Scalability

conga-BM67 - Extreme Graphics Performance
2nd Generation Intel® Core™ i7 processors up to 2.1 GHz
Maximum computing power and graphics performance

conga-BS57 - Ultra Low Voltage
Intel® Core™ i7-620LE processors up to 2.0 GHz
Computing power and graphics performance at low power consumption

conga-BE57 - ECC Memory Support
Intel® Core™ i7-610E processors up to 2.53 GHz
Error Correction Code (ECC) memory for controlled reliability

conga-CA6 - COM Express Compact
Lowest power consumption, extended temperature range
Based on Intel® Atom™ processor E600 series and Intel® Platform Controller Hub EG20T

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Embedded Intel® Solutions
WINTER 2012

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Cover image: Intel displaying its Smart Car with new features incorporated by researchers to enhance in-car experiences. These cars of the future will leverage major IT innovations to advance safety, security, efficiency, entertainment and sustainability.
Portwell’s flexible business model and optimized SFF boards & systems have helped numerous Medical, Networking, and Industrial OEMs reduce costs, save space, accelerate development schedules and extend system longevity. Contact us to learn how we can tailor our embedded solution offering to your exact needs!

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- Expansion I/O options

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- Extended temp Qseven modules
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- Custom carrier board design and manufacturing
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**Portwell’s** extensive product portfolio includes single-board computers, embedded computers, specialty computer platforms, rackmount computers, communication appliances, and human-machine interfaces.

We provide both off-the-shelf and versatile custom solutions for applications in the medical equipment, factory automation, retail automation, semiconductor equipment, financial automation, mission critical and network security markets.

Ultrabooks and Infotainment Shine at CES 2012

Intel demonstrates real products and partnerships running its newest low power, high performance chipsets.

By John Blyler, Editorial Director

Remember the Intel Developer Forum (IDF) last summer 2011? At that time, the company highlighted upcoming products that were resulting from their relentless push toward low power, high performance processor-based applications.

Those products became reality, taking center stage at this year’s Consumer Electronics Show (CES) 2012.

Making the biggest splash were the Ultrabooks, Intel’s trademarked name for super thin, lightweight, relatively high performance laptops. In addition to size, weight and speed, Ultrabooks boast longer battery life and faster boot-up times than many comparable laptops. About a dozen Ultrabooks were on display at the company’s CES booth, including such manufacturers as Hewlett-Packard, Lenovo, LG and Asus. Intel believes that 70 more designs will be available throughout this year.

Another technology previewed at IDF 2011 but demonstrated at CES was Intel’s In-Vehicle Infotainment (IVI) system. The company envisions intelligently connected, location-aware cars that will act as a personal concierge for both home and business needs. Toward this end, Intel recently partnered with Toyota among others to develop IVI systems that will enable new usage models for mobile connectivity in automobiles. (Several articles in this issue of “Embedded Intel Solutions” delve further into Intel’s infotainment design strategies.)

Besides Ultrabooks and intelligent cars, another noteworthy application at CES was the Lego Augmented Reality (AR) demonstrations, based on Intel’s Sandybridge processor. Augmented reality is used to enhance a real-world image. In the demo, a customer holds up a Lego boxed product to a computer screen that then shows a real-time, 3D animation that changes as the box is moved around. Retailers such as Lego hope that customers will be more eager to buy products if they can see the assembled and finished 3D image.

Intel strives to find new and sometimes surprising applications for their low power, high performance chipsets and supporting multicore software. This year’s CES provided ample examples that the company is finding applications that consumers will want.

John Blyler can be reached at: jblyler@extensionmedia.com
Fanless 1.66GHz Industrial SBC of EPIC Proportions

The EPX-C380 is a rugged single board computer that provides an open powerful platform for industrial applications. Powered with either a single or dual core processor, it has a wealth of onboard I/O plus expansion options. Also it supports Linux, Windows® XP embedded, and other x86 real-time operating systems.

- 1.66GHz Intel® Atom™ processor N450, single core, or D510, dual core, available
- Embedded Gen 3.5+ GFX video core supports CRT and LVDS flat panels simultaneously
- Custom splash screen on start up
- Optional 1MB of battery backed SRAM
- Two Gigabit Ethernet ports
- Two SATA channels
- Eight USB 2.0 ports
- Four serial RS-232/422/485 channels
- 48 bi-directional digital I/O lines
- CompactFlash (CF) card supported
- MiniPCIe and PC/104-Plus expansion connectors
- High Definition audio supported (7.1)
- WDT, RTC, LPT, status LEDs, and beeper
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- EBX sized SBC also available
- Extended temperature operation
- Responsive and knowledgeable technical support
- Long-term product availability
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Contact us for additional information, custom configurations, and pricing. Our factory application engineers look forward to working with you.

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AIMB-781 ATX Motherboard supports 2nd Generation Intel® Core™ i7/i5/i3/Pentium® Processors

Advantech announces the introduction of a new industrial-grade, ATX motherboard supporting 2nd generation Intel® Core™ i7/i5/i3/Pentium processors with LGA 1155 sockets which are 32nm quad or dual core processors with integrated graphics and memory controller, so that it could provide incredible performance on industrial applications. AIMB-781 also supports PCIe Gen II and SATA Gen III of RAID 0, 1, 5 & 10 for the application which needs high transmission bandwidth and high storage speed. To ensure product durability, AIMB-781 is designed by all solid capacitors.

Rich Expandability and Performance

The AIMB-781 comes with high connectivity and expansion options including: one PCIe x16, one PCIe x4, one PCIe x1, and four PCI expansion slot, six serial ports, fourteen USB 2.0 ports, and two Serial ATA III 600 MB/s and four Serial ATA II 300 MB/s connectors. One out of serial ports supports RS232/422/485 with hardware auto flow control to fulfill the demand of industrial application, and dual PCI Express based Intel 82579LM and 82583V Gigabit Ethernet ports delivering up to 1000 Mbps of bandwidth for network-intensive applications.

Axiomtek Launched High Performance Intel® Xeon® E3 Network Appliance Platform with max. 26 Gigabit LANs and Three Front Accessible Expansion Slots

Flexible multi-Gigabit NA-550 supports six-groups bypass function, ECC DDR3, and BIOS redirection to provide extreme network performance

Axiomtek introduces NA-550, a high performance 1U rackmountable network appliance with maximum up to 26 Gigabit Ethernet ports thru PCIe interface and up to 6-group LAN bypass segment for medium and enterprise business markets. The NA-550 supports the latest Intel® Xeon® processor E3 series with Intel® C206 chipset as well as supports four high bandwidth DDR3 1333 MHz non-buffer non-ECC/ECC DIMM sockets up to 16GB memory. The communication appliance has three front-accessible expansion slots that allow developers to configure PCIe LAN modules based on their solution requirements. Powered by the new-generation Intel® Xeon® processor E3 series with flexible expansions, the rackmount network appliance is ideal for IDS/IPS, VPN, content filtering, UTM, network security applications, and cloud computing solutions.

ITOX SB630-CRM ATX Embedded Motherboard Supports 2nd Generation Intel® Core™ Processor

ITOX announces the SB630-CRM, the first ATX motherboard in its Intel® Q67 product line. This ATX form factor board supports the 2nd generation Intel® Core™ i7-2600, i5-2400, and i3-2120 processors that feature 32-nanometer process technology providing higher performance at lower power than previous processors.

Intel, Micron Extend NAND Flash Technology Leadership With Introduction of World’s First 128Gb NAND Device and Mass Production of 64Gb 20nm NAND

New 128Gb Device Ideal for Small Form Factor Tablets, Smartphones, SSDs and High-Performance Compute Devices

Intel Corporation and Micron Technology, Inc., (Nasdaq:MU) announced a new benchmark in NAND flash technology — the world’s first 20 nanometer (nm), 128 gigabit (Gb), multilevel-cell (MLC) device. The companies also announced mass production of their 64Gb 20nm NAND, which further extends the companies’ leadership in NAND process technology.

Developed through Intel and Micron’s joint-development venture, IM Flash Technologies (IMFT), the new 20nm monolithic 128Gb device is the first in the industry to enable a terabit (Tb) of data storage in a fingertip-size package by using just eight die. It also provides twice the storage capacity and performance of the companies’ existing 20nm 64Gb NAND device. The 128Gb device meets the high-speed ONFI 3.0 specification to achieve speeds of 333 megatransfers per second (MT/s), providing customers with a more cost-effective solid-state storage solution for today’s slim, sleek product designs, including tablets, smartphones and high-capacity solid-state drives (SSDs.)
All From One Source
Efficient, flexible, rugged:
Embedded PCs with state of the art performance for your special requirements

Computer on module
Building blocks for customized computers in CoreExpress® and COM Express® form factors.

Single board computer
For stand-alone operation.
Boards in PC/104, PC/104-Plus, PCI/104, PCIe/104, EPIC, and Mini-ITX formats.

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From carrier boards for COMs to fully customized solutions.
Intel® Gigabit and 10 Gigabit Ethernet Controllers-Optimized for Multi-Core Intel® Processor-based Servers

The Intel® 82598 10 Gigabit Ethernet Controller and the Intel® 82575EB Gigabit Ethernet Controller are optimized for multi-core Intel® Xeon® processor-based systems to alleviate the network throughput and overhead problems associated with previous-generation server platforms.

In these previous platforms, application data requests were associated with a single processor and handled sequentially, raising CPU utilization levels. Intel's next-generation Ethernet controllers distribute the workload to available processor cores using MSI-X and VMDQ, receive-side scaling, and Scalable I/O, which use multiple queues to process multiple requests simultaneously. These improvements result in lower CPU utilization, lower latency, and better application response times.

Intel® Xeon® E5 Processor Debuts on TOP500 List; First Intel® Many Integrated Core Co-processor Demonstrated to Deliver Performance Above 1 TFLOPS

Intel Corporation revealed details about the company's next-generation Intel Xeon processor-based and Intel® Many Integrated Core (Intel® MIC)-based platforms designed for high-performance computing (HPC). The Intel Xeon processor E5 family is the world's first server processor to support full integration of the PCI Express 3.0 specification*. PCIe 3.0 is estimated** to double the interconnect bandwidth over the PCIe* 2.0 specification** while enabling lower power and higher density server implementations. New fabric controllers taking advantage of the PCI Express 3.0 specification will allow more efficient scaling of performance and data transfer with the growing number of nodes in HPC supercomputers.

MSI's All-new X79 Series Mainboards Deliver Superior Stability with Military Class III Components

Intel Corporation announced new architecture features of its upcoming Itanium® processor, codenamed "Poulson." The new features: Intel® Instruction Replay Technology, Intel® Hyper-Threading Technology improvements and Itanium processor New Instructions are aimed to take full advantage of the next generation, 12-wide issue architecture. "Poulson", with eight cores and 3.1 billion transistors, will be the most sophisticated Intel® processor to date, and is on track for launch in 2012. It is followed by a future “Kittson” processor, currently under development. There are threekey feature areas. The first is Instruction Flush Technology, which is a major RAS enhancement. The second new feature is an improved Hyper-Threading Technology. It supports performance enhancement with Dual Domain Multithreading support, which enables independent front and backend pipeline execution to improve multi-thread efficiency. Lastly, Poulson is adding new instructions in four key areas. These new instructions lay the foundation for the Itanium architecture to grow with future needs.

Taiwan Commate Computer Inc.(COMMELL) Announces the GPIO & Serial Converter Module

Taiwan Commate Computer Inc.(COMMELL), a global provider of Industrial Computers, announced the GPIO & Serial converter module -- ADP-GPION series for photo-couple input/relay output and ADP-RS485 for Isolated RS-232 to RS-485 -- Expands converter module line to meet the demand and application of system integrators. All of the modules come with a PCI bracket to allow customer to install the module into chassis’s PCI expansion slot easily without modification.

ADP-GPION-4I4O5V is a signaling isolation board for COMMELL on-board GPIO feature. This board has four photo-couple input connectors and four relay output connectors. Four photo-couple diodes protect input lines from the damage caused by Electrostatic Discharge (ESD) and other transients. Four relays feature high current contacts capacity.

ADP-GPION-8I5V is a signaling isolation board for COMMELL on-board GPIO feature. This board has eight photo-couple input connectors. Eight photo-couple diodes protect input lines from the damage caused by Electrostatic Discharge (ESD) and other transients.

ADP-RS485 is a converter board, which is used to convert two RS-232 ports to two RS-485 ports. This board needs 5V DC input. This board provides complete galvanic isolated full duplex RS485 transceivers. This board is ideal for systems where the ground loop is broken allowing for large common mode voltage variation.

Emerson Network Power Extends Range of ADN-C Series Slim Three-Phase DIN Rail Power Supplies

Emerson Network Power extended its line of ultra compactADN-C series three-phase DIN rail mounting power supplies with new 10 A and 5 A models. The power supplies are ideal for a wide range of heavy duty industrial applications – especially those involving large inductive loads – such as machine control, semiconductor fabrication, conveyor and material handling systems, including Class 1, Division 2 hazardous locations. Designed for high reliability, these new models have a mean time between failure (MTBF) of more than 500,000 hours, and are backed by a comprehensive five year warranty.

Designed to operate direct from standard three-phase inputs, the new Emerson Network Power ADN-C series power supplies have a wide 320 to 540 Vac input range, capable of accommodating virtually all standard line voltages worldwide. They are also capable of operating from a dc input, in the range 450 to 760 Vdc. The power supplies are very high efficiency designs: typically 85 percent for the new 5 A model and 91 percent for the 10A model.
Meet the Next Generation

AAEON’s Latest Innovations
Based on Intel® Atom™ Processors

All Models are Coming in 2012

4” Sub Compact
GENE-CV05

EPIC SBC
EPIC-CV07

Mini-ITX
EMB-CV01

Embedded BOX
TKS-G21-CV05

Computer On Module
COM-CV

Single Board Computers
- PICO-CV
- PFM-CVS
- HSB-CV1P
- COM-CV
- EMB-CV01

- NanoCom-CV
- ETX-CY
- XTX-CV
- GENE-CV05
- EPIC-CV07

Embedded Controllers/BOX PCs
- AEC-6963
- AEC-6873
- AEC-6201
- TKS-G21-CV05

Applications
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WWW.AAEON.COM
**Kontron microETXexpress®-PV-XT: COM Express® compact module with dual-core Atom™ for the industrial temperature range**

Kontron announced the expansion of its COM Express® compact form factor portfolio of Computer-on-Modules that follow the pin-out type 2 definition to now include the new Kontron microETXexpress®-PV-XT that boasts a rugged design rated for the extended temperature range of -40 to +85 °C. With the further enhancement of up to 4 GByte DDR3 system memory and high-performance dual-core Intel® Atom™ processor D525@ 1.80GHz, the Kontron microETXexpress®-PV-XT is a best-fit drop-in replacement for designs previously based on Intel® Pentium® M processors. OEMs benefit from a seamless migration path to energy efficient upgrades and extended usage models, increasing the long-term availability and investment security of their applications.

With its high performance per watt ratio and powerful dual-core processor, the Kontron COM Express® compact Computer-on-Module microETXexpress®-PV-XT enables OEMs to implement multicore processing features such as asymmetric multiprocessing for dedicated 2-in-1 systems for hardware consolidation into cost-effective low power devices. Furthermore, its industrial temperature rating and low overall power consumption of only 17 Watts simplifies fanless designs, reducing R&D efforts for rugged and highly available applications in areas such as outdoor digital signage, medical appliances, POS/POI terminals as well as tools used in industrial automation, transportation and military applications.

**Intel and Motorola Mobility Strike Multi-Year Strategic Mobile Partnership**

*Motorola Mobility to Begin Shipping Intel*-Based Smartphone in 2H 2012*

Intel Corporation and Motorola Mobility, Inc. (NYSE: MMI) announced that the two companies were entering into a multi-year, multi-device strategic relationship that includes smartphones which Motorola will begin shipping later this year using Intel® Atom™ processors and the Android™ platform. The collaboration, which also covers tablets, will combine Intel’s leadership in silicon processor technology and computing innovation with Motorola’s mobile device design expertise to deliver products that have the high performance, long battery life and convenience necessary for increasingly mobile lifestyles.

**Intel® WiDi Expands Platform and Receiver Ecosystem**

*Includes Embedded TVs, Monitors, Smart TV Adapters, Software Applications, Content Service Providers and Standards Support*

People will soon have significantly expanded choices in experiencing Intel® Wireless Display (WiDi) to wirelessly share PC content on their TV due to recent collaboration with leading consumer electronics manufacturers, content service providers and software vendors. New Intel WiDi-enabled devices include those from multiple television and monitor manufacturers, smart TV adapter vendors and content service providers. In addition, people will now be able to share content on a large number of existing devices via new standards support. People will have a larger variety of receiver devices they can connect with in an ever-growing number of select Intel WiDi-enabled Ultrabook™ devices, laptops, tablets, netbooks and desktop systems.

**will.i.am to Tour World for Intel’s Ultrabook™ Project**

*Part Travelogue, Part Insider’s Guide, this Music Expedition will Send will.i.am to 12 International Cities in 12 Months Creating 12 Original Pieces of Content*

will.i.am, Intel’s director of creative innovation and international recording artist, is gearing up for another world tour. This time, however, he will be traveling around the globe as part of the Intel Ultrabook™ Project. Mirroring the musician’s vision of a richer, more participatory music experience for his fans, the Ultrabook Project will put music at the epicenter of social content to create the ultimate musical expedition. Fans will be able to see what will.i.am sees and experiences, and showcases the inspiration for and creation process behind each of the pieces of music. The 12-city, 12-month tour, which will kick off in Mexico City at the end of the month, will produce 12 original pieces of music inspired by the cities will.i.am visits. Ten-thousand downloads of each piece of music will be available exclusively on intel.com.

**Intel CES 2012 Booth ‘Spotlight’ Features**

Several “Spotlight” features were showcased each day at Intel Corporation’s CES booth, in the Las Vegas Convention Center. “Spotlight” features provided visitors with insights from a variety of personalities and perspectives on topics including art, exploration, security, fashion, music, telemedicine and entertainment. Each “Spotlight” explored how the latest innovations in technology and performance powering Ultrabook™ systems and other technology devices with Intel inside are inspiring new levels of creativity, performance and innovation.

**CES 2012 Guide to the Ultrabook™, Inspired by Intel**

Intel Corporation is leading the industry to re-invent the personal computing experience with the new category of Ultrabook™ devices. Shaped by extensive user research, Ultrabook devices will increasingly give people the most complete and satisfying, no-compromise and secure computing experience in one sleek and portable device. Hitting store shelves less than 4 months ago, Ultrabook devices have already seen strong momentum with more than 15 models available from such companies as Acer, ASUS, HP, Lenovo, LG, Samsung and Toshiba. More than 60 Ultrabook designs -- and growing -- are in the pipeline for 2012. The second wave of Ultrabook systems based on the forthcoming 3rd generation Intel® Core™ processors (codenamed “Ivy Bridge”) will begin to arrive in the spring. They are followed by the 2013 introduction of Intel’s “Haswell” processor, expected to achieve up to a 20 times improvement in idle platform power and usher in the third wave of Ultrabook devices.
8.4” ~ 19” Industrial Fanless Panel PC with Touch Screen

CMPK-374X series

Features:
- 8.4” ~ 19” TFT-LCD with touch, Fanless and compact design
- IP65 in the front bezel, VESA mounting
- Onboard low power Intel® Atom™ processor N270 (1.6 GHz)
- DDR2 up to 2.0 GB, Intel® Gigabit Ethernet, USB 2.0, SATA
- 1 x 2.5” SATA HDD driver bay, Compactflash socket,
- Windows XP Embedded or Windows Embedded Standard 2009

2nd Generation Intel® Core™ i7/i5/i3 processor (Desktop) solution

**AS-C74**
- ATX motherboard
- DDR3 up to 32 GB, 2 x Giga LAN
- PCI-Express X16 / X4 slots
- 5 x PCI 32-bit slots, 6 x COM

**FS-A74**
- PICMG 1.3 SBC
- DDR3 up to 16 GB, 2 x Giga LAN
- 2 x Mini-PCIe sockets, 6 x COM
- 6 x SATA, 8 x USB

**LV-67G**
- Mini-ITX motherboard
- DDR3 up to 16 GB, 2 x Giga LAN
- PCI-Express X16, Mini-PCIe socket
- 4 x COM, 8 x USB, 6 x SATA

2nd Generation Intel® Core™ i7/i5/i3 processor (Mobile) solution

**LV-67H**
- Mini-ITX motherboard
- DDR3 up to 16 GB, 2 x Giga LAN
- PCI-Express X16, Mini-PCIe sockets
- COM, SATA, DC 9V ~ 24V or ATX P/S

**LS-574**
- 5.25” SBC
- DDR3 up to 16 GB, 6 x Giga LAN
- Mini-PCIe sockets, 6 x COM
- USB, SATA, DC 9V ~ 24V or ATX P/S

**LS-378**
- 3.5” SBC
- DDR3 up to 6 GB, Giga LAN
- Mini-PCIe sockets, COM, USB
- SATA, DC 9V ~ 24V input

**HS-773**
- Half-size PISA-bus SBC
- DDR3 up to 16 GB, 2 x Giga LAN
- 4 x COM, 4 x SATA, Mini-PCIe sockets
- DVI / VGA / 24-bit LVDS interface

**MS-C73**
- MicroATX motherboard
- DDR3 up to 15 GB, 2 x Giga LAN
- PCI-Express X16 / X4 slots, Mini-PCIe
- 2 x 32-bit PCI slots, 6 x COM, LPT

**FS-A75**
- PC/104 1.3 SBC
- DDR3 up to 16 GB, 2 x Giga LAN
- Mini-PCIe socket, VGA / DVI / LVDS
- 6 x COM, 6 x SATA, LPT

COMMELL

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ODM, We can help!
### congac-TM67

COM Express Type 6 up to Intel® Core™ i7 Processors 2.5 GHz

High end graphics performance

Intel® Turbo Boost technology 2.0

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**Formfactor**

Formfactor COM Express™ Basic, (95 x 125 mm), Type 6 Connector Layout

**CPU**

Intel® Core™ i7-2710QE processor (4 x 2.1 GHz, 8 Threads, 6 MB cache, 1600 MHz, TDP 45 W, PGA package)

Intel® Core™ i5-2510E processor (2 x 2.5GHz, 4 Threads, 3 MB cache, 1333 MHz, TDP 35 W, PBA package)

Intel® Core™ i3-330X processor (2 x 2.7GHz, 4 Threads, 3 MB cache, 1333 MHz, TDP 35 W, PGA package)

Intel® Celeron® 8810 processor (2 x 1.6GHz, 2 Threads, 2 MB cache, 1333 MHz, TDP 35 W, PGA package)

Intel® Turbo Boost Technology 2.0, Intel® Hyper-Threading Technology

Integrated dual channel memory controller, up to 25.6 GByte/sec, memory bandwidth

Integrated Intel® HD Graphics 3000 with dynamic frequency up to 1.2GHz, Intel® Clear Video HD Technology

---

**DRAM**

2 Sockets, 50-DIMM DDR3 up to 1600 MHz and 16 GByte

---

**Chipset**

Mobile Intel® 6 Series Chipset; Mobile Intel® 8M67 chipset / Mobile Intel® HM65 Express chipset (Intel® Celeron® processor version)

---

**Ethernet**

Intel® 82579 GbE Controller with Intel® Active Management Technology 7.0 support

---

**I/O Interfaces**

2x PCI Express™ GEN 2.0 lanes, 1x PEG, 2x Serial ATA® with 6 Gbit/s, 2x Serial ATA® with 3 Gbit/s (AHCI) RAID 0/1/0+1 support, 2x ExpressCard®, 8x USB 2.0 (1 Hi-Speed), LPC bus, 16C bus (fast mode, 400 kHz, multi-master)

---

**Sound**

Digital High Definition Audio Interface with support for multiple audio codecs

---

**Graphics**

Intel® Flexible Display Interface (FDI), OpenGL 3.0 and Direct3D10.1 support. Two independent pipelines for full dual view support optional High performance hardware MPEG-2 decoding, WMV (VC-1) and H.264 (AVC) support 802-11a/b support @ 40 MB/s, hardware motion compensation

---

**LVDS**

Dual channel LVDS transmitter, Supports panel with two 24-bit interface, VESA mappings, resolutions up to 1920x1200, Automatic Panel Detection via EDD/EDP

---

**Display Port (DP)**

3x DisplayPort 1.1

---

**HDMI or DVI**

3x ports shared with DVI, HDMI 1.4 (with 3D)

---

**CRT Interface**

350 MHz RAMPAC, resolutions up to QXGA (2048x1536)

---

**AUX Output**

Supports one 5VDC port shared with HDMI and DisplayPort capable of driving a 200MP pixel rate

---

**congatec Board Controller**

Multi Stage Watchdog, non-volatile User Data Storage, Managing and Board Information, Board Statistics, BIOS Setup Data Backup, PCI bus (fast mode, 400 MHz, multi-master, Power Loss Control

---

**congatec BIOS Features**

AMI Aptio® UEFI 2x firmware, 8 MByte serial SR firmware flash

---

**Security**

The congac-TM67 can be optionally equipped with a discrete "Trusted Platform Module" (TPM). It is capable of calculating efficient hash and RSA algorithms with key lengths up to 2,048 bits and includes a real random number generator. Security sensitive applications such as gaming and e-commerce will benefit also with improved authentication, integrity and confidentiality levels

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**Power Management**

ACPI 4.0 with battery support

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**Operating Systems**

Microsoft® Windows7, Microsoft® Windows XP, Microsoft® Windows® embedded Standard, Embedded POS Ready (WEPOS), Linux 3.0

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**Power Consumption**

Typ. application: tc'd., see manual for full details, CMOS Battery Backup

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**Temperature**

Operating: 0 ... +60°C, Storage: -20 ... +80°C

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**Humidity Operating**

Operating: 10 - 90% v. r. non cond., Storage: 5 - 95% v. r. non cond.

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**Size**

95 x 125 mm (3.74“ x 4.92”)

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Scalability and Maintaining Determinism are Key to using

OEM products that incorporate real-time technology are complex to develop and validate to the point where they are deemed stable enough to release into the market. No one wants a robot to start behaving erratically on the manufacturing floor because of a software bug that wasn’t detected due to insufficient testing and validation of the code. Often, the key to being able to deploy new products rapidly is to use as much of an existing, proven code base as possible.

Engineers would like to be able to upgrade existing products and/or evolve new products by running tried and proven code and algorithms on a multicore processor. But that only works if the software is able to distribute and scale easily across multiple cores while maintaining its real-time integrity. This is not trivial with real-time applications.

Real-time application software is by its very nature tied to the outside world, and the controlling application must have unfettered access to the system elements that it is controlling and monitoring in order to respond in a deterministic manner. Distributing application components arbitrarily across several cores of a processor may not deliver the level of access and control that a real-time application needs to run as it was designed.

INtime® Distributed RTOS and INtime® for Windows® solve this problem using two new technologies, Embedded Virtualization and Global Object Networking, to enable an application to be scaled with minimal change. With these elements of functionality, software applications can be moved from a deeply embedded single processor environment to a multi-function environment on a multicore processor while maintaining the underlying real-time code as is. INtime® for Windows® enables the addition of a Windows interface for real-time applications that need to be coupled to an advanced user interface.

**Embedded Virtualization**

Embedded Virtualization allows the distribution of an application across the cores of a multicore processor while partitioning essential components such as memory, I/O and interrupts and associating them with the relevant portions of an application. The result is that an application that was initially loaded on one CPU (Fig. 2a) can be distributed across several cores of a multicore processor.

By Chris Grujon, TenAsys Corp.
Multicore Processors in Real-time Applications.

processor (Fig. 2b). I/Os and their associated interrupts are allocated to the relevant portion of the application such that interrupt activity from one portion of the code running on one core doesn’t interrupt a portion of the application that is running on another core.

INtime for Windows adds the ability to run Microsoft® Windows® on its own core while the real-time portions of an application run on other cores (Fig. 2c). In this configuration it is possible to run an advanced user interface alongside control and data acquisition functions without affecting the real-time aspect of the application. As with the partitioned real-time applications, Windows can have its associated I/Os allocated to it, too.

Global Object Networking

After having partitioned an application to run on individual cores, there is the need for those portions to communicate with each other. TenAsys® Global Object Networking facility, GOBSnet, provides that capability (Fig. 2d). It does so with the addition of a few instructions whose functions are handled by the INtime RTOS to ensure that the deterministic aspects of the application are maintained and that the application executes just as if it were running on one CPU. Windows applications, when using INtime for Windows, communicate with INtime RTOS applications using GOBSnet via a Windows API.

1Where hardware allows; some interrupts are shared among several I/O devices.
Intelligently Connected Cars Evolve

Consumers’ connected lifestyle moves into the car, bringing with it opportunities for development around safety, security and user interfaces.

Intel’s automotive industry activities date back to early infotainment work with German auto makers – particularly BMW – in the mid-2000s. At that time, the “connected car” was limited to hooking up a phone, MP3 player or other consumer device to a car with some degree of integration. From that jumping-off point, the connected car has evolved considerably and is heading towards deep integration between consumer devices, the car and the cloud – and from there to other cars, the intelligent highway, digital signs and to just about any other system.

Looking Out to the Next, Next Big Thing

Cars have long product life cycles – similar to silicon devices – so Intel is looking at automotive as a long-term investment. Joel Hoffmann, business strategist for the Automotive Solutions Division at Intel says, “We’re looking out to what’s going to be the next, next big thing. So we’re looking at innovations and ideas that are going to start developing into vehicles that might be on the road in 2016 and beyond... Our goal is to anticipate the kinds of technologies that are going to be needed in our product – which ultimately is silicon – for a future product that doesn’t even exist yet.” Demand forecasts support this approach – silicon solutions serving the infotainment and telematics market are expected to rise from $5.6 billion in 2010 to $8.7 billion in 2018, according to a Strategy Analytics study in October 2011.

And ABI Research forecasts that global shipments of automotive connected infotainment systems will reach 27 million by 2016, driven by a number of factors. “The emergence of smart phones and applications and their integration into the vehicle environment, decreasing hardware and connectivity costs, consumer interest and increasing awareness, fast development of cloud-based and web-based services, and consumers’ drive to extend their ‘connected lifestyle’ into the car environment are all key contributors to the push for connected infotainment,” says Dominique Bonte, group director, telematics and navigation.

As this connectivity increases, however, awareness is rising on how the connected car impacts the driver. Initially, it was a way to bring content into the car (or through the car into the phone or other device). But according to Hoffmann, innovation in future will be around “how can that connectivity help the driver – how can it help them become a better driver? Today we’re seeing the reverse of that – all these devices going into the car and making people into worse drivers.”

Driver Distraction and Safety Issues Need to be Addressed

ABI Research’s Bonte believes that connected infotainment in vehicles is inevitable, but he also addresses safety issues. “There is no way of stopping connected infotainment from finally conquering the car,” he says. “One way or another, users will access entertainment and information while driving. While connected PNDs, smartphones and tablets are already being adopted, the main challenge for the automotive industry is either allowing safe integration of portable infotainment devices, in various flavors of more or less integration, or preferably, provide embedded infotainment solutions maintaining control over quality, safety, branding and business models.”

Already, safety issues are being addressed by distracted-driver legislation around the world and the auto industry is being held accountable to solve some of those problems, but not all of them will be solved in the near-term. In the meantime, Intel believes that one approach lies in user-interface enhancements. “We believe we’re always going to have consumer devices coming into the car, but we need to make that process safe,” Hoffmann says. This will play out in the ways
people interact with the devices – including developments around voice recognition and touch- and gesture-based interfaces that don’t require the driver to look at a screen. It may also pay out in new sensor advancements that observe and respond to specific user attributes, such as facial recognition that automatically adjusts radio and car settings to match the driver without the driver’s specific interaction. Intel and Toyota recently announced joint research into a next-generation in-vehicle infotainment (IVI) system that will integrate advanced technologies in the vehicle in a way that helps reduce driver distraction.

Other safety advances are farther out, such as smart sensors in roads to help drivers avoid accidents. “If the world is ever going to go to an autonomous or semi-autonomous driving situation, there will need to be a lot of those sensors and there’s a lot of technology that would have to be deployed,” says Hoffmann, who doesn’t see that happening anytime soon.”We try to come with a sense of realism. If you meet with the government agencies, they have a lot of ambitions about how they’re going to improve intelligent traffic systems. But the truth is that funding is always a factor – who’s going to pay for it always comes into play.” Ultimately, consumers will pay for systems they see value in. But even today, new IVI and safety systems are available primarily in high-end vehicles and other drivers continue to use their cell phones as usual – regardless of safety or legality.

**Data Sharing Leads to Opportunities for Security Advances**

Intel sees the security side of the vehicle as a big area for opportunity as consumers realize that all these connected features are potentially exposing their vehicle to theft or malware introduction. Intel’s McAfee acquisition should provide opportunities there, as well as in privacy and data integrity. Hoffmann says, “As the connected car becomes more useful and valuable, we believe people that are driving their cars are going to be very conscious of the data they’re sharing.” In fact, data sharing is likely to trigger new business models around the connected car. For example, consumers may be willing to share driving pattern information with an insurance company for a discount. And with the rise in super-efficient hybrid and electric cars, states will see decreases in gas tax revenue, which may drive them to bill for road use. Drivers may be willing to share driving pattern information with state transportation departments to control their portion of that bill. Concerns that shared data could be used negatively (no one likes getting traffic tickets in the mail) may hold back the growth of the connected car, but there are already several proven approaches.

ABI Research’s Bonte recently stated, “Despite all the hype about hybrid and smart phone-based telematics solutions, embedded connected car systems still have a bright future. On the OEM side, solutions such as GM’s OnStar and Hyundai’s Blue Link offer more reliable safety and security functionality such as emergency calling. Similarly, embedded aftermarket systems for insurance telematics, road user charging, or stolen vehicle tracking offer the best performance. Finally, electric vehicles simply require embedded connectivity in order to remotely check battery charging status, which has even prompted Ford to abandon its hybrid approach in the Ford Focus Electric.” ABI Research forecasts that the installed base of embedded OEM and aftermarket connected car systems is expected to grow from 41 million at the end of 2011 to 189 million by 2016.

**Software in the Driver’s Seat**

One of the exciting changes Intel is involved in is on the software side. Particularly as hardware becomes more standardized, it opens up more opportunities for software to provide differentiation. While the systems that run a car can include tens of millions of lines of code, Hoffmann notes that, “More industry leaders are coming to realize that they only need to have complete control over about 5% of that software to offer differentiation – to control their future and their profitability. If they can let the other 95% of that development take place in collaboration with other auto makers, other suppliers and companies that aren’t even normally part of the automotive ecosystem, then they save money because they don’t have to develop all that code. And they actually get a stable and reliable set of code because millions of eyes may have looked over it if it’s attractive. That’s one of the reasons Intel is investing so much in software companies: to make sure that we have the skill sets in our environment to influence that.”

One of Intel’s automotive activities is its involvement in GENIVI, the industry alliance committed to driving the broad adoption of an IVI open-source development platform. “We see that as a significant inflection point for the auto industry – to be willing to open up their environment to other industries. The most aggressive move being made there is the idea of open source software, because software is such a big part of a car now and the availability of open source means that the bar is being lowered for new people to enter into the business.” There are a number of GENIVI-
FOCUS ON INTEL

compliant open source operating system distributions, one of which is MeeGo – which was Intel-backed until recently, when efforts turned instead to Tizen. Hoffmann explains, “The MeeGo project is going to continue as far as a Linux Foundation project, but the resources for that are shifting towards Tizen, including from Intel. I think the project will still exist out there but it will be mostly legacy.”

MeeGo Gives Way to Tizen

Hoffmann says, “With MeeGo, our objective was to create a collaborative environment that lots of companies feel comfortable contributing to and there’s some structure to it so that it’s got a focus to specific industries. In the case of MeeGo, we spent a fair amount of effort in creating the in-vehicle (IVI) version of MeeGo and the purpose wasn’t so much to create an operating system that car makers would install into their car, but it was to create the environment where new innovations could be incubated, and then they could be incorporated by other commercial software distribution companies like Wind River.” This differs from the open-source approach for handsets and tablets, where an OEM may directly install the open source version of the distribution. But car makers can’t rely entirely on an open source project; they rely on systems integrators and operating system vendors to harden the OS, integrate it and provide full-time engineering, warranty and support. According to Hoffmann, at least a half-dozen companies in the GENIVI alliance are offering services to customers that will help them implement a Linux-based system on Intel hardware for any car company in the world. Many of them have derived their feature sets and components from MeeGo.

He continues, “What’s going on with Tizen is that there have been some learnings about how open source and industry – particularly the automotive industry – can interact. So Tizen has the opportunity to perfect that relationship and we’re certainly putting a lot of effort into making sure that when the Tizen automotive project is fully open and people understand it, that it will integrate smoothly with projects like GENIVI – and no doubt there will be an IVI version of Tizen that will be compliant with GENIVI – so there’s not a taking-of-sides here; everyone is a winner.”

According to ABI Research, car OEMs and tier-one suppliers are still facing multiple challenges in designing cost-effective, upgradeable and easy-to-use embedded solutions and bringing them to the market rapidly. While vendors such as Continental, Saab and SAIC Roewe and the GENIVI consortium are pinning their hopes on open source operating systems such as Android and Linux, others such as Toyota are looking to adopt cloud-based systems to achieve cost and scalability advantages.

There’s no doubt, however, that as the “connected lifestyle” era continues to gain momentum – especially with younger consumers – automotive OEMs need to develop a solid connected car strategy in order to retain control over the user experience, safety and monetization opportunities of next-generation vehicles.

Cheryl Berglund Coupé is senior editor of Embedded Intel® Solutions Magazine. Her articles have appeared in EE Times, Electronic Business, Microsoft Embedded Review, and Windows Developer’s Journal. She has developed presentations for the Embedded Systems Conference and ICSPAT. She has held a variety of production, technical marketing, and writing positions within technology companies and agencies in the Northwest.

Figure 1: QSL card image, created by ham radio cartoonist, Jeff Murray, K1NSS.

Tesla’s Lost Lab Recalls Promise Of Wireless Power  
By Hamilton Carter and John Blyler

Legendary physicist and inventor, Nikola Tesla, conducted some of his most shrouded work in a forgotten lab at Wardencliffye, NY. On November 5, 2011, that lab will come alive as the site of a major event (see figure 1).

At the turn of the 20th century, The Wardencliffye lab was built to provide wireless power and communications across the planet. That potential was never realized as the world’s most powerful capitalist – J.P. Morgan - removed his funding from the project before it was completed.

On November 5th, ham operators will broadcast from the Wardencliffye lab to raise awareness about a restoration effort led by the TeslaScienceCenter.org - a non-profit that will also host a Tesla conference at Brookhaven National Laboratory on the same day.

Read the complete story at: www.chipdesignmag.com/lpd
Near field communication (NFC) is not a new technology, but it will spearhead an adaptation in our mobile lives. Soon it will be commonplace for the general public to “tap” or “touch” devices with smartphones to pay for transactions, access information from a smartposter or unlock hotel room doors. Information can also be exchanged from smartphone to smartphone. Most in attendance at WIMA’s first NFC-USA conference November 2011 at the Mission Bay Conference Center in San Francisco agree that the technology will be ubiquitous; the question is how soon. The general consensus is that, while many hoped 2012 would be NFC’s coming-out year, 2013 will be the year NFC rushes into the mainstream.

Intel representatives were in attendance to assess the value of NFC in their products. Intel is a sponsor of The NFC Forum, a non-profit industry association that advances the use of Near Field Communication technology. I asked Jeremy Rover, Senior network software engineer, Wireless Networking Lab at Intel, how they planned to implement NFC. His response was, “everywhere, anywhere there is a fit.”

NFC devices eliminate the need for business cards. Business contact information can be exchanged with an easy “tap.”
Intel helped found and leads Continua, which is a proponent of NFC usage in healthcare. NFC offers tremendous value for the industry to improve efficiency. Healthcare professionals can use a tablet or any NFC-enabled device to touch a patient’s NFC bracelet or file to access the patient’s full medical history. Individuals can keep track of their health condition by stepping on a reader that measures cholesterol, weight, blood pressure, etc. By simply touching an NFC device to the reader, an individual can instantly update his medical file.

NFC will assert itself further in the transportation industry. Smartphones will eliminate the need for transient tickets by becoming the ticket. Riders can quickly tap a reader device as they board vehicles. NFC-enabled smartphones can also act as keys to homes, offices, hotels and dorm rooms. Arizona State University has implemented a successful trial in freshmen dormitories.

The big question at the conference was, “How do we monetize NFC?” Beyond advertising through digital signage, there doesn’t seem to be a clear answer. However, considering customers in just about every market will eventually regard this technology as the norm, organizations will have to meet those expectations. Basically, even if you’re not making money offering NFC, you’ll likely lose money by not offering NFC devices. Another question that arose at the conference was how will developers make a variety of tags and applications that work together across the board. Interoperability is key for NFC to be successful on a global level.

Byron Adams is the assistant editor of Embedded Intel® Solutions. He has held positions as a content editor at technology marketing companies, as well as at a regional newspaper in the Southeast.
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Embedded Virtualization’s Tipping Point

Embedded engineers remain unfamiliar with concept of virtualization for mobile and embedded systems.

VDC Research analysts expect next-generation technologies – including multicore and operating system virtualization – to be significant growth drivers in the embedded market. Embedded Intel® Solutions asked VDC Vice President Chris Rommel and Analyst Jared Weiner about the trends they’re watching. Based on recent studies by the Embedded Software Practice, they believe mobile and embedded virtualization (MEV) has emerged as a viable alternative to address time-to-market and cost-reduction pressures in the face of the complexity of many new embedded systems. However, the tipping point may not occur until developers gain a stronger understanding and familiarity with these technologies.

**Embedded Intel® Solutions**: What are some key application demands facing embedded developers that impact their

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**Primary Advantages from the Use of Virtualization in Mobile & Embedded Systems**

(Percents of Respondents)

- Ability to easily port designs to hardware platforms: 27%
- Secure partitioning of guest operating systems: 23%
- Ability to easily run and manage multiple OSs: 22%
- Ability to easily integrate new applications onto existing platforms: 17%
- Enable safety-critical certification of the underlying operating system: 17%
- Ability to partition or segment application functionality over multiple processors: 16%
- Ability to consolidate discrete processors for potential bill of material (BOM) cost savings: 5%
- Other: 1%
- None of the above: 5%
- Don’t know: 37%

*Note: Percentages sum to over 100% due to multiple responses; Respondents could select up to three criteria.*

Time-to-market pressures promote virtualization use.
consideration of virtualization technologies?

**VDC Research:** From challenging economic conditions to increasing time-to-market pressures and cost-reduction requirements, engineers developing embedded systems must contend with a variety of obstacles. Frequently, these obstacles are in direct conflict with the mounting complexity now associated with many new embedded systems. Increasing mobility needs and intensifying requirements around safety- and/or security-critical applications have increasingly complicated embedded development. Furthermore, the potential benefits of migrating to multicore processors are often overshadowed by an inability to effectively manage the added performance and additional cores enabled by this type of architecture. Mobile and embedded virtualization (MEV) has emerged in recent years as an approach through which to address many of these challenges.

**Embedded Intel® Solutions:** How do the advantages of virtualization differ in embedded systems compared to more traditional IT applications?

**VDC Research:** The advantages of virtualization for enterprise systems – which range from potential overhead savings through server consolidation to increased flexibility and data storage capacity – differ slightly as compared to mobile and embedded systems. Many of these differences, of course, are due to the specifications inherent in many embedded designs, including power and memory constraints, and the often small form factor of embedded devices. The top benefits to MEV – according to VDC survey respondents – include the ability to easily port designs to new hardware platforms, the secure partitioning of guest operating systems, and the ability to easily run and manage multiple OSs.

**Embedded Intel® Solutions:** What kinds of options do developers have in virtualization software to address embedded application requirements?

**VDC Research:** Leading solutions for the embedded space include Green Hills Software’s INTEGRITY Multivisor, LynuxWorks’ LynxSecure, Real-Time Systems’ RTS Hypervisor, SYSGO’s PikeOS, TenAsys’ eVM for Windows, and Wind River’s Wind River Hypervisor. In the mobile space, Open Kernel Labs’ OKL4 Microvisor and Red Bend Software’s VLX are among the most widely used solutions, while VMware – an enterprise/IT virtualization leader – is expected to raise its profile in mobile.

**Embedded Intel® Solutions:** What needs to happen in the evolution of virtualization software to meet demands in specific vertical markets such as mil/aero or industrial control?

**VDC Research:** Many applications within these markets require safety-critical certifications, which frequently complicate and add further expenses to development projects. VDC believes that MEV solution providers must continue to
address the challenges associated with attaining safety-critical certifications for virtualization-enabled devices in order to further penetrate these and other markets with similar requirements.

**Embedded Intel Solutions**: What are your expectations for the growth of embedded virtualization?

**VDC Research**: Despite the increased attention and dedication to virtualization from mobile and embedded software vendors, little impact has been made on the attitudes of embedded engineers, the vast majority of whom remain less than extremely familiar with the concept of virtualization for mobile and embedded systems. As such, the expectations of mobile and embedded virtualization growth from the supply side seem to outpace the reality of adoption from the demand side. That said, VDC does expect that embedded engineers’ familiarity of virtualization will likely reach a tipping point in the coming years, especially given the continued emphasis on the technology exhibited by the leading vendors in this space. However, the current level of familiarity in the engineering community is an indication that the potential of the mobile and embedded virtualization market remains largely untapped.

VDC Vice President Chris Rommel is responsible for syndicated research and consulting engagements focused on embedded software, hardware and development solutions. Chris holds a B.A. in business economics and a B.A. in public and private sector organization from Brown University.

VDC Analyst Jared Weiner supports all of the Embedded Software and Tools practice’s major research programs and is a contributor on custom research and consulting engagements. Jared received an MBA from Babson College in 2007, and graduated from Bentley College in 2002 with a BS in information design and corporate communication.

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Embedded Virtualization Achieves Application Scalability

Remote creation of VMs can reduce maintenance and operation costs while also decreasing total component and board counts.

Moving software applications from older to newer hardware platforms as products evolve can be risky and can require unnecessary porting and regression testing efforts, greatly slowing down the pace of feature delivery and innovation in your products. Moving an application that is running on a single-core OS to a multi-core CPU can present unanticipated performance challenges that are difficult to identify, test, and resolve.

Migrating applications from older single-core hardware to Intel® Xeon®, processors which support Intel® vPro™ technology, can make this process easier and faster, and can greatly reduce regression testing. Embedded virtualization with Intel® CPUs with Intel® Virtualization Technology (Intel® VT) offers a unique opportunity for new technology adoption, and can allow you to leverage new hardware features like offload engines and specific SoC devices, as well as open new possibilities for the way your application can be sized. Using advanced virtualization features, applications can be dynamically scaled to meet demand, as demand dictates.

Challenges of Consolidation:
A clear win for virtualization is the ability to consolidate many servers onto a single hardware platform. This is low-hanging fruit, and is well understood. In the embedded industry, consolidating several applications that were formerly running on single-core processors onto a multicore

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Figure 1 - Consolidation options
platform is a great way to reduce bill-of-material (BOM) costs, reduce the overall size and weight of your product, and reduce the power consumption, but there are some unique challenges developers need to be aware of, depending on the type of consolidation that is chosen.

When considering consolidating multiple single-core applications onto a multicore platform, developers have three choices. Option one, where all applications are running on a single symmetric multiprocessor (SMP) operating system may seem the most obvious. But what if the operating systems of the legacy board are not the same? Perhaps there are control-plane and data-plane applications on the legacy single-core boards that are hosted on different operating systems; such as a real-time OS for the data-plane packet handling and forwarding, and a general-purpose OS, such as Linux, for the control plane. Trying to port one application to another foreign operating system is the porting effort that needs to be avoided.

Option two resolves this problem of different operating systems, allowing the applications to continue to be hosted by their native operating system in an unsupervised asymmetric multiprocessing (AMP) configuration, but introduces other challenges that need to be considered and accounted for. Operating systems assume they have complete read/write ownership of all the hardware that they detect at system boot-up. Each instance of each operating system in option two will try to have full access to the entire physical memory range of the board, resulting in trampling among the operating systems. Accounting for this in the BSP will be very difficult, and error prone. Recall, we’re trying to avoid unnecessary regression testing while moving our applications to better, faster (and cheaper?) hardware.

With Option three we have inserted a virtual machine monitor (VMM), a hypervisor, which virtualizes and partitions the hardware platform devices and presents subsets of these devices to the individual operating systems that are running in virtual machines, completely encapsulated execution environments hosting the legacy operating system and application, in such a way that these legacy operating systems and applications can detect the same compute environment they detected on the legacy single-core boards. By assigning just a single core to each VM, the AMP operating systems and applications continue to behave as designed, and—more importantly—as previously tested and verified.

Configuration of Devices

By presenting the same devices to the VMs as were detected by the operating systems and applications on the legacy boards, we are able to consolidate many of these applications onto a newer multicore platform with minimal, or no, porting effort, and significantly reduce regression testing efforts.

A necessary enabler for this is the avoidance of costly latencies that can typically be incurred by the virtualization platform.

An important factor in considering hosting mission-critical and high-performance applications, such as networking routers or gateways, on top of a virtualization platform is the amount of extra cycles needed by the virtualization platform, the hypervisor, itself. To achieve and maintain proper throughput it is necessary to avoid extra latencies in interrupt handling and I/O operations or hardware device accesses.

Applications that are running in the enterprise or IT back-offices do not have the time-critical requirement that high-end networking gear in embedded products have—these products cannot afford to incur extra latencies in signal or I/O processing.

Avoiding the latencies of the virtualization platform can be achieved by selecting the correct complete virtualization platform—not just the hypervisor and paravirtualized guest operating systems, but the hardware as well.

Intel has enhanced the capabilities of virtualization technology with a hardware-assist technology called Intel® Virtualization Technology (Intel® VT). Intel® VT performs various virtualization tasks in hardware, like memory address translation, which reduces the software footprint of the hypervisor and improves its performance and overall determinism.

Another key feature of Intel® VT-based hardware virtualization is the ability to isolate hardware (cores, interrupts, I/O) that provides guests with direct access to the resources needed. Using Intel® VT, it is possible to assign individual cores, interrupts, or even individual I/O devices directly to a suitable guest kernel, with hardware acceleration at near-native performance levels. This level of assignment and granularity ensures that the hypervisor does not impact the performance of the applications hosted by the guests, by providing the guests with direct access to the devices they require, in such a manner that other guests can neither detect nor gain access to the devices.

Figure 2 - Directly mapping Ethernet devices to virtual machines
Figure 2 depicts the advantage of the Single Root I/O Virtualization (SR-IOV) specification which, when supported by the hardware, BIOS and virtualization layer, provides the ability to map Ethernet devices (“virtual functions”) directly to individual guest operating systems in such a way that the guest operating systems detect individual PCI devices to which they have direct access—completely bypassing the hypervisor for Ethernet I/O interactions.

Consolidation Challenges Resolved—What Next?

We now have a solution for consolidating multiple AMP operating systems and applications onto a multicore hardware platform that offers increased compute capacity and the ability to directly map devices to individual operating systems.

But what about further capabilities? Are there any other uses for virtualization in the embedded industry?

So far this article has only discussed the steps necessary in order to consolidate multiple hardware boards or migrate applications from older platforms to new, higher performance platforms. Embedded virtualization offers opportunities beyond these listed here.

With higher level virtual machine ‘management’ and scalability features, there are opportunities to change the way the product behaves or interacts, or how products are designed to respond to fluctuations in application load or demand.

Dynamically Scale Your Application to Meet Demand—Just in Time!

There was a time in the manufacturing industry when “just in time” was the buzz phrase, referring to the ability to acquire the necessary parts inventory just as the product needs to be assembled, reducing the amount of inventory sitting idle and taking up space on shelves.

The concept can be applied to embedded computing using the tools that have been presented thus far, and another key tool: the ability to dynamically create virtual machines—as needed. As the demand for the application ramps up, having the ability to remotely or dynamically grow the number of virtual machines that host the application allows reduced product power consumption—only run your application on the number of CPU cores that are needed at any particular time. Spare cores can be shut down, or repurposed for other applications. For example, as new routing tables need to be supported, or as additional Ethernet ports need to be enabled and serviced by the data plane, guest operating systems that are hosting the data plane application can be instantiated and directed to use those ports needing service.

The concept can be applied to embedded computing using the tools that have been presented thus far, and another key tool: the ability to dynamically create virtual machines—as needed. As the demand for the application ramps up, having the ability to remotely or dynamically grow the number of virtual machines that host the application allows reduced product power consumption—only run your application on the number of CPU cores that are needed at any particular time. Spare cores can be shut down, or repurposed for other applications. For example, as new routing tables need to be supported, or as additional Ethernet ports need to be enabled and serviced by the data plane, guest operating systems that are hosting the data plane application can be instantiated and directed to use those ports needing service.

Embedding virtualization enables you to reduce the components and total number of physical boards in your product. Using CPUs that support Intel® Virtualization Technology lets you maintain the necessary performance and I/O latencies that high-end networking equipment requires, without incurring latencies that may be associated with the virtualization platform.

Chris is a senior product manager with Wind River focusing on virtualization solutions. Prior to joining Wind River, Chris has worked in various roles from software engineering to product management at Mitel, Nortel, Ciena, AppZero, and Liquid Computing, with a focus on application and server virtualization products, technologies and sales. Chris holds electronics, computer science, and economics degrees from Carleton University and Algonquin College and resides in Ottawa, Canada.
The brand new single/dual-core Intel® Atom™ processor features yet another breakthrough in efficient computing performance-per-watt. Savvy embedded system designers can quickly leverage off-the-shelf single board computers (SBCs) and computer-on-modules (COMs) to release new devices or upgrades of existing systems in order to gain a competitive advantage in their market. Mid-performance systems with one or two independent displays and popular, emerging small form factors (SFFs), such as COM Express and Nano-ITX, are the vehicles of choice to deliver the advanced graphics features and power efficiency of the 2012 “Cedar Trail” Intel Atom processor-based platform.

**Left in the Dust**

Originally, the first Intel Atom were positioned by Intel well below the Intel® Core™ processors to avoid cannibalization. That first generation consisted of the entry-level two-chip Intel Atom processor Z510-Z530 platform and the 13 Watt three-chip Intel Atom processor N270 platform. The Intel Atom processors quickly earned a reputation as great for running all embedded operating systems, but left a bit to be desired when running Windows XP and desktop Linux variants. With the 2012 Cedar Trail third-generation Intel Atom processor platform running Windows 7, Intel has definitively answered the call by solving the key performance bottlenecks, as listed in the comparison chart.

At this point, only the highest performance video/imaging, storage and communications applications truly need Intel Core and Intel® Xeon® processor-based platforms. Most other embedded applications are candidates for the dual-core Intel Atom processor N2800 or dual-core Intel Atom processor D2700 (known as “Cedarview” processors). The block diagram shows how to deploy Cedar Trail for embedded applications.

**Scouting the Cedar Trail**

The Cedar Trail platform is a two-chip solution from Intel consisting of a tiny 22x22mm 559-ball BGA Cedarview processor and Intel® NM10 Express chipset. For legacy-friendly board designs, an optional super-I/O chip can be added to provide serial ports, hardware monitoring and even PS/2 keyboard and mouse. The desktop-class Intel Atom processor D2700 boasts an impressive 2.13GHz frequency for each of its two cores, plus 1MB of L2 cache at 10W thermal design power (TDP). It supports hyper-threading – two threads for each of its cores, for a total of four concurrent application and OS process threads. For lower-power applications, the netbook-class Intel Atom processor N2800 has two cores and gallops along at 1.86GHz with half the cache at only 6.5W TDP. This performance is possible in such a small size and power envelope.
thanks to the die shrink from a 45nm to a 32nm lithography (wafer process).

Four PCIe x1 lanes can be configured as a single PCIe x4 lane if needed. Combined with parallel PCI (2 slots) and eight USB 2.0 ports, there is ample I/O expansion for high-speed peripherals such as Gigabit Ethernet and Wi-Fi. For applications that don’t need Gigabit LAN, the NM10 chipset includes an integrated 10/100 MAC to save cost and power by using just an external PHY chip, as shown in the block diagram. Substantially improved graphics (up to 640MHz GPU clock) with hardware decoding in two rendering pipes can directly drive two displays (VGA, LVDS and DisplayPort or HDMI) with the same or different images. This third-generation Intel Atom processor platform even supports an execute disable bit for security, to run code once established as trusted.
**A Tale of Two Form Factors**

COM Express has rapidly become the high-performance computing module standard in the embedded market as the offspring of the ETX form factor for system designs that use a modular CPU on a custom carrier board. On the other design path, SBC-based, Nano-ITX is quietly gaining momentum for entry-level computing in applications where Mini-ITX happens to be too large. At 4.7 inches square versus 6.7 inches square, Nano-ITX’s footprint occupies only half the area of Mini-ITX. The SBC design path is primarily for OEMs whose I/O is limited to PC-style (chipset) plus one or two off-the-shelf expansion USB and PCIe cards and modules, even PCI Express Mini-card (aka mini-PCIe). By stark contrast, the COM design path is ideal for unique I/O (e.g., FPGA), large amounts of I/O and processing circuitry and physical size minimization.

**SBC Design Path**

The steadily shrinking processor+chipset platforms have given rise to the tiny Nano-ITX form factor SBC, just as they did with Mini-ITX less than 10 years ago. This latest “Nano” variant sports the same Windows- and Linux-compatible computer feature set, but with much less on-board I/O and only up to mid-range (dual-core Intel Atom processor) processing. That said, Nano-ITX is certainly not stranded due to limited on-board I/O due to a choice of expansion options for real-world I/O such as A/D, D/A, serial ports, TTL I/O and isolated digital I/O up to ~30V input reading and output switching. Such I/O is available off-the-shelf to plug into a PCIe x1 vertical slot. Modern low-profile (only ~2.5 inches tall) PCIe slot cards are short enough to plug in vertically or, for a more compact system, can be used with a riser card for flat horizontal mounting. The photo shows the NANO-6040 Intel® Atom™ processor E6xx “Tunnel Creek” SBC with 16-bit analog I/O added (8 in, 2 out) by way of Contec’s AIO-160802L-LPE card, also available from Portwell for the North American market.

Alternatively, USB modules, whether dongles or OEM circuit boards, are easy to adapt with cabling inside or outside the system enclosure. Finally, an additional expansion option is available on some Nano-ITX SBCs – mini-PCIe for 802.11n wireless Wi-Fi and Bluetooth modules.

The newest SBC in the series, NANO-5050, features the Intel Atom processors N2800 and D2700 together with the Intel NM10 Express chipset. This Cedar Trail platform includes an integrated graphics engine to enhance 3D performance for media applications such as high-definition 1080p imaging.

**The Road Less Traveled**

Although Nano-ITX is still in infancy compared to more established form factors, numerous benefits accrue to this rising star. For example, the OS can be loaded and device drivers installed on day one after receiving the SBC due to the plug-and-play nature of PCIe and USB, without the need for a custom BIOS from the supplier. Dual-core performance on a small 4.7-inch by 4.7-inch SBC requires attention to heat removal, certainly. Placing the processor and chipset on the bottom of the board permits the mounting of a flat, thin metal plate with Z-axis-compliant thermal pads for the processor and chipset. The system manufacturer simply affixes the other side of the metal plate, known as a heat spreader, directly to the metal system enclosure. As long as the I/O circuits are readily available with USB and PCIe interfaces – or serial port interface if supported on the particular Nano-ITX board – this new SBC trail is by far shorter and less rocky than the computer-on-module trail described next.

**COM Design Path**

The COM Express form factor is a popular computer-on-module (COM) standard from PICMG which defines a compact PC subsystem that can be used in custom embedded designs much like a macro-component. Carrier board designers can utilize as little or as many I/O interfaces as deemed necessary. This versatility allows the designer to create a dense and optimized package, much shorter or thinner than board stacks or card cages or motherboards with vertical I/O cards, which can result in a more reliable product while simplifying system integration. Most importantly, COM Express (COMe) applications are scalable, which means an entire product family can be created through the use of different performance class pluggable CPU modules.

**COM Express hits the Cedar Trail**

At a mere 95x95mm (3.74 inches by 3.74 inches), the compact-size PCOM-B218VG features DDR3 SDRAM, VGA, Ethernet, 2 DisplayPort interfaces and 8 USB ports, along with the lowest power consumption among dual-core Intel® processors. There are seven pin-out definitions made by the PICMG organization to satisfy various system requirements. In order to transition from parallel PCI and IDE, and include

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*Nano-ITX with analog expansion card creates a compact affordable real-world I/O solution for Windows 7 and Linux operating systems*
new digital display formats within Cedar Trail (along with the Intel® Core™ i7/i5/i3 processor-series), the Type 2 pin-out is clearly yielding to Type 6 going forward.

The module firmware provides hash functionality, ATA security commands and flash-region protection. With these security features, the system is secure from hacking, including setting changes and stolen data during the system’s operation. Well-known hash algorithms supported in Cedar Trail are MD5 (Message-Digest Algorithm 5) and SHA (Secure Hash Algorithm). Remote display and control functions are also supported by the module, so that operators can control their systems without a monitor and keyboard, which simplifies system designs and also saves the cost of sending technicians to perform on-site services.

Two Paths to the Trail Head
Nano-ITX offers up-and-running support on day one as usual for SBCs, while COM Express is known for the optimization benefits of full custom design while using a proven working CPU module. The 95x95mm compact size is the smallest of the three official PICMG standard footprints, and Type 6 is the most versatile and forward-looking of the pin-out types for brand new carrier designs starting now. Regardless of which design path best suits a given set of requirements, Cedar Trail provides more performance within a lower thermal envelope to take many mainstream embedded applications to a new plateau without the much higher cost and TDP of high-end Intel® Core™ i7/i5/i3 processors.

Colin McCracken is the director of solution architecture at American Portwell Technology, Inc. in Fremont, California. American Portwell is one of the only board manufacturers in the Intel® Embedded Alliance Program to be certified to ISO 13485 “Medical ISO” in the U.S.A. Colin can be reached at colinm@portwell.com.

Developers Will Play Games
By John Blyler, IP Insider Blog

Gamification is moving from social media networks to technical sites for both motivational and generational reasons. Engineers will have to play to win.

Let’s play a little game. First, start with a noun. Let’s choose the noun, “game.” Now, add the suffix “ification” to the noun. The result is a new word (no longer a noun) that seems to add something more to the original meaning of the word. Wasn’t that fun? No? Well, it was at least engaging.

Why should semiconductor intellectual property (IP) professionals care about the growth of gamification systems? The reason is that their careers may depend upon it. I’ll explain what I mean shortly, but first I need to briefly cover this emerging field, starting with its use in popular social media applications.

Gamification is the act of changing a traditional non-game activity into a game. Wikipedia offers this definition: “Gamification is the use of game design techniques and mechanics to solve problems and engage audiences.” Note the last phrase, i.e., “engage audiences.” Gamification is not about making every activity or process fun, but rather making these experiences engaging and motivating.

Read the entire story at: www.chipdesignmag.com/blyler
Multicore Scalability for Embedded Systems

Standard computer modules simplify high-performance upgrades for embedded applications.

By Glenn DeYoung, congatec

Industrial systems and their requirements are getting more and more complex. For economic and practical reasons, it makes sense to bundle several functions within a single device. In most cases, modern multicore-processor systems offer a safe and economical solutions approach. Key to this is an appropriate (e.g., real-time capable) and safe separation of the various operating systems and functions on each mutually independent physical or even logical processor with dedicated resources. One proven way to do this is using a real-time hypervisor.

Modular Systems Ideal for Today’s Intelligent Machines

Industrial engineering is the key for many economies. International competition is driving up demand for more intelligent machines with greater performance. Modern user interfaces with graphical user guidance and contextual menus, similar to those prevalent in the consumer market, present additional challenges for developers. While it is important to differentiate yourself from the competition by using the latest technology, it is often difficult to reconcile these demands with the traditional requirements of long-term availability and competitive pricing.

To minimize the total cost of ownership (TCO) of their systems and to keep maintenance and service costs low, many manufacturers rely on unified platform concepts for new developments. They will also try to combine different applications of a device in fewer components without compromising on operational safety. Here, modular systems present an ideal solution as the computing power can easily be adapted by replacing components or using different assembly variants. These systems must be optimally adjusted; i.e., they should be as inexpensive as possible for the required computing performance, so you end up paying only for what you actually need. In addition, the systems need to offer an easy way of upgrading to more sophisticated versions without requiring any changes to the software or the development environment.

System partitioning is key for optimum scalability in terms of cost and functionality. Typical questions that arise for the developer in this context are:

- What can be outsourced and what not (cost, confidentiality)?
- What is my core competency?
- Which of the required technologies do I already have in-house?
- How much can my existing production facilities produce economically, and what new investments may be necessary?

New multicore processor technologies, progressive miniaturization, more and faster signals on the boards as well as increased EMC requirements have manifested themselves in completely new demands and challenges over recent years. But does the core competency of industrial engineers and machine builders lie in this fast-moving area? As a rule, surely not! If you can’t or don’t want to buy the hardware as a complete, relatively elaborate rack system with standard form factors such as Compact PCI or Micro TCA, and if you also don’t want to outsource the project to an EMS provider, then stand-alone systems based on Computer-On-Modules (COMs) are an ideal solution.

![Figure 1: Computer-on-module concept with the latest COM Express module, based on the Intel® Core™ i7-2710QE processor, from congatec](Image)

Here, only the fastest changing and technologically most demanding part is outsourced or bought. (See Figure 1.) Once a manufacturer has opted for a suitable standard (see sidebar: Why COM Express?) it is possible to freely exchange
Why COM Express modules?

As a result of the progressive miniaturization of computer components, the demand for ever-faster signals and higher EMC requirements, the pressures on industrial engineering departments are growing.

Achieving all these demands can appear impossible with the available resources and manufacturing capabilities. For one reason or another, outsourcing the entire development process to a qualified electronic manufacturing services (EMS) provider is often not an option. A cost-effective and proven solution to this dilemma is to buy in expertise in the form of ready-to-use computer modules (COMs) for the technologically most complex part of the development around the processor.

The benefits are obvious: COMs can be used universally and are not tied to a particular market or a specific application. This leads to high quantities at lower prices, especially with regard to the best-selling COM Express standard.

Company know-how is protected because the carrier board technology is easier to implement, and with the application-specific know-how, the boards continue to be produced locally or in-house.

Other benefits of COMs include:

- Virtually unlimited scalability and long-term availability of compatible, interchangeable modules.
- Pre-integrated platform (no problems with the often very specific hardware around the CPU; ready availability of drivers and board support packages for multiple operating systems).
- Shorter development times and time-to-market because a lot of development, testing and debugging effort is eliminated.
- Highest quality due to the module suppliers’ specialist know-how and qualitative consolidation effects through feedback from many different customers at the suppliers’ end.

To take full advantage of the scalability options, the chosen module supplier should have extensive practical multicore know-how and, ideally, good contacts to manufacturers of virtualization software.

Due to its many benefits, COM Express is the module standard with by far the highest number of units sold to date. COM Express is based on current, serial PCI Express technology and is an official standard of the PCI Industrial Computer Manufacturers Group (PICMG), a consortium, which by now has over 450 members. COM Express has matured over five years and is available in version 2.0, which was last revised in fall 2010. Significant parts of the documentation of the current version 2.0 (design guide and specification) were created for PICMG. The outer dimensions of the plug-compatible modules are optimized for use in industrial applications. The modules come in the following sizes: 125 x 95 mm² (basic), 95 x 95 mm² (compact) and 110 x 155 mm² (extended; rarely used). Figure 3 shows a selection of new COMs in compact and basic versions.

Multicore Processors and Hyperthreading Expand Possibilities

In recent years, completely new opportunities have been arising due to the availability of processors with multiple physical (multicore) and/or virtual cores (hyperthreading). They expand scalability enormously because they offer the possibility of running several applications completely independently and safely on a single processor module – even with different operating systems. To fully exploit a dual- or multicore application, it is crucial to ensure operational security, especially when it comes to hard real-time requirements. To build a system which is truly real-time capable but which is still manageable for system architects and software developers, in most cases, requires special software which controls the management of resources, including interrupts, caches and memory. A solution which has proved itself in harsh industrial environments – and particularly in real-time operating systems – is the Real-Time Hypervisor from
German company Real-Time Systems. This is described in more detail in the sidebar “What is a hypervisor?”

Real-time hypervisor technology provides developers with a wide range of new and transparent possibilities for the consolidation of existing multi-device and multi-platform systems. For instance, existing applications can be grouped in a cost effective, space-saving way on a dual- or multicore COM without major changes even when different (real-time) operating systems are used. To further simplify the system and to increase cost savings, it is possible to port the application to a single operating system later on, provided an identical hardware platform is used.

To guarantee system reliability, the hypervisor must make sure that the systems remain encapsulated on the individual processor cores under all circumstances, so as to prevent the inadvertent access of identical resources. Currently, the embedded space offers quad-core processors with four cores; processors with even more cores will enter the market in the coming years making COMs for industrial applications remain endlessly scalable in the long term. Thanks to hyperthreading the cores of many Intel® processors can be split into two encapsulated logical cores (“threads”), making it possible to develop complex systems with up to eight logical processors even today.

What is a hypervisor?

A hypervisor is a low-level software program that allocates and manages the processing resources of a multi-processor platform according to specific rules in such a way that the respective systems appear like individual, independent processorsto the user.

What makes the real-time hypervisor special is that in addition to conventional virtualization solutions it can also manage multiple hard real-time operating systems while the relevant real-time characteristics of the individual systems remain intact.

First of all this requires that the available memory is allocated to the different operating systems on an exclusive basis. All hardware devices are configured so that the associated interrupts are exclusively and directly distributed to the individual processor cores and operating systems. Each operating system can only detect those resources (such as cores, devices or memory) that have been explicitly allocated to it. Special or modified device drivers are not required because the specific interrupts are assigned to each operating system directly, and each OS can only access its own hardware devices. With real-time hypervisor technology, the developer is free to define the boot sequence and individual cores or operating systems can be shut down or re-booted completely independently from the rest of the system.

There can never be any interference between the operating systems or the real-time hypervisor – this guarantees maximum security at all times. It makes no difference whether several instances of the same (real-time) operating system are started, or whether a mix of one or several different operating systems is installed. (See Figure 4.) A new and interesting feature is the possibility to assign individual real or virtual processors to an OS which is capable of symmetric multi-processing (SMP). This is possible even when other operating systems are active in addition to the SMP-capable OS. In this case, the remaining processors can be used for symmetric multi-processing with the SMP-capable operating system. This opens additional possibilities for scaling, such as load balancing.

The communication between the virtual (operating) systems can be implemented arbitrarily, but in practice internal TCP/IP based networks or appropriately configured shared memory have proved effective.
SPECIAL FEATURE
Multicore on COM

powerful dual-threaded or dual-core solutions are perfectly adequate. The integration of the graphical user interface (HMI = human machine interface), however, is key. Here, device integration on a single hardware platform is a fast and easy way to save money without having to sacrifice any safety requirements.

Currently, the most common reason for switching to a dual-core system is the logical – or even better, physical – separation of the cores, with a deterministic and highly reliable (real-time) system on the one hand, and a low-cost, universal system for user interfaces such as Windows or Linux on the other hand. In this case, the industrial application continues to run uninterrupted even if, for example, a Windows graphics application crashes with a blue screen, and the Windows system on this processor core has to be rebooted.

Depending on the performance requirements in the industrial marketplace, COM Express modules offer a wide range of low-power single-core and dual-thread Intel® Atom™ processors with 600MHz clock frequency up to the most powerful dual-core Intel® Core™ i5 processor at 2.5 GHz and 3.1 GHz with turbo boost. Figure 2 shows a selection of current COM Express modules.

Conclusion
The general trend towards dual- and multicore systems is also taking root in the embedded industry. The practical arguments speak for themselves: significantly more performance at relatively low power dissipation and higher integration density; the secure consolidation of device functions, including legacy operating systems, without great porting effort; the cost-effective and reliable extension of traditional industrial systems with powerful graphical user interfaces (HMIs) with the help of securely encapsulated dual- or multicore systems.

The use of standardized, compatible computer modules, in particular those supporting the widespread COM Express form factor, gives developers quick access to the latest processor technologies at little expense and shortens development times drastically. Ready-to-use application modules and new software technologies such as real-time hypervisor enable rapid and transparent development of secure dual- and multicore systems. The constant expansion of the number of cores on these multicore systems means that the system performance remains endlessly scalable in the future.

Glenn DeYoung is an application engineer for congatec Inc. He has over 35 years of experience as a design engineer and application engineer. Throughout his career, he has been involved in the design of appliance controls, commercial cooling appliances, commercial fitness equipment and automotive diagnostic equipment, to name a few.
The Connected Car
The demand for a truly connected car presents a monumental opportunity for IVI developers.

Much like the iPhone used to elicit the “Wow” factor way back in 2007, features becoming commonplace in vehicle infotainment systems are likely to cause that reaction in 2012.

The rising popularity and growth of in-vehicle infotainment (IVI) systems – embedded systems that provide audio, video, navigation, telematics and Internet connectivity – are part of the drive toward the “connected car.” Chief among the reasons for this push is consumers’ demand for constant connectivity; smartphones and Wi-Fi access are creating an environment where anything less is simply unacceptable. Other reasons include security on the road, better navigation of increasingly congested roads, the ability to find services and schedule appointments and generally remain connected. In fact, market research group In-Stat estimates that more than 35 million IVI systems will ship in 2015. The research group also found that the smartphone will be the preliminary source of in-vehicle infotainment and connectivity.

Think about the possibilities: Drivers could use an application to tell a car’s system what their favorite music selections are and then carry this intelligence to different vehicles, sharing their tunes on rides with friends. For road warriors, applications could personalize rental car IVI systems with points of interest, radio station settings and seat preferences, to name just a few – eliminating the need to fiddle with mirrors and scan through countless measures of the radio spectrum, making the entire driving experience much more convenient and enjoyable.

Beyond the convenience factors are fundamental aspects of integration that may enhance hands-free capabilities. Legislation to limit talking or texting while driving has driven a number of innovations for vehicles. As governments continue to adopt distracted-driver laws, vehicle manufacturers will continue to expand features that help minimize distractions for drivers. Imagine getting in your car and being able to seamlessly transfer your phone conversation from your handset to your car speakerphone without so much as a button push. Or think of the convenience of a vehicle that’s intelligent enough to transfer your call back to your phone when you turn off the engine. These may seem like nice-to-have conveniences, but in reality, this sort of functionality can reduce the distraction of managing multiple devices.

All of this creates a huge and growing market opportunity for development teams that have the right design and development process experience. The In-Stat report found that the total semiconductor market for IVI system suppliers will grow nearly 110 percent through 2015.

The opportunity is well-defined, but there are significant challenges for device makers and developers that want to take advantage of it. The biggest challenge is finding the best way to pair their expertise with compressed time-to-market demands.

“One of the greatest challenges in bringing a competitive IVI system to market is getting far enough ahead of existing technology to preserve relevance when the system is finally launched,” says Roger Lanctot, a senior analyst in the global automotive practice of Strategy Analytics, a market research firm. “The big challenges break down to the human-machine interface (HMI), navigation (in terms of what enhancements will be relevant and competitive in two to three years) and mobile device connection.”

Breaking it Down
IVI system development has three major areas: head-unit HMI development, mobile-application development and integration. Each area has its own challenges related to creating industry-leading IVI solutions. For example, with mobile-device application development, it’s important to consider developing and testing for various platforms. To
fully integrate the HMI with a mobile-device application, you must consider numerous connectivity options – from Bluetooth technology to USB to Wi-Fi – each with its own specifications requirements for interoperability.

Before writing or porting even one line of code, it’s critical to understand the ultimate business goal. By identifying the features and applications that have maximum impact on the consumer, you'll be better able to define the scope and requirements and select the best design framework for your project. The answers will also help you clarify the best implementations that will ensure both driving safety and system security.

Head units generally offer touchscreen, steering-wheel and voice interfaces, and they are a key factor in creating a truly connected car. In the area of head-unit HMI development, the biggest challenges center on the user interface. The most difficult task is creating a consistent and responsive user interface that has the aesthetics that people have come to expect from their smartphones. Apple has set the bar as to what interfaces that has the aesthetics that people have come to expect from...
Another option is connecting into a Sirius satellite radio feed, which includes data for traffic information, fuel prices, etc. The issue here is that users are limited to whatever data Sirius provides. A third option is plugging a USB stick or smartphone into the system, but there are cost and availability issues with this approach.

The variety of devices users want to connect to their IVI systems presents another challenge. Media content is resident on everything from smartphones to iPods to USB sticks, and they all have to communicate with the IVI system in some manner. Once this problem is solved, users will be able to speak to the IVI system, and voice recognition will understand the command, such as “Play songs by Rob Thomas.”

The Connected Car: Moving Forward

One day, a driver will be able to access an “automobile app store” on his or her in-car IVI system to download apps for almost anything imaginable. Those apps will work on any IVI system, regardless of manufacturer or automobile.

That vision may be a few years off, but it’s definitely on the horizon. What’s missing are technology standards and collaboration between vendors – issues that are slowly but surely getting resolved.

In 2009, a group of auto and technology companies including Intel, BMW Group, GM, Wind River System and Delphi formed the GENIVI Alliance. The goal of the alliance and its member companies, which includes Bsquare, is to develop a fully interoperable Linux-based IVI platform that includes an operating system, middleware and platform for the IVI industry. The first GENIVI-compliant platforms have been announced, and so far, four members have announced solutions based on Intel® Atom™ processors and ARM’s Cortex-A series processors. More recently, Toyota and Ford agreed to collaborate on developing standards for in-car telematics and Internet-based services.

Clearly, progress is being made, both in terms of technology and collaboration. Within the next several years, manufacturers and vendors hope to see full cross-vendor compatibility, which will enable development of more feature-rich systems while enriching the user experience.

In-Stat estimates that more than 35 million IVI systems will ship in 2015.

In any case, to contain soaring IC manufacturing costs, the industry must take some dramatic steps:

**Intel: $100 Billion Required for IC Manufacturing**

*By Mark LaPedus, Senior Editor, Semiconductor Manufacturing and Design*

The semiconductor industry must continue to invest in new fabs, technologies and processes to keep up with current and future IC demand. But only the chip makers with deep pockets and strong technology can play in the leading-edge and high stakes IC game.

For example, to keep up with the insatiable demand for transistors, a leading-edge chip maker may have to spend more than a staggering $100 billion on IC manufacturing and R&D costs alone over a ten-year period in the future, said William Holt, senior vice president and general manager for the Technology and Manufacturing Group at Intel Corp. (Based on historical IC unit demand and die sizes, Holt’s figures are theoretical and not actual forecasts for Intel.)

In any case, to contain soaring IC manufacturing costs, the industry must take some dramatic steps:

Chip makers must continue to innovate, look for new solutions and continue stay on the two-year process technology cycle, Holt urged.

There are only a handful of companies that have the funds to stay on the leading edge. GlobalFoundries, Intel, Samsung and TSMC are among the few, it was noted.

Interestingly, during a presentation at SEMI’s Industry Strategy Symposium (ISS) at Half Moon Bay, Calif., Holt did not address one hot topic in the industry: 450mm. But he did briefly discuss the benefits of 3D chips using through-silicon-vias (TSVs).

Read the entire story at: www.semimd.com
Wind River’s Partner Ecosystem

If some ecosystems are like a forest of trees that all have generally the same shape and characteristics, the embedded ecosystem is more like the ocean: enormously diverse, large and interconnected.

Wind River has been in the embedded business for thirty years and has one of the largest ecosystems of hardware and software solution partners. Wind River supports a broad base of partners comprised of silicon providers, board vendors and independent software vendors (ISVs) across a wide range of verticals including aerospace and defense, networking, industrial, medical, mobile, automotive and digital home. Wind River’s Roger Williams, vice president of alliances and business development, provided insight into this partner ecosystem for Embedded Intel® Solutions magazine.

*Embedded Intel® Solutions*: What’s unique about an ecosystem for the embedded industry?

*Roger Williams, Wind River*: The embedded market is very fragmented. This presents choices for customers at every point (silicon, operating system (OS), middleware, applications and tools) in their solution stack as they build an integrated hardware and software offering. The fragmentation can also drive a different set of solution providers for each layer depending on the vertical. Wind River spans and competes across a wide range of market segments, so we have a very broad and extensive set of partners in our ecosystem.

*Embedded Intel Solutions*: How has Wind River built its ecosystem?

*Williams*: Wind River starts from the premise that each customer is building a solution, which could be a navigation system for an airplane, a wireless base station, a smart phone, tablet or home energy-management system. We make sure that between Wind River’s offerings and our ecosystem partners that our customers have access to all the necessary and best solution components for their projects so they can pick and choose where they buy and where they add their own value.

Because customers vary in their approach, Wind River delivers a range of products to its customer, from just a platform of OS and tools to complete devices depending on the customers’ needs.
We do this because some customers have their own expertise to develop solutions and just want a starting point and tools. For other customers, where time-to-market is critical or where they may not have all the necessary skills, Wind River can provide a turnkey solution through our professional services group. We also see these preferences differ by verticals – for example, the aerospace and defense market segment has long cycles and they do more of the development, whereas for the consumer market segment, time-to-market is critical and they prefer bundled solutions.

**Embedded Intel Solutions: What’s changing today in the market and ecosystems?**

**Williams:** If you look across the general technology market there is an increasing move to vertical integration which has to do with driving innovations in services, customer experience, time-to-market and emerging business models. The most obvious case is Apple integrating the device (silicon, OS, apps) and much more to include iTunes and cloud services to deliver customers a wide range of user experiences. In addition, the business model evolution is very significant as Google’s and Apple’s models are predicated on monetizing services, not selling devices.

These same pressures are being felt in the embedded space. However, since embedded lacks the same scale and uniformity as consumer, the benefit and ability to vertically integrate through acquisition or investment for any company is limited, so the proper approach is to focus on deep partnerships. Wind River is seeing both an opportunity and requirement to integrate our offerings with partners. We have done this with our Validation Program for ISVs in aerospace and defense, networking and industrial verticals and with board vendors through Wind River’s On Board Program.

**Embedded Intel Solutions: Can you give an example of how this trend is providing opportunity for ecosystem participants?**

**Williams:** One example would be in the machine-to-machine (M2M) market. M2M is the Internet of things, devices and systems communicating with humans and other machines. There are already more than one billion M2M devices at work in sensors, smart meters, smart buildings, etc., but this number will grow to 20-50 billion, which will require and drive integrated solutions from a robust ecosystem.

The M2M market opportunity and our work with Intel, Kontron, Eurotech and wireless carriers such as Vodafone has provided a significant opportunity for all partners involved. Building and delivering an M2M solution involves combining silicon, hardware, middleware and tools, application design, connectivity/cloud services, and the overall integration and testing of such as a system. We concluded that the best approach was a strategic collaboration among the partners, in the form of a verified and validated platform solution that takes out the complexity between the hardware and the software. This collaboration has enabled us to significantly reduce time-to-market requirements. We’ve also increased our value-added services by providing a rich and complete out-of-the-box experience that allows our joint customers to focus their efforts and investments around key market/business initiatives.

With our M2M partners, Wind River will continue to simplify the development, implementation and management of M2M solutions so that enterprises can rapidly deploy intelligent, connected and secure devices to realize the benefits of M2M for their businesses.

**Embedded Intel Solutions: So what will the embedded ecosystem look like in the future?**

**Williams:** I think the embedded ecosystem will continue to grow and fragmentation will give way to diversity as connectivity takes hold. M2M and its potential of 50 billion connected intelligent and secure devices will provide the necessary scale for a large and integrated embedded ecosystem. Think of it this way: if some ecosystems are like a forest of trees that all have generally the same shape and characteristics, the embedded ecosystem will be more like the ocean: enormously diverse, large and interconnected.
We earn your trust, one platform at a time

Discover why GE is one of the most trusted suppliers of military and aerospace COTS solutions

Program managers around the world consistently put their trust in GE for COTS computing and communications products for ground-up developments as well as technology insertions into existing platforms. For a hundred years, GE has been supplying the defense industry with innovative products. GE carries forward that legacy with embedded computers that reduce costs, leverage the latest commercial technologies, slash time-to-market, and reduce engineering risk.

Numerous high-visibility programs for manned and unmanned ground, air, and sea platforms have incorporated GE products to achieve targeted hardware and software benchmarks with a minimum of program risk. Let us help you achieve that same level of success with your next program.

For white papers and application details, visit: defense.ge-ip.com or scan the QR code with your smartphone.
Security Measures for Internet Enabled Devices

Increased reliance on intelligent devices and a growing number of threats require proactive security measures.

by Alan Grau, Icon Labs

Embedded devices, including Military and Aerospace devices, is the fastest growing segment of Internet users. The number of embedded devices on the Internet is predicted to be five times the number of PCs on the Internet by 2015. As our reliance on intelligent devices grows, so does our vulnerability to the failure of these devices. Extension Media talked to Alan Grau, CEO of Icon Labs, about security threats for embedded devices, trends in device security and what steps companies should take to protect their devices from Internet threats.

Q: It seems I read about a new security threat, Internet attack or virus almost daily. Most of these attacks are against Windows PCs and enterprise networks. Are embedded devices vulnerable to the same type of threats? Aren’t many of the malware and viruses specifically targeted to Windows PCs?

A: Yes and no. A large number of security threats specifically target Windows or Linux, but an increasing number of Internet attacks threaten embedded devices directly.

We have identified the three most significant Internet threats directed at embedded devices. The first is data protection: ensuring that data stored on the device, and communication with the device, is not intercepted or improperly accessed. The second threat is unauthorized access whereby someone actually hacks into and takes control of the device. The third threat is Denial of Service (DoS) attacks, an attack against a device causing it to fail or degrading its performance to the point that the device cannot effectively operate.

Q: How real are these threats? Aren’t many embedded devices built using custom operating systems that are not vulnerable to Windows based viruses?

A: The threats are very real. While most embedded devices are not vulnerable to Windows viruses, they are still vulnerable to many other threats such as DoS attacks. Automated hacking drones constantly scan Internet-connected computers looking for any vulnerability. If a device is connected to the Internet you need to assume it will be attacked.

All too often companies rush designs and launch products without ensuring sufficient security measures are in place, leaving the devices completely vulnerable to attack. With insufficient security, an unauthorized person can access the device or intercept communications. While encryption and authentication technology has addressed some of the issues, they only provide a basic level of security and do not provide protection from DoS attacks. The result of a DoS attack can be just as severe as if the device had been hacked. Companies need to recognize that threats against embedded devices are growing and the stakes are rising.

Q: What steps can companies take to protect their devices from these attacks?

A: Companies must start with encryption and authentication, but to ensure adequate protection a firewall must be added to the embedded device.

Q: What products are available to companies building embedded devices that address these security issues?

A: Icon Labs has developed three tools - Iconfidant SSH, Iconfidant SSL, and Floodgate Packet Filter – that allow companies to build security and protection into their embedded devices. Iconfidant SSH and SSL provide encryption and authentication for secure remote access. Floodgate Packet Filter is an embedded firewall that provides both static and dynamic filtering (stateful packet inspection). Floodgate also provides threshold-based filtering specifically designed to protect against DoS attacks. Together these products protect embedded devices from all major Internet threats.
From proposal to deployment in record time.

Our new COTS Rugged Systems are ready whenever the development clock is ticking.

More often than not, you need to be able to pull your next rugged system off the shelf. Our new line of integrated COTS Rugged Systems provides the quick delivery time most developers need for their UAV, ground vehicles or manned aircraft systems. These fully integrated computing platforms can be built around Freescale or Intel processors with a variety of 3U slot configurations to provide enough options to handle most applications. The CRS series takes the risk out of rugged system development with a fully tested computing platform that integrates with our own wide range of COTS products as well as those of third-party providers.

Finally, a rugged system that puts “off-the-shelf” back into COTS.

For white papers and application details, visit: defense.ge-ip.com/systems or scan the QR code with your smart phone.
6WINDGate Multicore Packet Processing Software

Compatible Architectures: Cavium OCTEON/OCTEON-II, Freescale QorIQ, Intel® x86, NetLogic XLR/XLS/XLP, Tilera TilePro64

6WINDGate™ is the Gold Standard in packet processing software for networking equipment, wireless infrastructure, security appliances and data centers. It provides up to 10x the packet processing performance of a standard networking stack, significantly improving the price-performance and power-performance ratios of networking equipment.

6WINDGate is compatible with standard Operating System APIs (e.g. Netfilter, Netlink etc). This ensures that clients can migrate either from a single-core to a multicore platform, or from one multicore platform to another, without needing to rewrite their existing software. Clients minimize the development time for their base multicore software platform, focusing on their unique product differentiation and accelerating their time-to-market.

With a full set of Layer 2 through Layer 4 protocols for routing, switching, security and mobility, optimized for multicore systems, 6WINDGate is a drop-in replacement for standard networking stacks. The majority of packets are processed in a fast path environment, executing outside the operating system for optimum performance. Available protocols include:

- VLAN, link aggregation, GRE, PPP, L2TP, GTP, MPLS;
- IP forwarding, IP tunneling, routing and virtual routing, IP Multicast, Mobile IP;
- IPsec, IKE, firewall, NAT, QoS;
- UDP, TCP, SCTP, flow inspection, TCP termination
- High Availability support;
- XML-based management, CLI, web management.

6WINDGate supports multicore processors from Cavium, Freescale, Intel, NetLogic and Tilera.

Features & Benefits

- 6WINDGate is fully compatible with standard OS APIs, so you can migrate your application software from a single-core to multicore platform, or between different multicore platforms, without needing to re-write or re-verify your code.
- 6WINDGate includes 40+ networking protocols, optimized for multicore platforms, eliminating the need for you to integrate software from multiple suppliers and accelerating your time-to-market, while reducing your schedule risk.
- By providing support for a wide range of industry-leading multicore processors, the 6WINDGate software enables you to leverage a single, optimized software platform across your product portfolio based on multiple CPU architectures.
- 6WINDGate provides full support for High-Availability frameworks and industry-standard HA configurations, enabling the development of mission-critical equipment with requirements for five-nines or zero-downtime reliability.

- By delivering up to 10x the networking performance of a standard OS stack, 6WINDGate enables you to meet or exceed the most demanding system performance requirements for next-generation networking, telecom and security equipment.

Technical Specs

- Optimized support for Cavium OCTEON/OCTEON-II, Freescale QorIQ, Intel® x86, NetLogic XLR/XLS/XLP and Tilera TilePro64
- Full support for Linux distributions from the open-source community, from commercial suppliers and from multicore processor vendors.
- Comprehensive set of protocols available for control plane, networking stack and fast path environments.

Application Areas

Telecom infrastructure, networking equipment, security appliances, data centers.

Availability

Available now.
More processor.  
More data.  
More intelligence.

**GE's rugged computers provide greater data throughput with 2nd Generation Intel Core i7 processors.**

GE’s new line of rugged single board computers and DSP products takes advantage of Advanced Vector Extensions to process more data. This new family of processors is raising the bar on floating point processing performance that is so critical to military and aerospace applications. Unmanned aerial vehicles, intelligence surveillance and reconnaissance, signal processing and sonar can now collect data with greater resolution and distance than ever before.

Don’t let your processor be a bottleneck in the mission-critical data stream. Let GE help you build a bigger data stream.

For white papers and application details, visit:  
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or scan the QR code with your smart phone

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Floodgate Packet Filter is an embedded firewall that allows networked devices to control the packets they process. Floodgate protects against potentially malicious attacks by filtering packets before they are processed by an embedded device.

Floodgate uses a two stage filtering engine that provides both threshold and rules-based filtering. Threshold-based filtering protects against denial of service (DoS) attacks, broadcast storms, and other conditions that result in a flood of unwanted packets. Rules-based filtering allows packets to be blocked based on static criteria such as port number, protocol, or source IP address.

Library for Embedded Devices
Floodgate is a source code library that provides packet filtering capabilities for embedded devices. Floodgate uses callback routines that are inserted into the device’s packet processing code. Layer-based callbacks allow filtering to be easily inserted at any layer in the network stack for maximum flexibility.

Internet Threats for Embedded Devices
In enterprise environments, firewalls, intrusion prevention systems and other security devices protect against Internet threats. In the embedded environment, including military and aerospace, devices are built using smaller processors and without the defenses found in more sophisticated environments. As a result, embedded devices are vulnerable to DoS attacks, packet floods and other Internet attacks.

Features & Benefits
- Allows OEMs to easily add firewall security to existing products or new designs.
- Portable source code for use with any embedded OS.
- Fully configurable rules engine allows full control over filtering behavior.
- Small footprint and optimized design for embedded systems.
- Unique two-step filtering engine first blocks packets using filtering rules and stateful packet inspection and then using thresholds to protect from Internet threats, network traffic floods and DoS attacks.

Technical Specs
- Static filtering blocks packets based on configurable filtering rules. Supports filtering by source IP address, MAC address/type, port, protocol or user defined criteria.
- Built in Stateful Packet Inspection (SPI) filtering for TCP/UDP and ICMP packets.
- Threshold-based filtering blocks packets in real time based on threshold crossings.
- Supports both white list and black list filtering.
- Layer-based callbacks allow filtering to be inserted at any layer in the network stack for maximum flexibility.

Application Areas
Medical Devices  for home & hospital use, Server and Storage Networking, Telecom/Networking, Military/ Aerospace, Industrial Controls, Consumer Devices, Mobile/Handheld
Iconfidant SSH and SSL

Iconfidant SSH & SSL are source code products providing embedded security for VxWorks, Solaris and Linux based systems. Iconfidant allows network equipment vendors to easily add secure, encrypted communication to their devices.

Iconfidant SSH implements SSHv1 and SSHv2 protocols and includes:
- ssh – rlogin/rsh-like client program.
- sshd – ssh login daemon.
- sftp – secure file transfer program for SSH1 and SSH2.
- sftp-server – secure FTP server subsystem.

Iconfidant SSL implements SSLv2/v3 and TLS protocols and includes:
- ssl – ssl client program.
- ssld – ssl login daemon.
- tls – tls client program

Features & Benefits
- Allows OEMs to easily add security to existing products or new designs.
- Full source code provided, royalty free.
- Drop in support for VxWorks, Solaris and Linux.
- Small footprint and optimized design for embedded systems.
- Strong authentication and encryption protect against common Internet attacks.

Technical Specs
- Logical API allows easy integration of Iconfidant libraries with existing CLI & Web interface.
- Support for WindRiver Web & CLI interfaces provided (formerly RapidControl CLI & Web).
- Supports multiple communication channels.

Application Areas
Medical Devices, Server and Storage Networking, Telecom/Networking, Military/Aerospace, Industrial Controls, Consumer Devices, Mobile/Handheld
D525 Fanless Embedded System – eBOX620-801-FL

The eBOX620-801 is our NEW cost-effective fanless embedded solution that features the high performance dual-core Intel® Atom™ processor D525 1.8GHz with Intel® I/O Controller Hub 8M (ICH8M). Our embedded computer system has a unique thermal solution, expandability, has a wide operating temperature range and is IP40 protected. The eBOX620-801 is the reliable and robust box solution ideal for various embedded applications of gaming, digital signage, POS, kiosk, industrial control automation, medical equipment and more!

Features
- Intel® Atom™ processor N455 1.66 GHz/D525 1.8 GHz
- Intel® ICH8M
- 4 x USB 2.0 ports & 3 x COM ports
- Fanless operation design with full feature I/Os
- High Performance DDR3 SO-DIMM (N455 supports DDR3-667 max. up to 2 GB, D525 supports DDR3-800 max. up to 4 GB)
- 1 x 2.5” SATA drive bay & 1x CF 2.0 slot
- 1 x PCI Express Mini Card slot & 1 x internal USB Wi-Fi mounting space

AXIOMTEK
D525 Fanless Embedded System - eBOX620-801-FL
Mini ITX SBC with Mobile Intel® QM67 Express Chipset -MANO860

COMMELL
AS-C74

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Mini ITX SBC with Mobile Intel® QM67 Express Chipset – MANO860

Our MANO860 is our latest model that features the Quad/Dual Core Intel® Core™ i7/i5/i3 or Intel® Celeron® processor, excellent for small and space limited environments. Our board features the latest Intel® vPro technology and Intel® Active Management Technology – for remotely managing and securing PCs out-of-band. Ideally designed for graphic-intensive applications such as medical-imaging, digital signage, kiosk/POI, gaming machines and more!

Features
- Quad/Dual Intel® Core™ i7/i5/i3 or Intel® Celeron® processor
- 2 DDR3-1066/1333 MHz, max. up to 16GB
- PCIe x16 Gen. 2 supported
- SATA-600 with RAID 0/1/5/10 supported
- CFast™, Intel® Active Management Technology, TPM supported

AS-C74

Taiwan Commate Computer Inc. (COMMELL), the worldwide leader of Industrial Single Board Computers, launched industrial ATX motherboard based on Intel® Q67 Express chipset.

AS-C74 mainboard sets up to the ATX format (307 x 244mm), which gives it room not only for 32GB of DDR3 memory, but also for five expansion boards(one PCIE x 16, one PCIE x 4, one PCIE mini card, one Mini PCI, five PCI slots). It is with Intel Q67 Express chipset, supports desktop Intel® Core™ i7/i5/i3/ and Pentium® processors and the Intel® Xeon® processor E3-1275. AS-C74 includes both VGA & DVI ports, two Giga LAN, 12 USB 2.0, 5 x RS232C and 1 x RS232/422/485, 4 SATA2 and 2 SATA3, HD Audio & one Parallel port.

COMMELL is a leading supplier of Single Board Computers and focuses on developing the most advanced and reliable IPC products. In addition to promise our customers constantly stay ahead of this competitive business, we are always in search of disruptive & incremental sustaining innovation. We treat every of our customer as partner and provide the best services and total support. The combination of innovation, superior quality, and excellent services will ensure both Taiwan Commate Computer Inc., and our customers always have the competitive edge in the computer world.

For further information about COMMELL is available at http://www.commell.com.tw
3U & 6U VITA 46 VPX & VITA 65 OpenVPX Processor Boards

The 6U iVPX7220 and 3U iVPX7223 VITA 46 VPX & VITA 65 OpenVPX™ processor boards from Emerson Network Power features the dual-core and quad-core 2nd generation Intel® Core™ i7 processor @ 2.20 GHz, with integrated graphics and memory controller and the Mobile Intel® QM67 Express chipset with leading edge I/O functionality. This high compute density platform offers both high speed fabric connectivity with PCI Express and Gigabit Ethernet control plane connectivity with data transfer rates up to 5Gbps.

On-board memory includes up to 16GB DDR3-1333 memory (soldered), embedded USB flash and 256KB non-volatile F-RAM. Additional connectivity includes a variety of USB 2.0, serial and SATA ports, GPIO, DisplayPort, VGA and XMC sites for maximum flexibility. An optional 2.5” SATA SSD is also available.

The boards are fully rugged for extreme environments with extended shock, vibration, temperatures and conduction cooling. They are designed for a range of industrial, communication and military/aerospace applications. Software support includes Solid and Stable BIOS with password protection and a wide range of operating systems.

Features:
- 2.20 GHz dual- or quad-core, 2nd generation integrated Intel® Core™ i7 processor & Mobile Intel® QM67 Express chipset
- Up to 8GB (3U) or 16GB (6U) ECC-protected DDR3-1333
- VITA 48 REDI two-level maintenance (2LM)
- Extended temperature (up to -40 °C to +85 °C) and rugged variants
- Air and conduction cooled

CPCI7203 Air- and Conduction-Cooled 3U Processor Board

The CPCI7203 3U SBC from Emerson Network Power features the integrated dual-core Intel® Core™ i7 processor for use in high performance, space-constrained applications. This leading edge thermal and rugged solution makes the CPCI7203 ideal for harsh environments. On-board memory on both variants includes up to 8GB DDR3; and on the air-cooled variant, 256KB non-volatile F-RAM and 4GB MicroSD flash.

Connectivity is optimized for maximum throughput and flexibility. The air-cooled variants have two Gigabit Ethernet ports, two USB 2.0 ports, and one VGA on the front panel. Rear IO includes one serial port, two SATA ports and four PCI interfaces to the rear. Conduction-cooled variants also provide rear VGA. The Trusted Platform Module (TPM) enhances data security and encryption capabilities.

The CPCI7203 is a low-power, high-performance SBC that offers full hot swap compliance per PICMG® 2.1 and supports the PICMG 2.9 System Management specification. It also supports a range of operating system and software options.

It is ideal for a wide range of industrial, medical and military/aerospace applications, such as railway control, factory automation, semiconductor processing, robotics, image processing, vetronics, VoIP and first responder.

Features:
- Integrated dual-core Intel® Core™ i7 processor (up to 2 GHz)
- Up to 8GB ECC-protected DDR3-800/1066 (soldered)
- 256KB non-volatile F-RAM on air-cooled variant
- Mobile Intel® 5 Series chipset: Ibex Peak-M PCH
- One VGA, two USB 2.0 & on-board Gigabit Ethernet interfaces
- 4GB MicroSD on air-cooled variant
- Air- and conduction-cooled
- Extended temperature range (-40 °C to +85 °C)
- Optional rear transition module

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Embedded Computers

The Emerson Network Power Embedded Computers are based around x86 Intel® architecture embedded motherboards with processor and memory, plus a disk. These are integrated into an application-specific enclosure that is designed for long-life applications with very little or no maintenance. Typical uses include medical clinical instruments, digital security and surveillance, industrial control and digital signage.

Emerson is offering two classes of Embedded Computers that are ideal for digital signage applications:

- Fanless, small, metal solutions that are designed to be mounted to a screen or instrument. These are noiseless, maintenance-free embedded computers that are available to suit a variety of operating temperature environments. They are easy to use and offer capability to fit a wireless module.
- Small, low cost embedded computers with some expansion capability. These are typically supplied in a plastic enclosure with mounting options, operate in an environment of 0 °C to 35 °C and are air cooled.

The KR8-315 is a fully integrated embedded computer. Enclosed in a custom, fanless case, the KR8-315 features the Intel® Atom™ processor E640 running at 1.0 GHz. Two versions are available – a standard temperature and an extended temperature version. The extended temperature version utilizes a solid state drive eliminating all moving parts.

The MCASE series consists of a Mini-ITX plastic enclosure and features the 2nd gen Intel® Core™ processor family. MCASE is a fully configured, application-ready platform ready to be powered up and loaded with applications.

iVME7210 Dual-Core VMEbus SBC

The iVME7210, with Intel® Core™ i7 processor variants and the Mobile Intel® QM57 Express chipset, is designed for a range of industrial, medical and military/aerospace applications including robotics, image processing, radar/sonar and C4. The dual-core processor has integrated memory and graphics controller. On-board memory includes up to 8GB DDR3 soldered memory and 256KB non-volatile Ferroelectric Random Access Memory (F-RAM). F-RAM does not require batteries or periodic refreshes and offers much greater read/write cycles and faster performance than flash.

The iVME7210 has additional storage of 64Mb of SPI boot flash, up to 4GB of embedded USB flash, and an 80GB SATA hard drive accessory option. Connectivity includes four Gigabit Ethernet ports, up to five USB 2.0 ports, five serial ports, two SATA ports and dual XMC sites or one XMC site with DVI port. P0 connectivity includes dual Gigabit Ethernet, one USB 2.0 and two SATA ports. Compatible operating systems include Wind River VxWorks, Linux and Green Hills Integrity. Extended temperature and rugged versions will be available via Emerson alliance partners.

Product Features
- Dual-core Intel® Core™ i7 processor (1.06 ULV or 2.0 GHz LV) with integrated memory controller
- Intel® Ibx-M Peak Platform Controller Hub (PCH)
- 4GB or 8GB ECC-protected DDR3-800/1066 memory
- 4GB eUSB flash module
- 256K non-volatile F-RAM
- Optional HD & mounting kit
RapiDex™ Board Customization Service

In addition to standard motherboard and Computer-on-Module (COM) products, Emerson now enables cost-effective embedded solutions by tailoring the motherboard design to match your requirements.

Introducing the RapiDex™ board customization service from Emerson Network Power.

Emerson’s unique design and manufacturing technology delivers quick turns with minimal setup fees. First boards are delivered within eight (8) weeks of the order. Any following production order has a volume commitment of only 100 pieces, with unit costs comparable to standard products.

Emerson’s rapid customization capability can remove the need to use a less optimized standard product, leading to improved cost, space and power profiles.

As one of the most respected vendors in the embedded board space, Emerson is a Premier member of the Intel® Embedded Alliance and collaborates closely with Intel to enable customers to bring products to market quickly. Emerson’s RapiDex service is based on select embedded Intel® processors and chipsets, with custom boards available within a few weeks of silicon launch. The first supported platform is the Intel® Atom™ processor E6xx series coupled with the Intel® Platform Controller Hub EG20T. This ultra low power Intel Atom processor variant supports soldered down memory and a wide variety of interfaces.

The manufacturing setup fee covers a number of services including:
- Custom heat-spreader design
- Custom shield design
- Development support
- Custom BIOS splash screen
- Flat panel support adaptation for common panels
- Three-year supply commitment
- Two-year warranty

Additional services available include:
- Longevity of supply
- Extended warranty
- Major BIOS customization
- BIOS/security updates
- OS certification
- Driver development
- Custom form factor design
- Chassis and power integration

Features:
- Custom motherboards, COMs, or COM Express carriers
- Intel® Atom™ processor E6xx series
- Fast turnaround time
- Designed and built by Emerson

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**TRACE32® PowerTools for Intel® ATOM™ and Intel® Core™ i3/i5/i7 Processors**

Lauterbach TRACE32® with Intel® processor support brings its mature high-end debugging solution to the Intel® ATOM™ and Intel® Core™ i3/i5/i7 processors.

The TRACE32® PowerView GUI provides fast assembly debugging and includes a very efficient and user friendly high-level debugger for C and C++. All major compilers are supported, e.g. Microsoft Visual C/C++ and the GNU Compiler Collection (GCC).

A user configurable display system for internal and external peripherals helps examining the target behavior at a logical level.

Integrated Flash support allows programming external and internal Flash memories. Developers can use virtually unlimited software breakpoints, even for code running in Flash memory.

The powerful PRACTICE® scripting language helps to set-up the debug environment and allows creating complex automated test cases.

Lauterbach offers a wide range of TRACE32® PowerTools that can be connected to either Windows or Linux hosts via USB and/or Ethernet 100/1000.

The TRACE32® debug system supports display and analysis of code execution traces using Last Branch Registers (LBR), and DRAM on Intel® processor-based platforms supporting this.

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**EC200 Series System Uses Modular Construction Targeting Industrial Computing Applications**

The industrial grade ITOX EC200 series system features sealed construction and anti-shock drive bay mounting designed for factory floor environments. Up to 12 modular system configurations are supported using four riser cards and three I/O module types. Virtually unlimited configuration options are possible using low-cost custom I/O modules designed to meet specific customer requirements.

All configurations feature passive cooling and a 1.8 GHz dual core Intel® Atom™ processor D525 with Intel® 82801 HM I/O controller hub requiring only 15.4 Watts maximum power. The integrated Intel® Graphic Media Accelerator 3150 with DX9.0c and OpenGL 1.4 compliance supports VGA displays up to 2,048 x 1,536 @ 60 Hz. Systems can be configured with up to 4 GB DDR3 800 MHz memory, 8 USB 2.0 ports, 10 RS232/422/485 serial ports, 16 GPIO, and 3 PCIe/PCI expansion slots.

EC200-LRA060 System Model Features (pictured)
- 1.8 GHz dual core Intel® Atom™ processor D525
- Fanless, passive heatsink cooling
- Single 19-24V DC power input, with AC adapter
- Compact 55mm x 203mm x 275 mm (H x D x W)
- Desktop, VESA, and wall mounting
- 2.5” SATA HDD bay, CompactFlash socket
- Up to 4GB DDR3 800 MHz memory
- 2 Gigabit LAN, 6 USB 2.0, and 10 RS232/422/485
- 1 Mini PCIe expansion card slot
- 2-channel Analog and HD Audio support
- UL, CE and FCC Class B approvals

This low-power industrial system is ideal for applications requiring a stable revision-controlled platform, such as industrial control, factory automation, POS and other applications requiring flexible system configuration.

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Product Showcase

**Toucan-TC**

The COM Express Compact module uses the Intel® Atom™ processor E6xx series. The low-power module targets automotive, telecommunication, telematics, medical, traffic, and industrial applications. On a small printed circuit board of 95 x 95 mm, the Toucan-TC embedded PC module features:

- Max 2 GB of soldered DDR2 Memory
- On Board SSD (optional) 2-64 GB
- SDVO and LVDS graphics interface
- 3 SATA ports
- 1 PATA port
- 5 PCIe x1 ports
- 7 USB 2.0 ports (including a client port)
- Gigabit Ethernet port
- Micro-SD Card Slot
- CAN bus and four UART ports on mechanically lockable option connectors

In addition to these hardware features, the Toucan-TC offers a Fail-Safe BIOS function and comprehensive condition monitoring. The Fail-Safe BIOS functionality allows secure remote BIOS flash upgrade, while the condition monitoring (LEMT) provides numerous additional software functions. LEMT comes with a programming interface in source code. As a special feature of the Toucan-TC, the user can determine in real time the current consumption and thus the power requirements for different operating states of the CPU. LEMT Web allows remote monitoring using any web browser.

The Toucan-TC is optionally available in the extended temperature range of -40 °C to 85 °C. Cooling is supported with a suitable heat spreader. All memory is soldered to the board, which accounts for high levels of shock and vibration resistance.

**MSI Offers Premium Embedded Solution IM-QM67 with Intel® Core™ i7, Core™ i5 and Core™ i3 Processors**

MSI launches IM-QM67 with the latest Intel® Core™ Platform. This is the multi-display outputs of mini-ITX form factor board with the latest 32nm process technology for the highest HD graphic quality.

Based on the Intel® Core™ i7, Core™ i5 and Core™ i3 processors, IM-QM67 offers lower power consumption and enhanced graphic and media performance. The IM-QM67 is equipped with dual-channel DDR3 1067/1333/1600 MHz memory up to a maximum of 16 GB in dual SO-DIMM slots. MSI IM-QM67 is improved with power efficiency and high-speed data transfer for performance-driven industrial applications, such as industrial control, automation, digital signage, kiosk, POS, gaming, ATM and medical electronic.

MSI IM-QM67 supports multi-display outputs, including Dual Channel 18/24 bit LVDS, VGA, dual DVI, HDMI and dual display configurations. It has great 3D graphics performance and support for up to 1080P high definition video. IM-QM67 also features support for Intel® Active Management Technology7.0, Direct-X 10 shader model 4.0, and full hardware acceleration. IM-QM67 provides a wide range of storage, I/O, and expansion connectivity, including 4 COM ports, 8 USB ports, and 4 SATA ports. Expansion takes the form of one CFast slot, one PCI slot and one Mini-PCle slot.

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X-ES has an extensive portfolio of Intel® processor-based products. Designed for both conduction- and air-cooled applications, X-ES provides Intel® platform-based 3U and 6U VPX, 3U and 6U cPCI, and VME single board computers (SBCs) and Processor PMC (PrPMC), XMC, and COM Express processor mezzanines.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Form Factor</th>
<th>Processor</th>
<th>Max CPU Speed</th>
<th>Memory</th>
<th>NVRAM</th>
<th>Mezzanines</th>
<th>SATA</th>
<th>Ethernet</th>
<th>USB</th>
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<tr>
<td>XPedite7470</td>
<td>3U VPX</td>
<td>Intel® Core™ i7 2nd Gen</td>
<td>2.1 GHz</td>
<td>8 GB DDR3-1333</td>
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Let’s start with two trends. First, the cost of high-resolution displays has plummeted to new low levels along with the exploding demand for high-resolution LCD, OLED and other flat panels for high-volume markets such as mobile phones, netbooks, laptops and TVs. Secondly, manufacturers have recognized that a global chassis approach to the manufacture of cars delivers significant reductions in cost if adopted in high volume globally.

The result of these in combination: software-configurable dashboards using flat panels mean the benefit of fewer changes from country to country. And being able to configure more customer options at the dealer rather than custom fit on a production line has major benefits for the retail channel. That’s good news for everyone in the car supply chain.

If there’s a good argument to adopt a new technology that delivers cost savings while significantly enhancing your product’s appeal, then that’s a strong motivation to move fast. And that’s what we’re starting to see for electronic dashboards.

Consumers have high expectations for the dashboard of their vehicle: the display must be highly responsive, extremely clear and easy to use.

These systems utilize advanced 3D graphics techniques, sometimes combined with high-speed vector graphics, to deliver the high-quality, fast-response imagery needed by high-resolution dashboards.

The ability to change the look of the dashboard depending on model type or user preference opens up a whole new world of user configurability – always a desirable feature for the car world. And the displays can also be used for a wide range of video applications. Video decoders and encoders are already being used in applications as diverse as rear cameras, proximity detection and security – as well as for displaying movies and TV.

By combining a high-performance graphics processor with video, engineers are now exploring powerful new applications such as augmented reality for head-up displays and navigation point-of-interest recognition. All this is now a practical, cost-effective reality, thanks to the mobile phone and computing industries bringing advanced graphics technologies to new and exciting price points that make so much sense for automotive product planners.

Imagination is also working with other industry leaders such as Navteq to develop next-generation navigation solutions that take advantage of these possibilities, as well as leading car manufacturers worldwide, to get these exciting new features into users’ hands as quickly as possible.

High quality 3D, 2D and vector-graphics acceleration is rapidly becoming a ‘must-have’ technology for any navigation product. Driven by demands for next-generation UIs and realistic navigation views with stunning visual impact and high frame rate, designers now appreciate how many key automotive applications can benefit from using low-power, highly-efficient graphics processors (GPUs). From navigation and ‘backseat’ gaming to increasing the usability of the dashboard, GPUs provide an increase in performance and quality while reducing power consumption and heat build-up.

Tony King-Smith is VP of marketing for Imagination Technologies. Tony holds a 1st class honours degree in electronics and electrical engineering from the University of Melbourne, Australia.
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