platform also helps protect the investment of plant engineers and operators, and open software and hardware interfaces aid in the creation of custom builds as well as application-specific customizations.

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Figure 2: The R&S Power Measurement System R&S-TS4506 with open KVM



Figure 3: The R&S Power Measurement System R&S-TS4506 in a 19" rack



Figure 4: USB Power Sensor type R&S NRP-Z11

About Rohde & Schwarz

The Rohde & Schwarz electronics company is a leading solution provider in the fields of measurement, broadcasting, radio monitoring, and radiolocation, as well as secure communications. Established more than 75 years ago, the company has a global presence with its services and a dedicated service network in over 70 countries around the world. It has approximately 7,400 employees and generated a net revenue of €1.2 billion in fiscal year 08/09 (July-June). The company headquarters are in Munich, Germany.

The quality and environmental management system of Rohde & Schwarz has been certified according to DIN EN ISO 9001 and 14001 and meets the requirements of AQAP 110 and 150. The company is authorized for the development, manufacture, and maintenance of communications equipment for aviation and is the first German transmitter manufacturer authorized to provide BZT (Bundesamt für Zulassungen in der Telekommunikation) certification for radio transceivers in Germany.

About Kontron

Kontron, the global leader of embedded computing technology, 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

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