

➤ Kontron Solutions@Work

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Embedded Computer Technology in Maritime Recording Equipment

➤ (Cool) Monster sighted on Luxury Liner 'Aida Blue'

Large shipwrecks like those of the „Jan Heweliucz“ and the „Estonia“ in the mid-1990s led to the realization that flight recorders mandatory in aviation should also be, in similar forms, used in shipping. According to the regulations of the International Maritime Organization (IMO Resolution A.861), a UN organization for maritime safety, these 'Voyage Data Recorders' must be used on all RoRo (roll-on/roll off) passenger ships beginning July 1, 2002. In similar terms, they are also stringently required for all new vessels of 3,000 GRT or more. However, old "barges" without passenger traffic presently are not yet required to have them installed.

Nevertheless, underwriters would also like to see this class of older vessels be included in new regulation. Smaller class B, C and D ships will likewise have to be equipped with Voyage Data Recorders. The details of the legislation are regulated by each state authority.



For example, Germany and other European countries require that Voyage Data

Recorders must also be installed in rescue craft and military fleets. Furthermore, all passenger ships with



a capacity of 1000 passengers or more must install such a 'black box' by October 2006. The entire 98/18/EU regulation covers capacities down to 400 passengers. These types of ferries must have a black box installed by 2010 at the latest.

Further legislation is currently introduced worldwide and should be implemented by 2010. Consequently, the still young market for this technology will grow strongly in the future.

One company that has specialized in this market segment is AVECS Bergen GmbH, a subsidiary of AVECS Company AG, which has been active for

years in the area of “decision support systems for emergencies on sea-going vessels”.

AVECS Bergen was founded in 1999. To-date, the company has already equipped ten percent of ships sailing the world’s oceans with their Voyage Data Recorder “MER” (Marine Event Recorder) and so has become a world market leader in this field. AVECS Bergen was especially successful in Europe, since the company enjoys patent protection against competitors here. With each new vessel, installation of their system is virtually ensured.

Among the first installations, for example, is the clubship AIDA BLUE or the MS ARKONA. Also, the Greek shipping company “Super Fast Ferries” equipped its fleet of ten Fast Ferries with the Marine Event Recorders (MERs), four of them on the Rostock-Helsinki line.

A SIMPLE BUOY IS DIFFICULT TO DISTINGUISH FROM HIGH-TECH-RECORDERS

Voyage Data Recorders (VDRs) cannot be recognized immediately by the untrained eye. Not to mention that in the first versions, they were not designed to sink with the ship, but rather floated like a buoy.

Today, they are attached securely to the ship in square dipping caps and do not look any different from the inconspicuous waterproof boxes that are installed on the deck and/or on the bridge. The inside of these deep sea-suited boxes is loaded with high-tech electronics, which can record several GB of data from heterogeneous sources and store



them for more than 12 hours. For example, a special rule algorithm stops the recording at the time of a collision so that the crucial event window remains documented. Thus, the stored data offers the basis for a realistic and objective evaluation.

The MER’s replay system permits internal shipping line analysis of all the integrated system processes via a data concentrator while the ship is operating. In addition, statistics and prognoses derived from those data – even without an event – enable long-term planning to ensure value preservation and the vessel’s safety. Crew training can be conducted through additional options offered by the solution. All data can be transmitted directly onto control panels. For this, only a connection with the system is required.

The core task is and remains however data gathering in the case of an emergency. The near-comprehensive documentation of such events is already possible. In heavily traveled waters an even more comprehensive documentation will be possible at last with the implementation of respective national legislation. Collisions for example can also be documented by ships traveling some distance away. The MER by AVECS Bergen was already admitted as evidence in maritime court proceedings. Although the ship was several nautical miles away from the location of the incident, with the recorder as a “witness”, the data provided objective and thus crucial references.

Specialists in Maritime Data Processing from heterogeneous sources

AVECS Bergen’s core responsibility is the integration of extremely heterogeneous infrastructures existing on vessels and the management, consolidation and evaluation of these complex data. Data is logged by radar and positioning and speed recording instruments, and radio traffic. The data arrives at the central data interfaces through other interfaces like NMEA (the National Marine Electronics Association), Ethernet, RS422, as well as digital and audio interfaces. The central interface



was modularly laid out on-site on account of the heterogeneous requirements.

The main computer intelligence comes from Kontron (formerly PEP) in Kaufbeuren. The data is transferred from this central collecting point to the bridge of the ship via Ethernet to the final MER system in the buoy, which is likewise equipped with its own intelligence. For the hardware solution, again Kontron – this time in Deggendorf (formally JUMPtec) - was chosen.

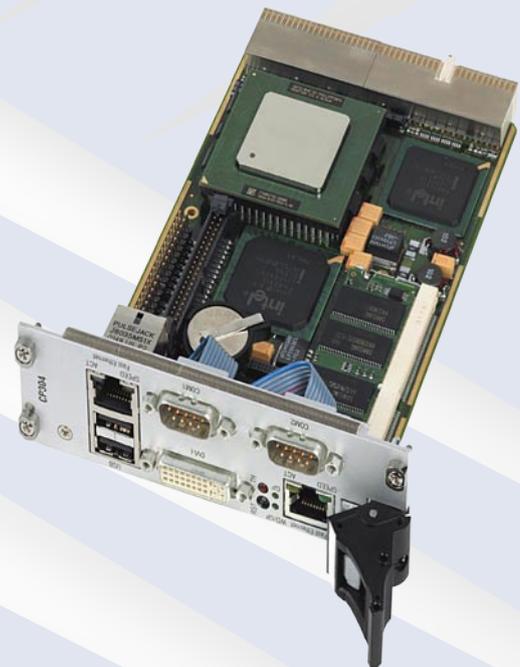
For both solutions it was important to the Ruegen-based company that the hardware originate from Germany because it wanted to have direct access to the manufacturer's employees and did not want any language barriers. Therefore, the solutions of companies outside of Germany or even outside of Europe were not considered. They were not interested in Far Eastern suppliers, as these were noted particularly for their constant design changes. Long-term availability was the second main criterion for AVECS Bergen. The specific requirements were crucial to the form and functional development of the two solutions. An undeniable factor in the selection of a suitable supplier was the fact that the two Bavarian companies also attended an in-house meeting in Ruegen, so that accordingly they felt that they were being taken seriously.

CompactPCI for the data collector

Modular CompactPCI systems are ideal for connecting heterogeneous peripherals to systems

that are highly-accessible and robust. Of course, there should not be any moving parts such as fans or rotating hard disks. In addition, the separate modules are easy to mount, are mounted vibration-proof at the front, and are quickly connected to various ship devices.

Currently, the CPU module CP304 is deployed. The CP304 comes with a flexible processor base, which makes its unleashing of computing power very flexible too. Besides flexible computing power, there are also the communication options, which make the CompactPCI computer the ideal compact server: besides two Ethernet channels, the CompactPCI board has two USB ports, two COM interfaces, and a VGA-CRT or a DVI socket. The module has passive cooling, is available in 8TE width and can be fitted with CompactFlash, an HDD-Microdrive, or a 2.5-inch HDD, as required. The board has E2PROM to

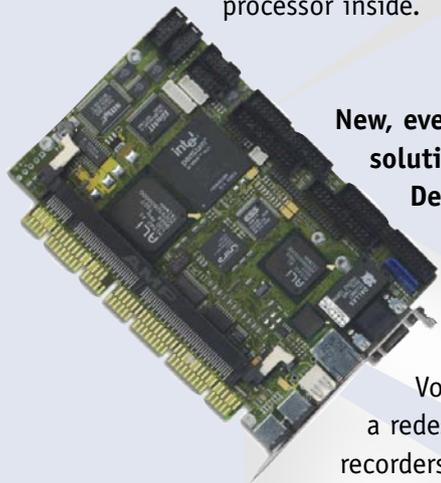


store BIOS settings and QNX boot parameters as well as over 2MB of Flash memory. Kontron also offers an add-on Ethernet boot and PreBoot agent to the standard BIOS.

PISA for the latest MER system

Saving space and power were especially important in the latest MER system. In addition, the CPU

module was designed to directly support enough peripherals and provide a PCI and ISA-bus with the smallest footprint. The ideal configuration was found in the PISA form factor, which implements PCI and ISA in a half-size format, for which PICMG modules need the complete format. In hundreds of buoys on deck coolMonster-S CPU-modules are in operation today, with the Intel Pentium MMX processor inside.



New, even more compact solution during the Design-In Process

As part of MER's ongoing progress towards the MER-NVDR (National Voyage Data Recorder) a redesign of the final recorders is currently underway, which will enable also data collection. The system will be positioned directly above the bridge, which would make no sense with large ships over 3,000 GRT, but is especially practical in this case. The overall solution is reduced to minimum dimensions here. The coolMONSTER/VE will be the server and is available in two fanless versions with 300 MHz and 600 MHz VIA Eden processors from Kontron.

Thanks to the very competitively priced VIA processors, the boards are extremely economical compared with similar high performance Intel-based systems. Another distinguishing feature of the coolMONSTER is its S3 Savage 4 graphic engine, whose graphics performance is equal to an Intel Pentium MMX-based system and provides up to 32MB of VRAM UMA. The unventilated VE- (VIA Eden) versions are coolMONSTERS in the truest sense of the word: built to a low-power design, the heat they generate is considerably reduced, so no active fans are required. Its memory can be easily amped

up to 1GB of SDRAM-DIMM. Thanks to its fast



UDMA-100 hard disk interface, data is not slowed down when reading and writing to disk.

Simple upgrade

Since all Kontron coolMONSTERS have an identical pinout for all interfaces such as 10/100 BaseT Ethernet, USB, COM1-4, mouse, keyboard, CRT, IrDA, EIDE (2.54mm and 2mm), LPT, dual floppy and sound, the upgrade for AVECS Bergen can be completed quickly.

A pragmatic approach to the Design-In problems that occur from time to time always makes sense. The standard RAM, which Kontron boards come with, was too high for the CPU's thermal coupling through the housing. A phone call to the product manager revealed that alternatives are available. A few days later the new chip was on the developer's desk and the problem was solved.

The board's processors are not just mounted either, they are - really embedded - soldered on. With a bolted on chipDISK a highly stable complete system is achieved even under the harshest conditions in half-size format.

The fact that conditions at sea are rough goes without saying. That's especially true with black boxes, which in the worst case scenario have to function for at least an extra hour: the container protecting the disk has to be waterproof and pressure-tight to a depth of 6,000 meters, resist extreme temperatures from fire over long periods of time, and much more. The requirements are laid down in standards IEC 61996 and IEC 60945. The new MER-NVDR system will take these compliance tests soon.



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