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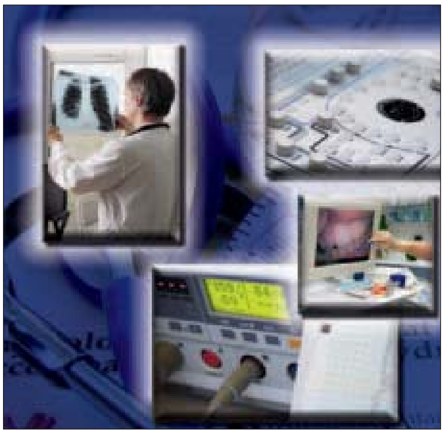
Game-changing performance for new medical devices

Game-changing performance for new medical devices

By Bob Ghaffari and Conor Clancy, Intel

Ultra-low power, multicore architecture, integrated technologies, scalable platforms – all features of the new embedded Intel® architecture



■ It's an indisputable fact that computing technology is now a vital tool in the practice of medicine, rendering many traditional medical devices obsolete. For example, electronic medical records (EMRs) are replacing handwritten versions. And ultrasound – once used almost exclusively for obstetrics – is becoming the "stethoscope" of choice for a variety of providers. Several trends (see table on next page) are fueling the shift to technology-based health care methods. Yet most of the devices available today are simply better versions of older technology, or automated versions of manual processes. Medical industry experts agree that these are inadequate solutions and have called for the development of new technologies to help resolve the growing health care crisis.

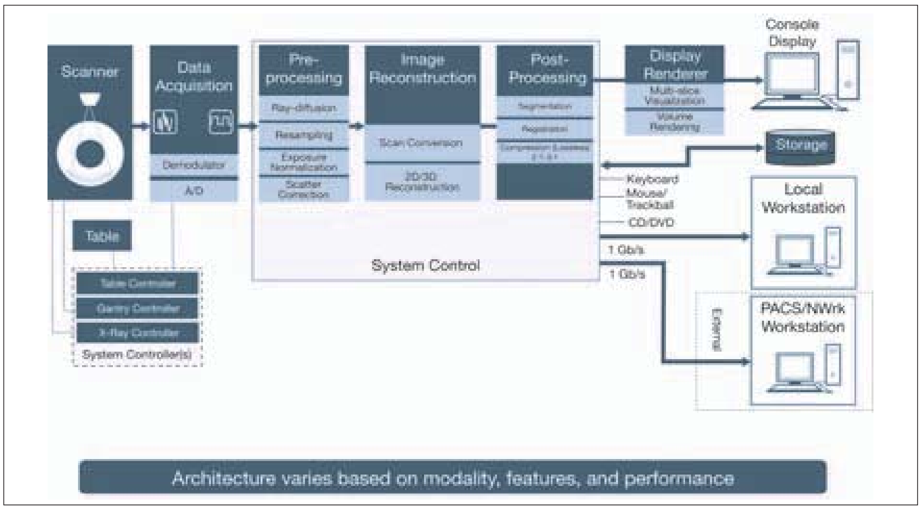
We are talking about a whole new class of devices and technologies, not just adding new features to existing solutions. Early designs might include handheld systems that run on a battery and are wirelessly connected to the network, such as a pocket-sized ultrasound device. Later you might consider systems that run multiple applications – diagnostics, monitoring, dosing, and record-keeping, for example – allowing one device to perform many tasks. As you consider the technical implications of these trends, it might be good to know that Intel is one of the leaders in the development of standards-based technologies and high-performance/ultra-low power solutions that will allow you to deliver on these needs. In fact, Intel has power and performance-efficient multi-core processors available today, and industry experts agree that the company's long-term roadmap indicates that Intel's performance and low-power advantage will likely continue for several years. For example, a new, soon-to-be-announced category of ultra-mobile processors will be capable of supporting designs of less than 5 watts.

Intel is also one of the drivers in the development of standards important in the medical industry, including specifications for sensors, connectivity, aggregation computing and services, so that future solutions can be interoperable and compatible. As a member of the Continua Health Alliance (www.continuaalliance.org), Intel is working with other industry experts to study the standards, technologies, devices and applications needed to address the challenges in health care.

Intel also offers integrated platform technologies – such as virtualization, sleep state management, dynamic execution, efficient memory access, graphics, secure authentication, flash disk, quick assist, and active management technology – that will allow for the design of small and efficient devices. And because all Intel chips use the same architecture, you can reuse software across multiple solutions for maximum scalability and efficiency. Several small form factors suitable for new medical devices and applications are in production or under development, including the variants of COM Express, Mini-ITX, ETX and other form factors that can get as small as the size of a credit card. The potential benefits of these designs include a longer battery life, fanless enclosures that can be sealed from moisture and dirt, and the ability to make devices cool enough to hold in the hand – all features vital in the medical field. *(www.intel.com/go/medical_embedded)*

Such designs are possible because of greater efficiency in both power and performance. Intel took the lead in this area in 2006 with the launch of the new Intel® Core™ microarchitecture. This engineering accomplishment has allowed Intel to double and quadruple the performance of its chips without changing the footprint or increasing demands on power.

Future generations of this multi-core architecture are expected to have dozens, if not hundreds, of cores. Other planned power-performance efficiency advancements include a soon-to-be-announced line of ultra-mobile chips that operate at very low power, and complete system-on-chip designs that will allow developers to use just one embedded Intel processor instead of two or three.



This diagram represents a general medical imaging system which can be varied in both features and performance through the addition of third-party co-processors. The scalability of Intel® architecture is especially suitable for computational and/or display applications, such as medical imaging.

Intel is also integrating advanced technologies into its processing platforms for even greater system efficiencies. Several these technologies can be valuable in addressing the needs of the medical industry, including:

Virtualization: Intel® Virtualization Technology (Intel® VT) allows multiple applications to run on a single platform or device as if they were running on separate systems. Virtualization solutions enhanced by hardware-based Intel VT allow a platform to run multiple operating systems and applications as independent virtual machines. For example, a monitoring device in the ICU can run critical care functions in isolation from the Windows* client functions needed for the device to interact with the hospital network.

Trends and Challenges in Health Care ⇒	New Care Methods and Technologies ⇒	Technical Implications
▪ Rising Costs ▪ Shortage of facilities, doctors, and nurses ▪ Chronic conditions ▪ Aging population ▪ Remote, underserved populations ▪ Rapid growth of data ▪ Expanding treatment options ▪ Stricter regulations for record-keeping, patient privacy, etc. ▪ Difficulty maintaining a continuum of care – from hospital-clinic-doctors' office-home	▪ Mobile/Portable diagnostics and treatment – taking care to the patient ▪ Monitoring and treating multiple patients simultaneously ▪ Remote diagnosis and monitoring ▪ Patient-administered treatment/care regimen ▪ Process modernization (from paper/manual to electronic /automated): EMRs can be shared among providers and facilities ▪ Safer and more effective non-invasive out patient procedures	▪ Very high performance at ultra low power ▪ Strong graphics support ▪ Reliablity ▪ Long life product availability ▪ Low thermals for fanless operation, low noise, and cool to the touch ▪ Tightly sealed enclosure, free from dust, moisture ▪ Long battery life ▪ Easy to use ▪ Network everything ▪ Remote access and management ▪ Support for multiple functions and operating systems from one device ▪ Huge data stores

The medical industry faces a number of challenges that all affect the methods used to provide health care. In many ways, these new care methods depend on technology. The design and engineering implications for board and solutions developers are significant.

Intel® Active Management Technology: Any networked device can be managed remotely with Intel® Active Management Technology. Although not necessarily vital to medical devices, this integrated advanced platform technology allows for remote access and management of medical devices or equipment – a feature that could become more important as more devices are used in remote settings (e.g. the home) or dispersed throughout a hospital network or clinic.

Intel® QuickAssist Technology: Intel is ushering in a new generation of accelerator-powered computing through a variety of initiatives under the banner of Intel® QuickAssist Technology. This "open attach strategy for accelerators" provides a consistent set of platform-level services for accelerators through an accelerator abstraction layer. In addition, new system-on-chip designs will include chip-based acceleration engines for cryptography and content processing that will be completely integrated with Intel platforms yet be accessible to ISVs and others in the field of computing innovation.

System-on-Chip (SOC): Intel has announced a new family of enterprise-class processors that will combine multiple system components into a single chip design. Instead of three chips on a board, the new SOC products will allow developers to use just one Intel architecture-based processor. The benefits of the new SOC include lower system and development costs, easier design, smaller form factors, and even greater power-performance efficiency.

Power-performance efficiency is perhaps the most important reason to choose an Intel chip for your next medical design. And when you consider the added benefits of integrated advanced technologies, you might call it good. But there are even more reasons why using an embedded Intel processor makes sense; All Intel processors are built on the same, underlying x86 Intel® architecture. As a result, your designs are truly scalable from top-to-bottom in performance, features and value. Scalability of the Intel processor family allows you to reuse your software across devices and equipment without changing your code. You can scale down your high cost professional equipment for the consumer markets by repurposing the same CPU architecture.

And the range of products allows for flexible definition of performance, power, features and price across your entire product line. Scalability also protects your design investment for future products because you know that your software will run on new generations of Intel chips. Similarly, you can more easily recertify existing technology products for the health care marketplace. Because Intel architecture is in many of today's PC clients, servers and networks, new medical devices can more easily be integrated with these functions. Intel chips already support the operating systems and hardware peripherals that are most commonly used in networks today. Look for the following power/performance-efficient Intel processors and chipsets for your next medical design:

Quad-Core Intel® Xeon® Processor Family: Single- or Dual-processor platforms based on the Quad-Core Intel Xeon processor family provide high levels of computing for threaded applications delivering eight-thread, 32- and 64-bit processing capabilities. They are especially suited to applications that involve the merger of multiple medical image data sets from MRI, PET, CT, Ultrasound, Digital Radiography and other sources to create information-rich visualizations.

Intel® Core™2 Duo Processor Family: The Intel® Core™2 Duo processor provides two energy-efficient, mobile-optimized execution cores in a single processor. This processor is an ideal choice for lightweight portable imaging, diagnostic and monitoring devices that require processors with a combination of high performance and thermal efficiency. Usage examples include both cart-based and portable ultrasound scanners, depending on which chipset you choose.

Intel® ultra mobile processor technology: Intel® ultra mobile processor technology built with Intel® ultra mobile processor and Intel® ultra mobile chipset allows for a sub-7 watt solution in a fanless, embedded form factor. It offers application scalability to higher-end Intel architecture-based devices. Intel plans to extend the low power roadmap after Intel® ultra mobile processor and continue to push the performance/power/cost envelop though advancements in process technology and architectural innovations.

Tolapai, an SOC: Although not formally announced, Intel® QuickAssist Technology has been discussed at IDF and will be the first SOC solution based on Intel architecture. Tolapai can be used for applications such industrial control, security off-load, or small medical devices such as pulse oximeters. Because multiple chip functions will be integrated into Tolapai, it is expected to reduce chip sizes by up to 45 percent and power consumption by approximately 20 percent compared to a standard three-chip design, while improving throughput performance and processor efficiency. ■