

Advantech Embedded Design-in Forum

Technologies, Trends & Innovations for Embedded Developers

By Advantech Embedded Core Group

Advantech Embedded Design-In Forum (ADF) is a global event that brings together respected, leading industry representatives and Advantech experts to address and discuss the latest trends and technologies faced by embedded developers. The first run ADF was hosted in Taipei, Shenzhen, Shanghai on March, 2010. Subsequent, forums will be held in Beijing, South Korea, Japan, Germany, and other countries.



K.C. Liu, CEO, Advantech, presenting the opening speech: Mega Trends in Embedded Computing Solutions

With the advancement of technology and fast-changing market demands, the IT industry is facing a major transformation. Vendors need to provide specialist products quickly to meet the growing demand for intelligent terminals and automation equipment. K.C. Liu, CEO of Advantech stated, "Being just a board provider does not fulfill the customers' needs any more. Based on our long-time embedded experience, we not only provide total solutions, but we also understand the range of needs within the customers' product design process. As a result, Advantech now provides a full range of embedded platforms, and also integrates them with all of our internal and external resources to provide a range of specialist design-in services."



Booth Showcase, ADF Taipei in TICC, March 3

ADF helps everyone take advantage of changing technology and advances business success through collaboration with other industry leaders and experts. As a leader, Advantech demonstrates its commitment to developing advanced services and platforms that give our customers the edge.



Cafe Chat: Talk with the experts - Embedded BIOS

Trends in the Embedded Market

Mega Trends in Embedded Computing Solutions

With the Internet's popularity, eBusiness opportunities have flourished since 1995. The trend toward an ever smarter planet will make a great impact on the current generation. In order to build an intelligent planet, embedded systems must possess three capabilities: sensitive perception (Instrumented), comprehensive Internet connectivity (Interconnected), and intelligence (Intelligent). This will change the function of embedded computers from general purpose to application-oriented and service-oriented platforms. Advantech, as a platform provider, will cooperate with software, hardware, and system integration partners to create service-oriented, intelligent, and connected embedded solutions well beyond the role of traditional embedded computers.

Transforming the Next Generation of Embedded Computing

Eric WP Chan, Director of Intel ECD Asia said that, "In addition to mobile phones and computers, there are many devices which will support online functions, including home

appliances, automobiles, and Machine to Machine (M2M) applications. According to the forecast, there will be over 15 billion pieces of Internet equipment in the global market by 2015." Intelligent networking applications continue to develop in various fields including government projects, public construction works, social and economic infrastructures, and technology research and development; in all of these, next generation embedded computing technology will play a key role. For example, the construction of smart energy grids are imperative and have far-reaching implications for industry and society as a whole, with requirements for intelligent meters, energy storage, transmission and distribution networks, intelligent switches and sensors, information analysis and management software, all of which have to be designed and implemented. Furthermore, there will be more intelligent designs for vehicles, with personalized user interfaces, smart driving assistance functions, as well as programmable remote update capabilities for vehicle information and communication.



Eric WP Chan, Director, ECD Asia, Intel, presenting the keynote speech: Return to Growth, Transforming the Next Generation of Embedded Computing

Building Three Screens and a Cloud

Jim Fredricksen, Sr. Director of Microsoft Global OEM Server Sales introduced the concept and vision of “three screens and a cloud”. The three screens represent traditional computers, mobile phones, and televisions. Through the interaction of these screens and the cloud, in this instance empowered by Windows Azure with its natural user interface, the various communications needs of consumers can more easily be merged into one another for a more seamless and powerful experience. In this framework, Microsoft can provide consumers with familiar products and services from anywhere. “Cloud computing services are rapidly developing in many applications and changing the infrastructure with far-reaching impact on the lives of everyone. For example, users can easily edit digital content through a Context-Aware System to acquire the most needed real-time information,” Fredricksen said. Now a user can easily get the software tools they need to improve work efficiency, and share information with family, friends and colleagues on a variety of different devices—from anywhere. It is also worth mentioning that Microsoft has developed a new innovative user interface

called the Natal Project which is whole-body motion sensor technology. Through the natural user interface, the human body can be the controller in a game or an application. This kind of technology provides a controller-free interface and will enable a whole new wave of applications in the future.



Jim Fredricksen, Sr. Director, Global OEM Server Sales, Microsoft, presenting the keynote speech: Building Three Screens and a Cloud

Business Strategy of Advantech Design-In Services

In view of evolving embedded board technology, Advantech established Embedded Core Services, which includes the computing platform, design-in services, and software solutions. Miller Chang, AVP of Advantech Embedded Core Group said that Advantech not only associates with Intel products to provide embedded boards, but also gets an early

start on development of the next generation of embedded boards. At the same time, Advantech is focusing on the core features of embedded intelligence platforms, such as low power consumption, compact form factors, reduced software complexity, and plug & play.



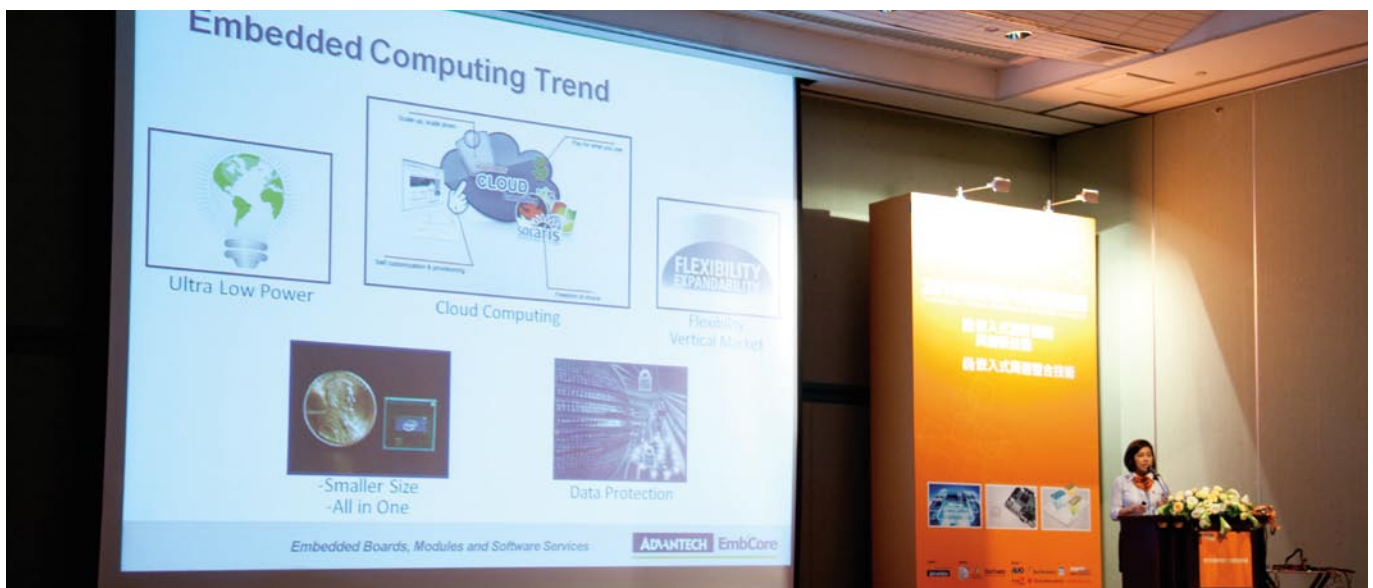
Miller Chang, AVP, Embedded Core Group, Advantech, presenting the keynote speech: Business Strategy of Advantech Design-In Services

With regard to software development, future trends include the Extensible Firmware Interface (EFI) architecture, intelligent management, real-time OS, system security, remote access, and crisis recovery. Advantech has integrated development services for embedded BIOS, OS, and software API to satisfy the demand from vertical markets. Embedded Core offers three EFI solutions: embedded EFI BIOS, embedded EFI Pre-Boot application, and embedded EFI Remote Management solution.

Moreover, Embedded Core intelligent management is able to perform cross-platform management functions including data security, hardware and smart fan monitoring, and provides a three-layer security mechanism which covers the BIOS,

platforms, and storage devices for more reliable system security as well as remote access and crisis diagnosis. Embedded Core Services can also provide industrial embedded modules, such as storage modules, wireless modules, and LCD panels and touch controllers.

For embedded design-in services, Embedded Core Services provides advanced software and hardware to help design-in energy-savings, better thermal performance, and reduced EMI mechanism solutions, as well as integrate peripheral designs that improve system reliability and security. Chang stressed that Advantech established close ecosystem partnerships to collaboratively provide total solutions.



Sandy Chen, Product Manager, Advantech, presenting the technology session: Next Generation Embedded Platforms & Solutions

Next Generation Embedded Platforms & Solutions

There are some important future trends coming such as cloud computing, better data protection, highly integrated chipsets, ultra low power consumption, and flexible scalable designs that focus more on vertical markets. By far the most important trend is cloud computing. Cloud computing reduces the dependence on client-end applications, so some applications and data will be kept remotely on servers “in the cloud”, this in turn will reduce the performance level requirement on some hardware. Furthermore, data protection and privacy issues will be crucial if cloud computing is to really take off and individuals and enterprises are to be reassured. Flexibility in design is important for specific vertical markets such as transportation, health care and gaming which have their own special I/O needs. Highly integrated chipsets allow designs to be smaller and more efficient, and ultra low power consumption saves energy and money. In addition, Advantech can offer reliable hardware and software integration services to meet any customer requirements.

In 2010, Advantech introduced four major new platforms to the market ranging from entry level to high performance level:

including DM&P's VortexDX86 SoC, Intel® Atom™ N450/D510 processor (the first Atom dual-core processor), mobile Intel® Core™ i7 with QM57 (supports up to 4 displays), and desktops with Intel® Core™ i7 Q57/3450 processors. Advantech's PCM-9562 with Intel® Atom™ N450/D510 processor offers COM6 and LAN3 port isolation to meet medical UL60601 standards. Port isolation protects the whole board and system if there's an electrical surge. PCM-9562 also offers two watchdog timers and has power off protection. On selected product lines like PC/104, 3.5", and EBX form factors, we support heat spreader thermal solutions to provide better thermal results.

The processor frequency on the Intel® QM57 platform is 2.66 GHz, a 30~60% CPU performance increase over previous platforms with support for DDR3 memory. The 3D graphic capability can support up to four displays, and with vPro Remote Control Management, it can diagnose and repair a PC remotely, perform asset traces and security management.

Advantech's SOM-5788 is based on the Intel QM57 platform. This is a highly integrated product with an API which supports: multiple control interfaces, advanced watchdog, smart fan, and hardware monitoring. And, through Advantech's eSOS system rescue software, a user can remotely diagnose and solve onboard problems. Plus, power consumption is ten times lower than the previous generation board.

DM&P Vortex86DX SoC is a low power x86 based processor with a frequency up to 1.0 GHz and dedicated FPU (Floating Point Unit) operation. The Vortex86DX is an ultra low power consumption platform; its non-graphics processing power consumption is 4W, and only 6W with graphic processing. It also supports the ISA interface and multiple I/O to fulfill legacy application requirements.

Advantech PCM-3343 and PCM-9343 with Vortex86DX are highly suitable in applications in harsh environments needing fanless designs. These two products come with DDR2 memory on board and also support extended temperature operation from -40~85° C or -20~80° C. A conformal coating option is available for environments that offer challenges from friction, dust, temperature extremes, or chemicals. These products are great choices for rugged environments.

In November, Advantech will launch a new product range based on future Intel® Atom™ processors with ultra low power consumption of around 5.5 Watts, and new products based on PC/104, 3.5", COM-Ultra and Q7 form factors. Advantech aims to provide the very latest processor and chipset platforms to achieve faster times to market.



Aaron Su, Product Manager, Advantech, presenting the technology session: Techniques for Embedded Design-In

Techniques for Embedded Design-In

Advantech Embedded Core Group emphasizes the benefits of hardware, software and services integration. In accordance with customers' needs, the Design-in team can integrate single board computers with peripheral modules and software and make use of global resources to facilitate production for a faster time-to-market. For an optimized thermal system, all components are comprehensively evaluated, including hard disks and CPU's to ensure system quality and reliability. Furthermore, the balance between cost and efficiency is also important, so in the design phase, a comprehensive detailed evaluation is carried out to prevent problems later on. As a result, we can provide unique thermal solutions based on simulation, sample testing and certification.

Similarly, Advantech power management solutions can expand value for customers. For instance, if you operate in

transportation centers like airports and stations, sudden power failures can be disastrous. If a flight information display system goes down it can affect thousands of travelers and result in chaos or worse. That's why Advantech's iManager power management system provides an "always on" option for dealing with power problems. In case of abnormal power, the system will automatically boot to remedy such problems. Hardware monitoring tracks temperatures, CPU speeds, voltages, fan speeds, and brightness; if any problems occur, the system will send an alert message, and take appropriate action. Compared with general monitoring tools based on the operating system which can only be executed after the operating system returns to normal, Advantech's iManager can do more accurate monitoring because it can start to monitor right from system boot up.

Embedded Technologies

Embedded EFI & Fast Boot Technology

Daniel Lin, Senior Program Manager of Phoenix Technologies said that, "There are many system issues to be discussed but the essence of these problems are contained in the BIOS." Phoenix Technology divides their product lines into two categories: one is legacy BIOS products which they have been providing for over 25 years, and which include Embedded BIOS® and SecureCore™. The other product line is Unified Extensible Firmware Interface (UEFI) BIOS SecureCore™ Tiano (SCT) which was launched in 2003 to support the Intel Extensible Firmware Interface (EFI) architecture and to provide more tools for the easy conversion to the Unified Extensible Firmware Interface. With these more complex BIOS, UEFI divides the BIOS into two segments. In the past, many features were based in the OS; today, these functions are implanted into the BIOS.

Phoenix technology has assisted customers in transforming from legacy BIOS to the new UEFI framework. There is a dedicated CE team developing UEFI further and helping transplant legacy BIOS features to ensure compatibility with manufacturing tools and offering production, training, and technical support.

Embedded customers generally have four major needs: the first is security, to protect privacy, data, authorization and accuracy. The second is connectivity, to ensure that the device can easily connect to the Internet via UEFI applications. The third is reliability, providing extended testing and debugging. The last is environmental design, which includes the battery and energy management. Due to the long evolution of BIOS technology, many features have been created with great precision using UEFI to give it even broader capability.



Daniel Lin, Senior Program Manager of Phoenix Technologies, presenting the technology session: Embedded EFI & Fast Boot Technology

Phoenix Technology is the first and largest BIOS manufacturer in the world. They specialize in UEFI applications, tools, and

OEM customized modules that help product differentiation, add more value, and improve time to market. Moreover, Phoenix Technology has an established partnership with Advantech of more than 15 years.

Windows 7 & Windows CE 6 Applications

"Looking to the future, Windows 7 is the roadmap of Microsoft's embedded operating system in 2010," said Nelson Lin, Senior Partner Technology Manager at Microsoft. Microsoft will introduce both the enterprise version of Windows 7 and the latest version of Windows Embedded Compact 7 for the consumer market later this year; this is the next version after Windows CE 6.0 R3. Windows Embedded Compact 7 with Silverlight will be upgraded from version 2.0 to version 3.0 to provide more useful tools for 3D UI development and also multi touch support. The new version offers better performance for browsing YouTube video and also supports Flash v.10.1, multi-core CPUs, as well as utilizing more than 512 MB of physical memory.



Nelson Lin, Senior Partner Technology Manager, Microsoft, presenting the technology session: Windows 7 & Windows CE 6 Applications

Based on the Windows 7 kernel, Windows Embedded Standard 7 will be launched in May 2010 to help differentiate products from embedded system manufacturers. For example, the system offers enhanced multi-touch, handwriting input, and a new Windows 7 user interface. Like any other Microsoft embedded OS, it enables developers to create a custom embedded operating system, and helps developers to create applications and drivers in the Visual Studio environment. Windows Embedded Standard 7 will support Silverlight and Windows Presentation Foundation. It will provide a richer Internet experience using smaller bandwidth, and IE 8 support will strengthen the networking capability of embedded devices and allow developers to use Windows online services; with additional support for 64-bit x86 processors.



Ekron Hsu, Senior Project Manager, PHISON, presenting the technology session: Flash Reliability Enhancement of Embedded Solutions

Flash Reliability Enhancement of Embedded Solutions

Ekron Hsu, Senior Project Manager of PHISON introduced the latest storage technology. Today, most mainstream NAND Flash memory is based on Parallel ATA (PATA). Because of the lack of speed, it is slowly being replaced by three specifications: one is the PCI-E solution (still less than popular), the second is SATAII (SATA SSD is the hottest solution and its next-generation specification, SATA-III, is expected to release this year with speeds up to 6 times faster than PATA), the third is USB 3.0 (USB is the most popular storage interface but 3.0 is premature). Many people believe that SATA SSD's speed and performance are the most important, but reliability is actually a higher priority for industrial products; reliability means security, and 90% of all developers are focused on it. The lack of reliability in embedded solutions can result in significant losses including system crashes, data loss, unrecognized devices, and data errors. Although performance or speed may not be great, it is important that a system keeps on functioning, that is the reason why reliability is so important. There are several ways to enhance reliability including Error Correction Code (ECC), wear leveling, bad block management, and read disturbance management. In connection with those technologies, PHISON

Electronics owns 177 patents in Taiwan, China, and the United States; and an additional 345 patents are currently under examination.

Touchscreen Panel Technology Trends and Consumer Market Development

"It has been 40 years since the first touch panel technology was revealed," said by Steven Lai, Regional Sales Director of Elo TouchSystems. At this stage, there are many vendors who have invested in it and it has a large annual value. According to estimates, the annual value was \$4 billion U.S. dollars in 2008 which increased to \$4.8 billion U.S. dollars in 2009, with an annual growth rate of 14%. This has been driven largely by the iPhone, and traditional large resistive technology has been transferred into the consumer market. In the next 3 to 5 years, an "all-in-one" with touch panel will flood the market and touch panel costs will drop significantly because of mass production for the consumer market. One technology that has been very popular recently is multi-touch, which was originally introduced back in 1992, and is now expected to be imported into the notebook. However, cost and lack of attractive applications are major problems for touch applications. More still needs to be done to attract users.

Most touch-panel technology vendors in Taiwan focus on 4-wire resistive but Tyco Electronics specializes in Surface Acoustic Wave (SAW) development. When the panel is touched by one or more fingers, four sensors around the screen detect the frequency and intensity of the waves generated, which can be used to calculate the touch position. Most of the SAW vendors calculate by intensity of the waves but Tyco uses the frequency. Each cell detects a different wave range and the waves are loaded into the chip; the touch position is calculated from the data. The technology is quite commonly used in single-touch applications. The multi-touch technology has been developed and is currently awaiting Windows 7 certification. One of the benefits of this multi-touch technology is low cost because it only needs one layer of glass with four sensors.

Right now, Projected Capacitive Touch technology is the mainstream technology used for the large touchscreens but the price is too high for embedded applications. The best solutions for embedded markets are infrared and SAW because of their high light transmission and low cost advantages.



Booth showcase, ADF Taipei in TICC, March 3

Industrial Display Technology and Trends

There are several industrial display technology trends, the first one is for greener products, and so the environmentally friendly panel has been gaining popularity. According to estimates, the market share will reach 55% in 2011. Product carbon footprint management and cumulative carbon emissions have also become global trends as they are important in meeting the Green Seal certification.

Debbie Chiu, Senior Manager of AU Optonics said “The LED backlight is a low-power, low-carbon-dioxide product. Its penetration is increasing. Notebooks adopted LEDs early on and TV manufacturers started using them last year. All AUO products of less than 15 inches are ready. Compared with CCFL, AUO expects the LED price to drop to an

acceptable range after 3 years and their volume of production will enlarge. Industrial market penetration is expected to be up to 50% after 3 years. With a ceramic package, the product life of an industrial LED backlight is 50,000 hours. The power consumption of an AUO 10.4-inch product is lower than CCFL by about 29%. This represents a reduction of 66 kg of carbon dioxide and saves about US \$11.40. Compared with RGB, AUO adopted RGBW technology which offers light transmission of 50%, with reduced power consumption, and a smaller number of LEDs.”

The second trend is touch technology. AUO developed their own embedded multi-touch technology, which integrated the touch control into the driver IC. It is a thin solution with good optical features, anti-glare, and can recognize up to 8 touch points or gestures. These kinds of products are suitable for POS, ATM, and KIOSK applications. Small sized products started shipping last year.



Debbie Chiu, Senior Manager, AU Optonics, presenting the technology session: Industrial Display Technology and Trends

The third trend is 3D display technology. There are many application markets, such as TV, advertising machines, and photo frames. To make things convenient for the viewer, the new technology should eliminate the requirement for 3D glasses. With the glasses, some of the technologies need to change the picture frequency up to 120 Hz and it has not gained popularity yet. Therefore, AUO chose to develop the technology without glasses.

The fourth trend is electronic paper. Through the acquisition of SiPix, AUO invested a lot of effort in development of Microcup® and has shipped several hundred thousand units using this technology. The last trend is Field Emission Display (FED) Technology, a technology transferred from SONY. Its design is similar to that of the CRT displays, and it is very important in the health care market. AUO estimates that mass production will begin in the first half of next year.

Trends in Embedded Computer Design

What are the trends in embedded computing design? How to seize the trends and opportunities to developing the next generation of embedded applications is the key topic of discussion.

Moderator: Jeff Chen, Chief Technology Officer, Advantech
 Participants: Eric WP Chan, Director, ECD Asia, Intel
 Steven Lai, Regional Sales Director, Greater China & ASEAN, Elo TouchSystems
 KS Pua, President, PHISON Electronics



Eric WP Chan
Intel

There are various changes in the embedded market that designers should pay attention to. Eric pointed out that software design is crucial. He believes that rightly directed, the R&D investment can quickly obtain the expected harvest. Software and hardware integration is a necessary condition. Intel® Atom™ processors provide design advantages of flexibility and low-power as well as being easy to incorporate, and therefore they are widely supported by partners and customers. For embedded design, Intel® has launched the exclusive Intel® Atom™ processor to offer satisfactory functionality for embedded applications.



KS Pua
PHISON Electronics

KS said that in order to enhance the reliability of environmental applications, embedded system development was used, adopting flash memory as the storage device. To reduce cost, flash memory used an advanced process that enlarges the storage capacity, but with certain tradeoffs, such as shorter product life and a slightly higher susceptibility to data corruption. But these tendencies are counteracted through chip control technology that extends the product life through ECC and other algorithms; and also enhances accuracy and reliability.



Steven Lai
Elo TouchSystems

In addition to processor and storage technology, Steven indicated that the touch interface is the most convenient and intuitive method of man-machine control. It has become the basic necessity of interface technology and has gradually entered the consumer market, as well as medical, automotive, home appliances and other embedded devices. Currently, there are many kinds of touch technologies, such as resistive, surface capacitive, projected capacitive, acoustic style, and optical. All of them have their own technical characteristics and application areas. For the future, Built-in Touch Technology with the panel process integration is worth noting. The design challenge in embedded computers is how to develop the control board to support touch functions.



Trends in Embedded Software

To differentiate the embedded application, software plays a key role, but to make the embedded platform more efficient and successful, innovation is the thing we need to realize.

Moderator: Miller Chang, AVP, Embedded Core Group, Advantech
 Participants: Michael Chiu, Director, Asia OEM Server Sales, Microsoft
 CT Wang, VP & GM, Greater China, Phoenix Technology
 Richard Lee, General Manager, Taiwan Division, Wind River



Michael Chiu
Microsoft

Regarding the development of cloud computing, Michael said that the transition from PC, to network, to cloud computing will shuffle the value chain of the industry ecosystem. In the future, there will be more and more embedded networking devices. Through cloud computing, we won't need powerful computing capabilities and we will be able to provide a variety of applications from anywhere. In this framework, cloud computing will serve as the processing hub, enabling Internet applications to be used just like your own computer or local area network is.



CT Wang
Phoenix Technology

CT presented his views on the embedded software development trends from the perspective of the end product, and said that the BIOS which is used to start up the operating system has now progressed to a new level where it provides more advanced features. For example, today's EFI/UEFI BIOS not only can boot, but also can drive Bluetooth, WiFi and other communication features at the same time. This means that the system is able to access the Internet just as it starts to operate. It also provides for more secure operation. CT pointed out that BIOS development aims toward creating innovative functions including more energy-savings, high reliability, shorter boot time, pre-boot, and multi-switching operating systems.



Richard Lee
Wind River

"In embedded system development, the importance of software is continuously rising. As SOC develops towards multi-core architecture, embedded operating system design is more complicated," Richard said. In systems development, software is even more important than hardware, and therefore it is worth investing more. At this point open software can acquire more flexible advantages in development, but optimization is the key to creating value. In the development trend toward service-oriented platforms, there must be some standard environment to plan the proper software for the demands of different industries.