Philips Medical Systems Chooses INtime for Critical Real-Time Control

Since creating the first x-ray tube in 1896, Philips Medical Systems has long provided one of the world's most robust portfolios of medical systems for faster and more accurate diagnosis and treatment. With real-time control running on INtime® from TenAsys, Philips Medical's Windows®-based EasyDiagnost Eleva and MultiDiagnost Eleva x-ray systems reflect the company's commitment to delivering the highest image quality at the lowest possible dose, while enhancing quality of care and increasing productivity.

Many of today's control applications require the stability and reliability provided by a hard, deterministic Real-Time Operating System (RTOS). But the requirements for medical instrumentation in a hospital environment are perhaps the most critical.

The engineering team at Philips Medical in Hamburg, Germany, designed the EasyDiagnost Eleva and Multidiagnost Eleva x-ray systems using INtime from TenAsys for real-time control.

High-speed serial communications between subsystems is a key component of the Philips systems. The MultiDiagnost Eleva is a multi-purpose x-ray system with extended capabilities in vascular and interventional procedures, such a calcified plaque detection. The system recently won a presti-

The EasyDiagnost Eleva's custom controls are driven by the INtime RTOS.

gious iF award from the International Forum Design GmbH in Germany for its unique geometric C-arm and tilting table that facilitate patient access, position and general comfort as well as enhanced operability and sterility. The Eleva Examination Control ensures optimal application flexibility and customizable x-ray functionality.

"You need real-time capabilities to produce the stable systems required in hospitals," says Erich Heins, software group leader at Philips Medical. "For that reason we are using INtime from TenAsys in the MultiDiagnost Eleva and other x-ray systems."

The MultiDiagnost system won a 2003 iF award in the product design category.

Says Software Project Leader, Sven Kuehl, "We use INtime for those areas of the system where movements are controlled and where radiation is controlled. Those are two areas where we need the most reliable software. Real-time behavior is necessary for control unit accuracy and where response times for components like shutters is very short."

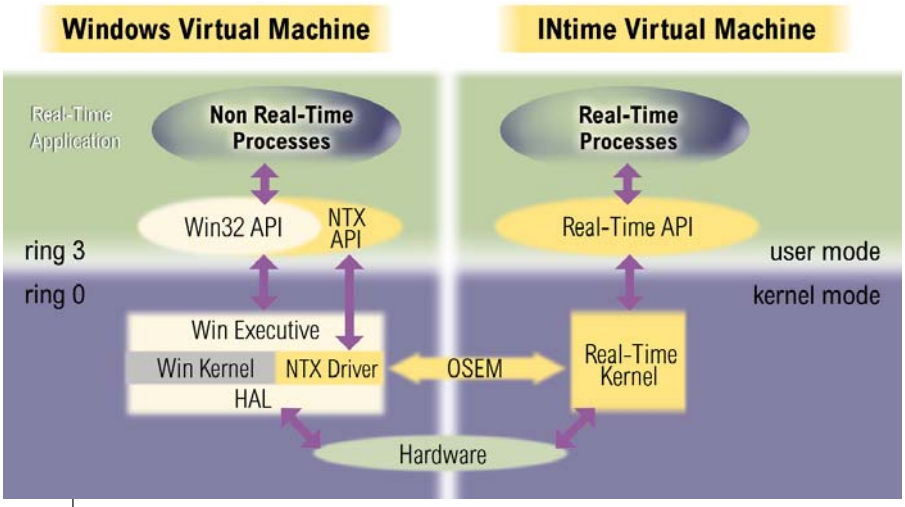
Unique INtime architecture protects real-time processes from possible Windows crashes

The INtime real-time extension combines deterministic, hard real-time control with standard Windows operating systems without the need for additional hardware. The unique INtime solution creates two virtual machines on a single CPU, providing isolation between the two kernels. This dual-kernel provides bulletproof protection from Windows "blue screen" crashes, which is so critical to hard real-time applications. The INtime solution is cost-effective, easy to develop and maintain, and delivers microsecond response time with complete control..

Start from scratch with INtime, or migrate from iRMX

In the early 1990s, the Philips engineers built their x-ray systems on iRMX, a robust RTOS developed at Intel® Corporation to exploit the computing power of the x86 chip. "In our earliest EasyDiagnost system, we had to ensure predictability while working with cycle-times of 10 miliseconds for the control loops, and that was one reason we chose iRMX," explains Heins.

Although the RTOS-based EasyDiagnost was a successful and revolutionary product for its time, the Philips design team recognized the increasing need for its diagnostic equipment to interact with the hospital enterprise. With Microsoft Windows clearly the operating system of choice for enterprise systems, their strategy



INtime creates two virtual machines on a single CPU, protecting the real-time system from Windows "blue screen" crashes.

was to develop the next generation product on a Windows platform.

Windows is quickly becoming the preferred platform for building highly intelligent automated systems. It is full featured, reliable and secure, even in the rigors of the medical environment. "The added value of Windows functionality for the clinical user is connectivity to the hospital network for patient administration and database access," says Kuehl. "We based the second generation of our Diagnost system family, DuoDiagnost, on a Windows 3.1 platform. The decision to adopt a Windows platform was made easier because we knew we could migrate the existing iRMX real-time control program to iRMX for Windows."

Continually evolving the Diagnost products, Philips Medical now offers its customers the advanced, state-of-the-art EasyDiagnost Eleva and MultiDiagnost Eleva. Says Kuehl, "For real-time control of our first systems we used iRMX. We then migrated to iRMX for Windows. We have now migrated to the TenAsys INtime product running together with Windows NT."

Other organizations with applications running iRMX on an isolated real-time box may find their customers demanding Windows compatibility. TenAsys offers an easy migration path for porting their systems to the Windows PC platform. Says Heins, "Our decision to go to INtime was based on our long history with iRMX. INtime was available for NT and we knew it would work — and it works fine. It was not at all difficult to port the iRMX program to INtime. This helped keep our engineering resources to a minimum for the real-time component of the new system. At some point, we will likely migrate to XP and still use the same INtime kernel."

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Microsoft Windows Embedded Partners keep current with OS updates

TenAsys is a Microsoft Windows Embedded Partner and committed to keep pace with Windows innovations — a critical consideration to customers like Philips Medical. "Although the demands on the real-time software is slowly increasing," says Kuehl, "The proportion of real-time demands to enterprise demands is decreasing. We are adding a lot more Windows functionality to add value for the clinical user. With the EasyDiagnost Eleva and MultiDiagnost Eleva systems, for example, direct database access allows the radiographer to download the exam- and patient-related presets for each examination. The technician simply selects the procedure through the user interface to obtain all relevant instrument settings, and they are pre-programmed to each user's preferences. This increases efficiency and reduces potential operator error."

Because TenAsys keeps iRMX, iRMX for Windows and INtime up-to-date not only with Windows but with new components as they become available, it is easy for customers to keep their systems up-to-date as well. Says Kuehl, "Real-time communication is stable over all of the instrument subsystems so we only have to adapt the real-time software to newer versions of the components that are managed by our system controller."

Unparalleled local and global support

Customer support is important to the engineering team at Philips, and always a priority at TenAsys. Says Heins, "INtime has a quick development process so the tools are available to do the development from the design to the implementation. Of course there were small, small things, but in general I would say we had no problems with porting or updating our INtime system. Working with INtime helped us get our products developed in time."

Kuehl adds, "Working closely with Robert Buehlmann at Profimatics GmbH, TenAsys' partner in Barmstedt, Germany, we have a very short line to TenAsys. If we do encounter any problems, we get help immediately. For real problems, Robert works with us closely and very well. We also have regular visits from people at TenAsys headquarters in Oregon. I have the feeling they care about us."

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