Extension MEDIA

Embedded Intel® Solutions

Spring 2018

Turning to the Experts for In-Vehicle Infotainment

Transport Data Center ZIPs Along

Intel® FPGAs Take on High Performance

www.embeddedintel.com

EMBED PERFORMANCE

Embed Success in Every Application

WinSystems' embedded single board computers are designed to support a broad range of industry applications in challenging operational environments, from energy and transportation management, to industrial IoT and automation. Our industrial embedded computer solutions enable the collection, processing and transmission of real-time data requirements at the heart of your overall system.

From standard components to full custom solutions, WinSystems delivers world-class engineering, quality and unrivaled technical support. Our full line of embedded computers, I/O cards, and accessories help you design smarter projects offering faster time to market, improved reliability, durability, and longer product life cycles.

EBC-C413
EBX-compatible SBC with latest generation Intel® Atom™ E3800 Series Processor

EPX-C414
EPIC-compatible SBC with latest generation Intel® Atom™ E3800 Series Processor

PX1-C415
PC/104 Form Factor SBC with PCIe/104™ OneBank™ expansion and latest generation Intel® Atom™ E3900 Series processor

ENERGY | AUTOMATION | TRANSPORTATION | INDUSTRIAL IOT | TEST & MEASURE | MEDICAL | SCADA

Single Board Computers | COM Express Solutions | Power Supplies | I/O Modules | Panel PCs

WinSystems®
The Embedded Systems Authority

817-274-7553 | www.winsystems.com
ASK ABOUT OUR PRODUCT EVALUATION!
715 Stadium Drive, Arlington, Texas 76011

intel IoT Solutions Alliance

QUALITY ISO 9001:2015 CERTIFIED

www.congatec.us
6262 Ferris Square | San Diego CA 92121
Phone: 858-457-2600| sales-us@congatec.com

intel IoT Solutions Alliance

conga-B7AC

EMBEDDED EDGE COMPUTING

Server-On-Module

- Intel® Atom™ Processor C Series (Denverton)
- up to 16 cores and 16 MB cache
- 4x 10 Gigabit Ethernet KR Interface
- Small Server Board - 95 x 125 mm²
- Optimized for demanding real time applications

Embedded in your Success.

Application-Optimized Server Solutions

Exactly the Best Performance & Density at Enterprise Scale

The Most Efficient Data Center in the World

A Fortune 100 Enterprise deploys over 50,000 Supermicro® MicroBlade™ servers at its Silicon Valley data center. With a PUE of 1.06, and Intel® Xeon® Scalable Processors it achieves an 88% improvement in energy efficiency and over $13M in annual savings.

intel XEON® PLATINUM inside™

SUPERMICRO®

Application-Optimized Server Solutions

Intel Inside®. Powerful Productivity Outside.

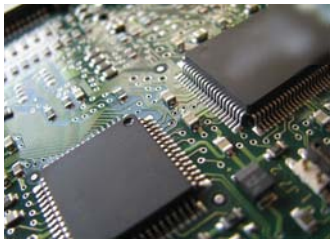
Learn more at supermicro.com

Spectre, the Deep Firmware Threat

Born before silicon-level security was deemed necessary, speculative execution is now something Intel and other leading companies are wrestling with

By Lynnette Reese, Editor-in-Chief, Embedded Intel® Solutions

For years, CPU architectures have used predictive actions to speed up the pipeline with respect to how they handle memory. To gain speed in throughput, a processor loads data into as many as four levels of cache. Cache is closer to the processor, reducing memory fetch time. When it comes to speed of access the hard disk drive ranks lowest on the memory hierarchy.



Speculative execution is similar in that it, according to Apple, "improves speed by operating on multiple instructions at once—possibly in a different order than when they entered the CPU."[1] This predictive, or speculative, behavior has led to a security flaw that makes nearly every processor in cloud servers, personal computers, smartphones, or tablets vulnerable to a hack. Of course, if you have an isolated processor, you have few worries, but cloud servers have a multitude of third-party software running on them. Given the growing number of multi-party entanglements, operating systems and web browsers are affected, and engineers have been working on patches for Windows, iOS, and Linux.

There are two potential security flaws that exploit speculative execution, and they are Spectre and Meltdown. Both have been a secret, discussed only on a need-to-know basis among major hardware, cloud, and software companies since around mid-2017. Apple, Intel, AMD, Arm, Microsoft, Google, Amazon, and higher-ups working with the Linux kernel knew and were preparing patches.

Why did this happen? There's still a need for speed, and the door is closing on Moore's Law. Improvements in performance while reducing cost and increasing power efficiency aren't coming as quickly as chip designers butt up against the laws of physics. How did this happen? Security needs to start at the physical layer, in the silicon. The speculative execution technique was introduced and became a standard before security was considered necessary at the silicon level.

Humankind is making incredible forays forward into technology, yet just behind it, hackers are creating unnecessary roadblocks based on petty greed (ransomware), ego (viruses that accomplish nothing), and revenge (DoS attacks). The good news is that there was about a seven-month lead before outsiders put the pieces together. Clues came from open source Linux patches and some email list discussions shortly before the intended reveal/release date. The press revealed the hack a week prior to the anticipated date. Apparently, enough had been revealed such that hackers could piece it together, and the media felt that the public needed to know. Regardless, IT personnel worldwide are working hard to apply firmware updates and patches before the flaw can be exploited.

Lynnette Reese is Editor-in-Chief, Embedded Intel Solutions and Embedded Systems Engineering, and has been working in various roles as an electrical engineer for over two decades. She is interested in open source software and hardware, the maker movement, and in increasing the number of women working in STEM so she has a greater chance of talking about something other than football at the water cooler.

1. https://support.apple.com/en-us/HT208394

Embedded Intel® Solutions
www.embeddedintel.com

Vice President & Publisher
Clair Bright

Editorial

Editor-in-Chief
Lynnette Reese
lreese@extensionmedia.com

Managing Editor
Anne Fisher
afisher@extensionmedia.com

Senior Editors
Caroline Hayes
David Bursky

Creative/Production

Production Traffic Cordinator
Marjorie Sharp

Graphic Designers
Nicky Jacobson
Simone Bradley

Senior Web Developers
Slava Dotsenko

Advertising / Reprint Sales

Vice President, Sales
Embedded Electronics Media Group
Clair Bright
cbright@extensionmedia.com
(415) 255-0390 ext.15

Sales Director
Elizabeth Thoma
ethoma@extensionmedia.com
(415) 244-5130

Marketing/Circulation
Jenna Johnson
jjohnson@extensionmedia.com

To Subscribe
www.embeddedintel.com

Extension MEDIA

Extension Media, LLC
Corporate Office

President and Publisher
Vince Ridley
vridley@extensionmedia.com
(415) 255-0390 ext. 18

Vice President & Publisher
Clair Bright
cbright@extensionmedia.com

Human Resources / Administration
Darla Rovetti

Special Thanks to Our Sponsors

ADLINK Leading EDGE COMPUTING
congatec
EFCO EverFine Group
Portwell
SUPERMICRO
WinSystems The Embedded Systems Authority

Embedded Intel® Solutions is sent free to engineers and embedded developers in the U.S. and Canada who design with embedded Intel® processors.

Embedded Intel® Solutions is published by Extension Media LLC, 1786 18th Street, San Francisco, CA 94107.

ADLINK
Leading EDGE COMPUTING

Leading EDGE COMPUTING

ADLINK Technology is leading edge computing with products and platforms that enable computing at the edge of the network, whether that network be the public Internet or an enterprise information technology (IT)/operational technology (OT) network.

With the main goal of driving data-to-decisions, ADLINK provides solutions to connect the unconnected and simplify the design, development and deployment of Industrial Internet of Things (IIoT) applications.

Edge Gateway for Industrial IoT

MXE-210/210i

Intel® Atom® E3950/E3930 SoC based Edge Gateway platform with DisplayPort, USB 3.0, GbE, COM ports and Wi-Fi/ Zigbee/ 4G LTE/ 3G/ LoRa

▶ Extreme Rugged, -40°C to +85°C

Computer-on-Modules

cExpress-AL / nanoX-AL

COM Express Compact Size Type 6 / Mini Size Type 10 Module with Intel® Atom® E3900 series, Pentium®, and Celeron® SoC

▶ Extreme Rugged, -40°C to +85°C

Embedded Open Frame Panel PC

SP-AL, Smart Panel Series

7"/ 10.1"/ 12.1"/ 15.6"/ 18.5"/ 21.5" Intel® Atom® E3950/E3930 SoC based Fanless, IP65, PCAP / Resitive Touch

▶ Extended Temperature, -30°C to +70°C

Rugged, Thin Mini-ITX Motherboard

AmITX-AL-I

Thin Mini-ITX Embedded board with Intel® Atom® E3900 series, Pentium®, and Celeron® SoC

ADLINK Technology, Inc.

Toll Free: +1-800-966-5200

▶ *info@adlinktech.com* ▶ *www.adlinktech.com*

intel IoT Solutions Alliance Premier

embeddedworld2018 Exhibition&Conference

Hall 1, Booth 1-540

Embedded Intel® Solutions

SPRING 2018

DEPARTMENTS

SPECIAL FEATURES

PRODUCT SHOWCASES

On the Cover:
BMW's 7 series autonomous driving vehicle in the Intel Corporation booth at 2018 CES illustrates how Intel technology powers BMW's fleet of autonomous vehicles. Intel Corporation displays how the power of data is affecting our daily lives at the 2018 Consumer Electronics Show (CES) from Jan. 8-12 in Las Vegas. (Credit: Walden Kirsch/Intel Corporation)

EFCO
EverFine Group

Nuremberg, Germany 27 February - 1 March
embeddedworld2018
Exhibition&Conference
... it's a smarter world

Visit us at Hall 1/ 1-253

We Engineer Based Upon Your Imagination

Our Engineering and project management teams are highly experienced in the development of gaming computing hardware and software while maintaining a keen service oriented customer focus.

High Performance Gaming Logic Box

2 x FHD + Max. 6 x 4K Displays

EGL7090

- Intel® Core™ I Series, Pentium®, Celeron®
- Integrated GPU HD530 + External graphic card
- 2 x DDR4 SO-DIMM, up to 32GB
- 2 x SATA with Pin 7 VCC + SmartBay®
- Modular I/O design
- Long lifetime support to 2030

Cost-Efficient Gaming Logic Box

2 x Full HD Displays

EGL5025

- Intel® Celeron® Quad Core 2.0GHz
- Integrated GPU HD4000 series
- 1 x DDR3L SO-DIMM, up to 8GB
- On board eMMC storage 16GB
- 1 x SATA with Pin 7 VCC
- 2 x DP + 1 x VGA
- Modular I/O design
- Long lifetime support to 2029

EverFine Group

Head Office
10F-3, No. 270, Sec. 4,
Chung Hsiao E. Rd.,
Taipei, 10694, Taiwan
T: +886 2 2751-7192
info@efco.com.tw

Americas
1991 Village Park Way, #204C,
Encinitas, CA 92024, USA
T: +1-760-827-8600
sales-us@efcotec.com

EMEA
Ulrichsberger Str. 17
Haus G1, 94469 Deggendorf,
Germany
T: +49-991-2009298-0
info@efcotec.com

www.efcotec.com

BMP'ing Obstacles to Smart Buildings Out of the Way: Q&A with CANDI

How the Intel Building Management Platform makes it possible for the IoT to encompass a marketplace of solutions for smart buildings.

By Anne Fisher, Managing Editor

Editor's Note: How do you make a building smart? CANDI Controls CEO Steve Raschke believes manufacturers, developers, and service companies can "make buildings smart by generating actionable data to optimize and monitor HVAC, electrical, and other systems."

Responding to questions from Embedded Intel Solutions, Raschke notes that even when a building has sensors and devices—and only fifteen percent of small- and medium-sized buildings in North America do—most are hard to connect to remotely. And then there's the risk of hacking. Edited excerpts of our Q&A follow:

Embedded Intel Solutions: What are some of the things you have learned about security and smart building management—and Intel's approaches to both—that you have found particularly valuable?

Steve Raschke, CANDI

Steve Raschke, CANDI: Intel's approach is to make it easy to access the data. In the past it was quite difficult to integrate edge devices across the building and link them to cloud-based apps and services. Intel's Building Management Platform (BMP) solves that problem. It takes the complexity out of edge device communications, normalizes the data, and enables secure, remote access to it. This speeds time-to-market, lowers costs, and fosters a marketplace of solutions.

On the security front, we've learned that many existing systems and IoT networks are not very secure. Building operators and their IT departments are justifiably worried about network security on-premises. Intel and CANDI engineers designed the Building Management Platform to reduce the risk of threats originating from within local networks. BMP also makes secure access to the data stream by remote applications possible. Security starts with a robust, stripped-down Linux-based OS, is enhanced by features like embedded McAfee software

IoT sensors being installed to monitor a 90-ton rooftop HVAC unit via an Intel BMP gateway. (Photo courtesy CANDI)

that monitors the binaries running on the gateway, and follows best practices like locking down ports, disabling root access, and randomizing addresses. Security features extend between gateways and the cloud, with features like strong keys for authentication, encrypted communications, isolation of gateway and user accounts, and of course all the WAN and server-side security that Google's Cloud infrastructure brings via Google's recent collaboration with CANDI and Intel.

Embedded Intel Solutions: What should the application developer who may be unfamiliar with the Intel Building Management Platform do first in order to hit the ground running?

Raschke, CANDI: Intel BMP opens up many possibilities because it links to a wide range of devices and data, so the first step is to decide how your software will add value to the smart buildings market. Will it analyze energy data and control

Empowering the Connected World

Boosting IoT Designs from Edge to Cloud

- Scalable module, IoT gateway, network appliance
- Energy-efficient embedded solution
- Industrial operating temperature
- Extended product longevity
- High reliability







Enable Your Design Today

www.portwell.com
info@portwell.com
1-877-278-8899

Portwell

intel IoT Solutions Alliance

Almost any building can easily be made 'smart' with IoT sensors and an Intel BMP gateway. (Photo courtesy CANDI)

equipment to reduce consumption? Alert maintenance workers to equipment faults? Unlock data from building control systems? Optimize for workforce productivity by controlling lights and temperature? Remember to define the target customer and the types of devices or data involved.

Once the product goal is clear, it is fast and easy for developers to connect to remote devices and data streams via Intel BMP gateways. Authentication and all functions are through a REST/JSON API. Data streams and history are also accessible through Google Cloud's Pub/Sub service.

CANDI makes it easy for developers to get started, with documentation, code examples, live data feeds, and support for qualified developers who sign up for a PowerTools subscription. At this stage, subscriptions are limited to enterprise partners who are working larger projects. An introduction to the API is online at https://developer.pwr.tools/. We can also help introduce developers to device manufacturers and systems integrators that may be helpful in deploying a solution.

Embedded Intel Solutions: What pieces of the smart building management puzzle, if any, are still missing and how can they be put into place?

Raschke, CANDI: All the pieces are available today. Intel BMP gateways can be purchased from Arrow Electronics, Ingram Micro, and elsewhere. IoT-class sensors and actuators are available everywhere. BMP integrates the most popular protocols and devices out there like BACnet, Zigbee, IP/Wi-Fi, Z-Wave, and more. Innovative smart building apps and services from companies like Altair, Leverege, and Lucid are already in the market, accessing edge data through Google Pub/Sub or the CANDI PowerTools API. The stage is set for new entrants to develop and launch their own solutions.

One piece that's still coming together is the network of integrators who deploy and profit from these new solutions. The smart building market is still young, so Intel, CANDI, Google, and our affiliates are reaching out now to educate IT and OT systems integrators, solution bundlers, VARs, and service companies about this new class of products and high-margin services they can offer their customers.

Embedded Intel Solutions: How do you expect the smart building management touch points to evolve and how do you envision other sectors—say automotive or data center or medical or industrial to leverage the solutions worked out in smart building management?

Raschke, CANDI: Intel BMP-based solutions are already finding their way into adjacent markets. What works for smart buildings also applies to smart industry, cities, and the grid. In buildings, we're seeing use cases around energy and environmental management, and in cities and industry we are seeing BMP-based use cases as diverse as irrigation and flood control, renewable energy production, and airport infrastructure. Fundamentally they're all about monitoring, analyzing, and acting on data. Equipment differs, data types change, and analytics are specific to each use case, but because BMP is flexible and agnostic the core system remains the same.

Embedded Intel Solutions: What information directed specifically at engineers working with Intel products and services that you could not fit in recent press releases would you like to share with our readers?

Raschke, CANDI: The Internet of Things is a booming industry, but it still struggles with important issues. To me, interesting focus areas for engineers include improved security between the edge and cloud, containerized edge applications and micro-services, customizable edge analytics, and cross-platform device provisioning. Ultimately, the success of Intel BMP and other IoT platforms will hinge on market adoption, which in turn depends on how well we as engineers and developers de-risk, simplify, and scale the technology.

More information is available at info@candicontrols.com

Improving Traffic Surveillance with Intelligence, Integration and Efficiency

The traffic surveillance market already hungers for IP cameras and superior video quality, but with these systems now incorporating intelligent video analytics and recognition, server platforms face fresh challenges.

By Andy Wu, Consultant to ADLINK Technology

Worldwide, users are replacing or upgrading their H.264 cameras and NVR/DVR equipment, accelerating the trend that began in the last few years, when adoption of video surveillance equipment based on the H.265 video codec first took off.

At the Security China 2016 exhibition held in Beijing, the top three Chinese surveillance vendors, Hikvision, Dahua, and Uniview, unveiled a series of H.265 based IP cameras and Network Video Recorders (NVR) products. VIVOTEK, Taiwan's top vendor of surveillance products, had already launched its H.265 solution, including IP cameras, digital video storage, and surveillance system, as well as video management software at the end of 2015.

Traffic surveillance systems in developed countries must meet basic requirements such as high- resolution video (minimum 1440p, ideally 4K), high image quality (starlight level low-light, super wide dynamic range, dynamic video optimization), and high efficiency compression (H.265). Other must-haves include video analytics and smart image recognition functions.

New Intelligent Video Analytics (IVA) technology performs basic real-time video analysis functionality for traffic conditions, traffic volume, and pedestrian flow, such as detecting traffic accidents and abnormal congestion. IVA also enables intelligent searches after a crime or the ability to detect and prevent crimes before they happen. Basic traffic surveillance video analytics functions include logging pedestrian and traffic flow, face detection, and vehicle color and model detection from each camera. Advanced functions include preliminary analysis to obtain critical frames for image recognition. The frames aid the search for stolen vehicles, wanted criminals, and the presence of suspicious persons or vehicles near a crime scene.

Use Case: Taking an Intelligent Traffic Control Center into the Future

Requirements

The customer issued the following requirements for the construction, upgrade, and future planning of an intelligent traffic control center:

- Old and failed products are to be replaced with new H.265 IP cameras with a resolution 1440p or greater.
- Some H.264 IP cameras and video management systems (VMS) within their warranty period will be retained.
- New 4K high-definition IP cameras are to be added at important public venues, road junctions, road sections, and urban viaducts.
- Legacy VMS software:
  - Can remain in use on the new server.

Figure 1: Intelligent video surveillance solution

  - Must be compatible with the new server platform and support future system upgrades over the next three years.

- The new VMS and central management system (CMS) software must:
  - Incorporate intelligent video analytics and recognition functions.
  - Have a high availability (HA) architecture and redundancy.

- The new server platform must:
  - Comply with the system planning requirements.
  - Be able to satisfy the performance requirements of related application software.
  - Be energy efficient to ensure that the upgraded equipment will reduce overall system power costs.

- The new intelligent traffic surveillance system must be compatible with 4K HDMI monitors so that it can comply with the requirements of a high-definition video wall.

- The new VMS/CMS must be able to simultaneously process at least 64 video streams in real-time (H.265, 720p, 15 fps) for display on a video wall.

Response

Based on this intelligent traffic surveillance system's application and cost-performance requirements, ADLINK proposed its MCS-2080 Media Cloud Server Platform, a high density integrated video platform with 16 independent systems in eight MCN-1500 compute nodes.

Incorporating Intel® Iris Pro Graphics P580 and the Intel® C236 Chipset, the MCS-2080 platform has two Intel® Xeon® Processor E3-1585 v5 per node. An integrated GPU assures high computing performance and video processing power.

Each of the platform's two 10GbE switch modules is equipped with four fibre ports that can transmit data at up to 40Gbps. 10GbE fibre ports ensure the stability of video streams from IP cameras to prevent system anomalies due to network latency or cabling quality. An additional two 1GbE RJ-45 ports are available for the integration of a DIDO controller, IoT network sensor, and gateway equipment. Short bursts of data and video streams that must not be interrupted therefore pass through separate ports—an approach that prevents mutual interference during transmissions and improves overall transmission quality.

Two-way audio-video conferencing for crime prevention or the reporting of traffic accidents and violence can be supported on one of the systems without adversely affecting other security processing being performed on the platform.

To enhance the usability and flexibility of surveillance displays in the control center, the platform can be integrated with a video wall consisting of multiple computers and monitors. In addition, information from IoT sensor modules can be integrated with the surveillance management system logs to provide integrated alarms. By making it possible to tag alarm video files, the MCS-2080 aids quick searches through videos of related incidents.

Balancing performance and energy efficiency, the MCS-2080 includes two redundant power supplies, each with a maximum output of 1600 watts. The entire system equipped with 16 processors has a maximum power consumption of 1380W and occupies significantly less rack space than 16 stacked 1U server systems.

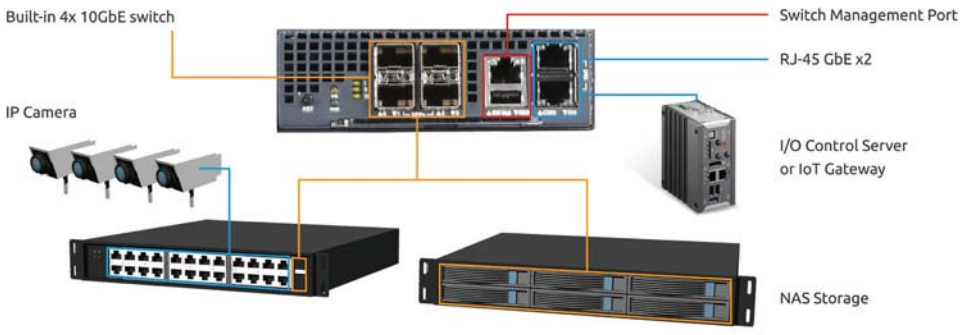


Figure 2: Built-in network switch application architecture

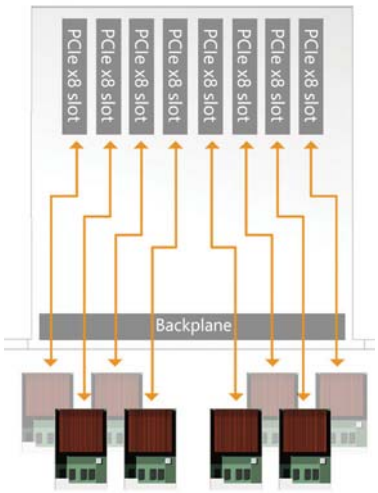


Figure 3: High density design to save the server room space

Its eight PCI Express x8 expansion slots can be used for Fibre Channel (FC) adapter cards to connect to SAN storage. High-speed network cards with speeds of over 10 GbE are also supported for connecting to NAS storage. If large amounts of video recognition data need to be buffered, then the expansion slots can be populated with SSD cards to provide additional onboard storage.

The MCS-2080 system architecture is designed for flexibility and can be treated as a server platform with 16 Intel® Xeon® Processor E3 servers with dual redundant power supplies, functioning as 16 independent systems. The clustering functions of Windows Server 2012 or Linux operating systems can also be used to combine the 16 servers into one super high performance operating platform.

Some of the systems can be for installing an existing VMS, with the new server platform boosting the performance of the legacy video management software. CMS software or VMS software can also be installed on two systems simultaneously for an HA implementation. Using an HA architecture with VMS or intelligent video surveillance software for important locations will improve the reliability of the video analytics system and avoid the risk of shutdowns that can occur with a single system.

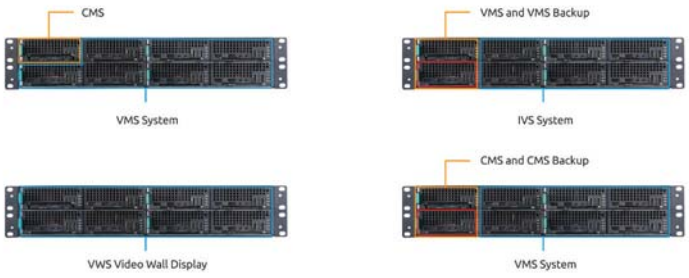


Figure 4: Integrated storage device application via PCIe expansion slots to save the recording files

The MCS-2080 can support LCD video walls up to 4x4 in size with its 16 4K HDMI video outputs. ADLINK has tested software from its partner VIVOTEK, a leading provider of surveillance solutions, that allows a single system to process 64 real-time H.265 IP camera channels at once (720p, 15 fps). This means the MCS-2080 with 16 systems can process in real time up to 1024 channels of H.265, HD 720p, 15 fps video and

Figure 5: Video wall application

output it to a video wall. This level of performance is superior to server systems with standalone graphics cards. The risk of a single machine failure causing the entire video wall to become inoperable is also reduced.

Conclusion

Integrated verification testing conducted by ADLINK demonstrates a high level of compatibility between the MCS-2080 Media Cloud Server platform and major types of video surveillance system software. In addition to more efficient use of server room space and better energy-efficiency management, it also allows the flexible integration of new and legacy surveillance systems. The ability to hot-swap individual systems reduces the risk of lost surveillance coverage during shutdowns. Server expansion to keep pace with the number of cameras managed by the system is possible. System migration in the event of failure is also supported for an HA architecture.

The MCS-2080 Media Cloud Server is an integrated platform that implements the hardware architecture of distributed servers while offering the advantages of centralized high physical density management. If the surveillance system or software is upgraded in the future, there is no need to replace the entire unit because components can simply be repurposed. For video recognition software that requires high processing power, support for clustering at the operating-system level harnesses the maximum performance of the platform's 16 processors, using software programs that support parallel processing.

Andy Wu is currently the President and CEO of A-MAXIM Intelligent Communications Tech (A-MIOCT), a new startup company focused on integrating new IoT, machine learning, deep learning, and AI technologies. Mr. Wu has more than fifteen years' experience in the surveillance industry. Before establishing A-MIOCT, Mr. Wu was Product Manager, VMS/CMS software, and Sales and Brand Manager of networking cameras and NVR. He is also the consultant for ADLINK Technology surveillance marketing and government surveillance project deployment. You can reach him at andywu@a-mioct.com

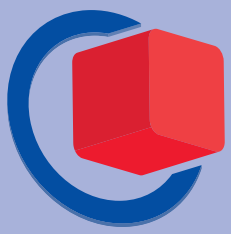
2ew18P

E-code for free admission

embedded-world.de/voucher

Nürnberg, Germany

Feb. 27 – March 1, 2018



embeddedworld

Exhibition&Conference

... it´s a smarter world

Media partners

Markt&Technik – Die unabhängige Wochenzeitung für Elektronik

Elektronik – elektroniknet.de – Fachmedium für industrielle Anwender und Entwickler

Computer & Automation – Fachmedium der Automatisierungstechnik

MEDIZIN elektronik – Fachmedium für Elektronik in der Medizintechnik

computer-automation.de

elektroniknet.de

MEDIZIN-UND-elektronik.DE

DESIGN& ELEKTRONIK – Know-how für Entwickler

Elektronik automotive – Fachmedium für professionelle Automobilelektronik

SmarterWorld – Solutions for a Smarter World

DISCOVER INNOVATIONS

Immerse yourself in the world of embedded systems and discover innovations for your success.

embedded-world.de

Exhibition organizer
NürnbergMesse GmbH
T +49 911 86 06-49 12
F +49 911 86 06-49 13
visitorservice@nuernbergmesse.de

Conference organizer
WEKA FACHMEDIEN GmbH
T +49 89 2 55 56-13 49
F +49 89 2 55 56-03 49
info@embedded-world.eu

NÜRNBERG MESSE

When Fatigue Can Be Fatal

Can biometric wearable technology improve safety in the transportation industry—and is transportation just the start?

By Dr. Stephen LeBoeuf, Valencell

While self-driving vehicles and high-speed commuter trains that take passengers from city to city may be part of our lives in a few decades, the transportation industry, now more than ever, is in need of present-day solutions to improve the safety for all its travellers.

While we can rest assured that organizations like Mobileye, an Intel® company and advanced driver assistance solution, are already working on ensuring safety in self-driving vehicles (Figure 1), other companies like KOSTechnology, creator of real-time drowsiness alert systems, are working to advance safety mechanisms in traditional driver-led vehicles.

Fatigue Risk Management Systems (FRMS) that monitor fatigue-related safety to ensure employees operate at adequate levels of alertness have been in place for years in the transportation industry (Figure 2). However, little is done outside of enforcing duty time limitations and minimum rest times between shifts to ensure the operator doesn't fall asleep at the wheel.

For companies in the long-haul trucking and aviation industries, putting their employees and property at risk because of fatigue-related accidents is a big problem that the transportation industry has yet to solve. Fortunately for drivers and employers, biometric wearables like those being created by partners KOSTechnology and Valencell could be the answer to making the road and airways safer sooner rather than later.

The Safety Problem

According to the National Highway Traffic Safety Administration (NHTSA), fatigue-related traffic accidents in the U.S. are estimated to be 100,000 per year. This includes 1,550 deaths annually, 71,000 injuries, and a 12.5-billion-dollar monetary loss in equipment—and these numbers figure to be conservative, since statistics rely on the individual willingly reporting to the police that the accident was caused by fatigue.

Figure 1: Professor Amnon Shashua, senior vice president of Intel and CEO/CTO of Mobileye, spoke on the future of autonomous driving at the Consumer Electronics Show (CES) in Las Vegas. (Credit: Walden Kirsch/Intel Corporation)

And these are just the accidents that occur. The National Sleep Foundation's survey Sleep in America recently estimated that as many as 168 million people have driven while feeling drowsy in the past year, and over 103 million have fallen asleep at the wheel—making the potential for fatal accidents even greater than the numbers suggest.

The challenge for the transportation industry is finding a way to provide

Figure 2: Fatigue Risk Management Systems (FRMS) monitor fatigue-related safety. Now, thanks to innovative new biometric measurement, customized information, including where a driver consistently shows signs of fatigue, is coming to FRMS.

real-time feedback to drivers of fatigue symptoms before drowsiness occurs. This will allow for proper intervention before there is any real risk of safety.

One such solution are biometric wearables, which have the potential to monitor vital signs and provide feedback for the wearer to take action when there is a warning of fatigue.

Wearable Technology Designed for Transportation

Whether it's smart watches, fitness bands, or gaming devices, biometric sensors are being used for a variety of purposes. For the transportation sector, data like heart rate, heart rate variability (HRV), and activity levels which are measured by wearables can also help to detect a person's fatigue level—or risk for falling asleep at the wheel.

By collecting metrics with a biometric sensor system or other wearable technology, the user will be able to determine energy levels, quality of sleep, training load, and stress levels. This will help the user determine how ready they are to take on strain and stress prior to getting on the road.

Once the user is driving, any dips in individual baseline biometrics will be signaled with an audio or vibration alert. Detection can occur several minutes before the user begins to nod off, making correction possible. If the driver is working for a company, a third-party can also be notified of the driver's low, medium, or high-risk assessment so direction can be given.

In addition to these biometric measurements, transportation wearables can provide GPS notifications to alert drivers when they've steered off course and data collection that can provide customized information, such as sections of a daily route where a driver consistently shows signs of fatigue.

Real-Time Notification

KOSTechnology recently partnered with Valencell, a biometric sensor company, to develop one of the first real-time notification transportation wearable devices (Figure 3). The KOS wearable, outfitted with Valencell's market-leading biometric sensor for collecting user data, is currently launched for the long-haul trucking industry, and uses a "patented algorithm to detect manifestations of drowsiness before a scenario becomes a threatening hazard."

In a situation where time matters, minimizing the margin of error in biometric wearables is crucial. Valencell's benchmark optical sensors ensure accurate biometric data sets across a variety of users and activity. This high-level precision helps to minimize potential lags in response time to fatigue-risk events. Another benefit that stems from high-level precision is that rounded results, including those that could unnecessarily alert the user, are avoided.

The wearable also has the ability to alert a driver, dispatcher, or other third-party when unwanted drowsiness occurs in order for countermeasures to be taken. This includes a software program that collects data, provides insight based on the data, and makes actionable recommendations. For example, analysis of historical data can determine if a specific route offers increased danger to the employee along with alternate rest points that may be used.

Figure 3: A biometric sensor capable of discovering drowsiness so as to avert its becoming hazardous.

While loss of life and property was the driving force behind the need for this technology, KOS also notes its wearable can be used to improve other aspects of the transportation industry, such as improved scheduling for drivers, overall route risk, and performance organization of employees.

KOSTechnology Training Systems also developed a user training tool to teach individuals how to recognize habits that cause fatigue along with techniques to improve performance and efficiency on the job. This combination of real-time feedback, system intervention, and user training shows the potential for transportation wearables and how they can improve safety in the transportation industry in the years to come.

Potential for the Future

With existing technology already making its way into the trucking industry, heavy-machinery operators, public transportation drivers, and the railroad and aviation industries seem like the next in line to begin utilizing transportation-based wearables. Whether it's an airline pilot on a red eye or construction worker operating a crane, big improvements to worker and environmental safety can be made.

Wearables and the algorithms that detect drowsiness like those from KOSTechnology have logical applications in the consumer market too. The commute home from work, a family vacation, or a cross-country trip are times when fatigue-related risk behind the wheel are possible. And since taking these extra measures will improve safety for everyone on the road, it isn't unreasonable to think that using this technology while driving could lower insurance premiums and lead to additional discounts for safe driving.

Outside of transportation, this same technology can make just as significant an impact in other industries where fatigue at work can be a serious issue. Members of the military standing watch, medical staff on overnight shifts, or miners working long hours are all occupations that could benefit from biometric wearable technology to improve safety.

As co-founder and President of Valencell, Inc., Dr. LeBoeuf has developed ongoing strategic partnerships between Valencell and leaders in industry and academia. He has raised more than $10M in funding for Valencell and is the inventor/co-inventor of more than 50 granted patents, including dozens of foundational patents in the field of accurate wearable sensors. Prior to Valencell, Dr. LeBoeuf led the optoelectronic biosensor program at GE Global Research, where he managed the development and productization of biosensor systems and developed cutting-edge nanosensor technology. Before joining GE, Dr. LeBoeuf developed optoelectronic solid-state materials and devices while researching at North Carolina State University. Dr. LeBoeuf holds a Ph.D. in Electrical Engineering from N.C. State and a B.S. in Mathematics and Electrical Engineering from Louisiana Tech University.

Intel Xeon Processors Fast Track a Competitive Edge for Railway Data Centers

How highly scalable embedded processor technology from Intel® and modular COTS platforms enable railway data centers to integrate more functionality into a smaller footprint

By Jarvis Wenger, MEN Micro

New Demands of Modern Passenger Trains

With the digitization of the rolling stock, railway operators are looking for new ways to make transportation more efficient, safe, and passenger-friendly. Important features for improvement are better remote train monitoring and maintenance functionalities, as well as additional services to improve the passenger experience. Both are strategic areas, and each improvement enables railways to better compete against cars and airplanes.

Handling Train-Specific Functions

There are train-specific functions that focus on the provisioning of diagnostic data for predictive train maintenance, the transfer of this status data and, ultimately, failure alerts. This data allows precise monitoring in real-time, providing an exact status for better planning. Armed with this information, previously rigid maintenance cycles can be exchanged for a more efficient on-demand service. This not only saves costs, but also increases reliability because the need for maintenance is detected before a failure occurs.

Increasing Passenger Comfort

Functions that have become a part of the services available to passengers include the control of seat reservation and passenger information displays, train announcements, and CCTV servers for video surveillance. Digital order services mean more convenient at-the-passenger-seat catering, and digital on-board bistros include cash registers and automated alerts to optimize food and drink replenishment. Passenger experience can also be improved by extensive entertainment and information offerings. Typical functions include a dedicated web portal for travel-specific information, a content server for streaming the latest videos, and a broad choice of music.

Consolidating Different Functions in a Single System

Previously all these different functions demanded dedicated systems. But today modern multi-core processor technology and modular embedded computing standards for rugged environments make it possible to consolidate many applications on one single IT platform, improving the size, weight, power and cost (SWaP-C) demands of modern railways. Further benefits of this consolidation are easier maintenance and improved reliability due to a reduced number of dedicated systems, leading to even greater cost efficiency, higher availability of services and ultimately increased customer satisfaction.

Server-Grade Performance and Features a Must

The latest embedded server-grade processor technology, such as the Intel® Xeon® D-1500 processor family, enables the implementation of many different functions into one single system by utilizing virtualization technology. With up to 16 independent physical CPU cores and hyper-threading support for up to 32 virtual cores, Intel Xeon D processors are an ideal starting point for mobile data centers in trains. They offer a core frequency of up to 2.20 GHz at a maximum

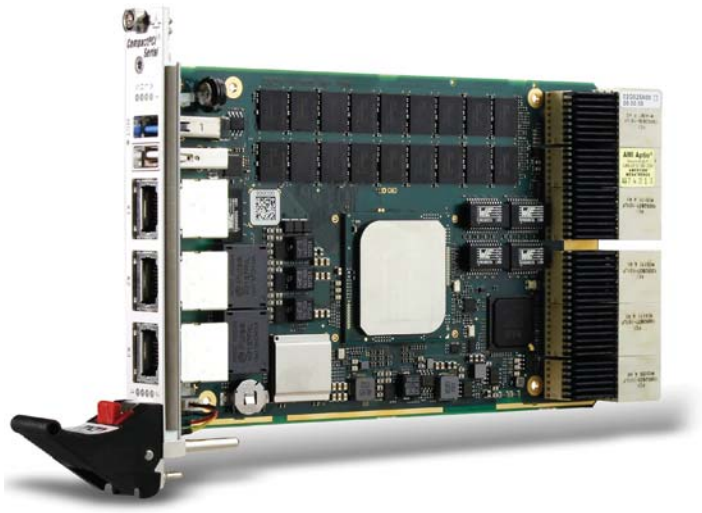


Figure 1: Based on Intel® Xeon® D-1500 processors, the multicore SBC G25A from MEN Micro offers built-in hardware virtualization and is designed for in-vehicle data centers in trains, ships, and airplanes.

TDP of 45W, providing a highly concentrated computing performance. With built-in hardware virtualization, they also offer the required abstraction of software from hardware, enabling a hassle-free segmentation of different applications and operating systems for dedicated tasks. More features can easily be added later by simply adding another virtual machine. For these virtual machines, the Intel Xeon D-1500 processors support up to 128 GB fast and energy-efficient DDR4 RAM, which is important as they need to run up to 32 OSes. Lastly, they feature an extended availability of seven or more years, which is another key requirement for the long life cycle of railway applications.

Standard COTS Offer Extreme Ruggedness and Flexibility

MEN Micro uses this processor technology on its powerful CompactPCI Serial Single Board Computers that are designed for mobile data centers with virtualization as a core component for state-of-the-art train IT platforms (Figure 1). The CompactPCI Serial standard by the PCI Industrial Manufacturing Group (PICMG), which has been maintained since 1997, is specifically developed for extremely robust, modular designs with passive backplanes. It therefore offers the required ruggedness to meet the high demands for use in the harsh railway environment where computers need to operate reliably for years in desert heat to arctic cold and under constant mechanical stress.

CompactPCI Serial—A Natural Choice

The CompactPCI Serial standard allows the integration of several high-bandwidth cards in one system which all communicate via the backplane (Figure 2). Since the standard also enables modular configurations, there is no need for complex, power-hungry cabling that would otherwise be required on the front end. The modular system design offers the advantage that only one system needs to be qualified and maintained for all essential functions. The individual cards can be plugged in or removed as required to form functional units that can be swapped at any time during operation: Wireless connections can be established via WLAN, UMTS, GSM, and GSM-R, etc. and combined with the latest Intel processor architecture, Ethernet switches, and modern mass storage media.

Figure 2: CompactPCI Serial enables high-performance train IT platforms in a compact 19-inch 4U form factor with fanless operation and EN 50155 qualification.

Already on Board All German ICEs

One example of a train IT platform based on these design principles is the new ZIP system, which is being deployed in all 256 ICEs operated by German DB. Jointly developed by MEN Micro and DB Fernverkehr AG, the new ZIP system consolidates two separately hosted application types into one single 19-inch system (Figure 3). The ZIP system is controlled by two CPUs, each responsible for dedicated tasks. One CPU, the Business Service Platform or BSP, hosts enterprise applications. The other CPU, the Customer Service Platform (CSP), provides all the functions that passengers can use directly on their end devices.

The individual platform functions of the CSP and BSP are virtualized, which extends the physical separation of the CPUs with additional partitioning on the software side. For example, the passenger portal runs on the same multicore board as the streaming portal, but on a different virtual machine. Importantly, virtualization also allows the addition of new features without hardware and software modification, so functionality can be expanded as necessary. At the same time, the system is designed to be flexible and can handle further passenger comfort or operator applications without noticeable loss of performance or quality.

Figure 3: Two in one: Two cards—connected over the backplane via Ethernet—and a redundant power supply in a single system.

Flexible FPGA-Based I/Os

Based on field programmable gate arrays (FPGAs), the I/O interfaces can thus meet train-specific interface requirements, e.g. CAN, RS422, or RS485 without the need to design a dedicated board for each new type of train. For the train announcements, the system also features a dedicated interface card in accordance to the UIC 568 audio standard. All implemented CPU, PSU, and extension cards support the extended temperature range of -40 to +85 °C, are sealed against dust and moisture by a protective lacquer, and all components are soldered for highest resistance against shock and vibration. The use of standard components guarantees low development costs and a short implementation time. Thanks to the modular design, the system can also be extended or modified so that it is future proof for many new demands to come.

Figure 4: Jointly developed by MEN Micro and DB Fernverkehr AG, DB's new train IT platform, ZIP, makes it possible for ICE passengers to access information and entertainment.

All-in-One Design—The New ZIP IT Platform

Most people will come in contact with DB's new train IT platform ZIP via the revamped ICE portal. The train IT platform is the data hub that provides all ICE passengers with free information and entertainment, as well as a wealth of details on their current journey. Passengers can use their browsers to view travel information and access DB infotainment and entertainment offerings. An app also provides access to a wide choice of movies to watch. In addition to these passenger comfort functions, the ZIP integrates a separate server for train-specific functions such as the provisioning of diagnostic data for predictive train maintenance, the transfer of status data, and failure alerts. The IT platform, ZIP, further controls seat reservation and passenger information displays as well as train announcements. Finally, it will also be used to manage the on-board bistro—including the cash register, passenger orders, and automatic replenishment of food and drink.

The Advantages of Professional Cooperation

Wolfgang Krupke, Project Manager at Deutsche Bahn, notes, "The collaboration with MEN Micro, the supplier of our ZIP platform, was very productive and we were able to discuss all issues at eye level at all times, which made the collaboration extremely efficient and fruitful. We have gladly accepted MEN's suggestions for technical improvements as they have invariably contributed to a high-performance, stable, and scalable IT platform on ICE trains. The fact that MEN also carried out the certifications on our behalf was the icing on our professional collaboration."

Jarvis Wenger is Product Solutions Manager, MEN Micro.

New Class of Embedded Design Emerges to Support Virtualized Fog Servers

Real time has taken on a new dimension with the advent of Industry 4.0. It is no longer enough for controls to communicate with sensors and actuators. Today, real-time communication is also required between industrial plants and machines as well as their incoming and outgoing systems, a demand being met by real-time-capable virtualized fog servers with redundant design for high availability.

By Dan Demers, congatec AG

The key challenge for machinery and plant manufacturers wanting to develop collaborative systems is fostering interoperability among discrete production units that previously operated independently. Everything needs to become a lot more fluid to allow previously segmented production to evolve towards the process industry. This requires a new communication level in the automation pyramid (Figure 1) that handles machine-to-machine (M2M) communication and sits above the internal process level of the machine or plant. Communication requirements increase when transitioning from field to process level. So too do data volumes, which are significantly higher at this new level compared to data volumes with field- and process-level common fieldbuses and industrial Ethernet solutions. In addition, collaborative robotics creates entirely new requirements such as situational awareness, which is implemented, for example, via infrared, ultrasound, and vision systems. The latter in particular can generate gigantic data streams requiring immense data analysis.

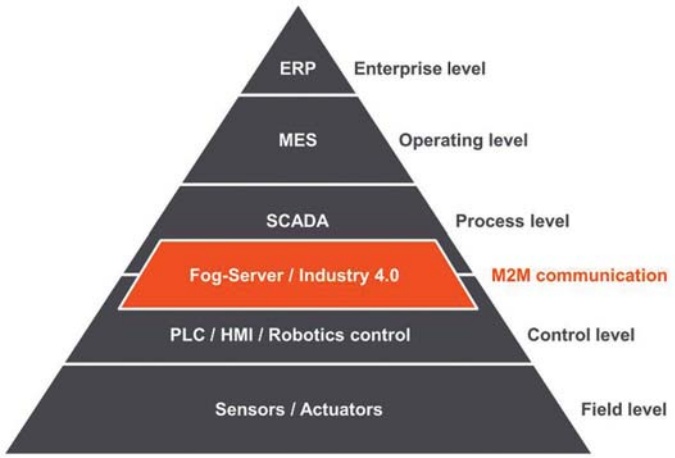


Figure 1: A new layer is currently being added to the automation pyramid: the fog server (or Industry 4.0) level which lies between the enterprise and process levels. In accordance with the IEC 62264 / IEC615112 hierarchy level[1], it fulfills station and work unit level functions while also providing direct gateways to the enterprise and connected world level.

Gaining Traction: Consolidation via Virtualization

While virtualization is already being used, for instance, to consolidate a PLC and machine vision on a single real-time hardware platform, Industry 4.0 and IoT demands are now supplying not just one reason—control plus HMI—but two or three reasons—control(s) plus HMI plus IoT plus M2M —to utilize virtualization as pivotal to smart real-time controller solutions (Figure 2).

To manage the significantly higher data rates in M2M communications as well as the consolidation of virtual machine controllers along with HMI, IIoT, and Industry 4.0 connectivity, OEMs need a new class of embedded computer technology: embedded fog servers. They should be designed redundantly to achieve highest availability. To allow short communication paths and low latencies, they must also be optimized for direct installation in harsh production environments. Ideally, they should therefore be designed for fully fanless operation and industrial temperature ranges. Standard rack systems are not suitable in this case. Embedded fog servers need a much more compact design, such as PLCs, DIN rail, or box PCs. This is why a new class of embedded systems is currently being developed.

1. https://www.vdi.de/fileadmin/user_upload/VDI-GMA_Statusreport_Referenzarchitekturmodell-Industrie40.pdf

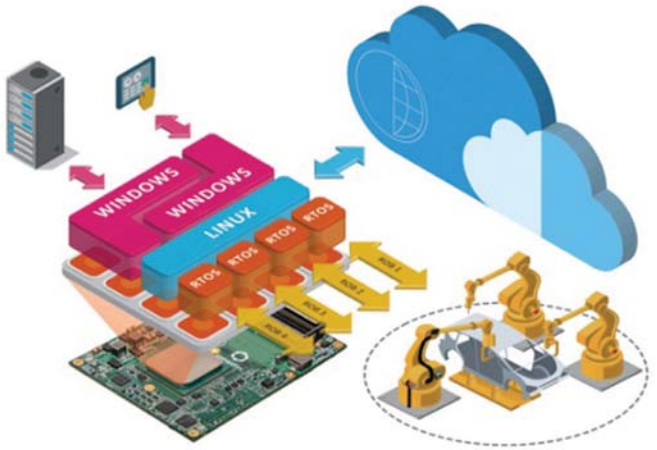


Figure 2: Assigning virtual machines to individual cores and operating them in privileged mode enables even hard real-time systems to work with Windows GUI servers and Linux web servers.

Platform standards such as the COM Express Type 7 form factor by the PICMG standardization body provide a sound technological basis for this. Designed to provide embedded server performance, this form factor natively supports up to four 10 GbE connections for the first time and provides additional high-speed storage and communication interfaces across a variety of PCIe lanes for the connection of fast industrial fieldbuses such as PROFINET or EtherCAT.

Real-Time Capability is Crucial

However, it is important that both the embedded edge server platform with its data processing capabilities and the 1/10GbE communication channels are real-time capable. The platform must never lose this capability, even with virtualization. congatec is presenting such a solution at Embedded World (Figure 3). It demonstrates how real-time

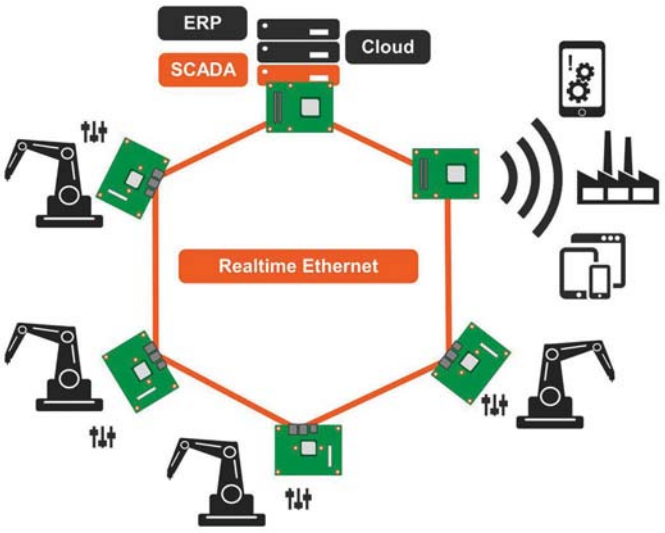


Figure 3: At Embedded World, congatec will be demonstrating a time-synchronized GbE implementation that also acts as a substitute for Ethernet-based protocols requiring proprietary controllers

systems can exchange real-time data via a GbE network in parallel with intensive data traffic without impacting real-time transmission. For this purpose, the boards support time-sensitive networking (TSN), which is also required for communication protocols such as DDS or OPC UA. In the demo, the IEEE 1588 Precision Time Protocol synchronization can be switched on or off via a digital switch in order to demonstrate the difference in communication behavior. The IEEE 1588 Precision Time Protocol enables high-precision synchronization of distributed devices with a fog server via Ethernet. The maximum jitter in standard Intel® NICs lies in the high-precision nanosecond range.

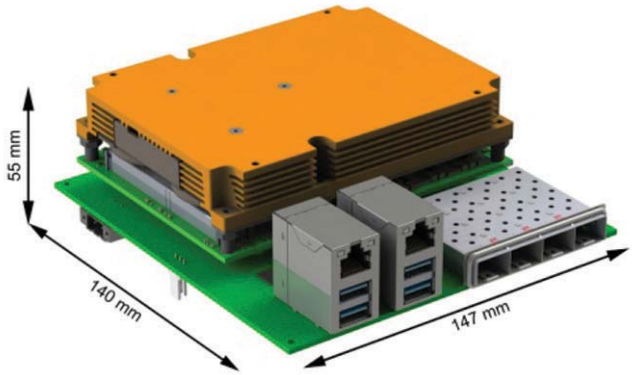


Figure 4: With COM Express, redundant industrial edge servers for up to 16 virtual machines can fit comfortably inside a control cabinet.

To comply with IEEE 1588, the feature set of the COM Express 10GBASE-KR interfaces provides a software definable pin for each of the up to four 10GbE interfaces. This physical pin can be configured as an input or output and is controlled by the associated Ethernet controller. This enables the implementation of an IEEE 1588 compliant hardware-based timing protocol for powerful real-time applications.

Low-Power Multicore Platform for Real-time Virtualization

The platform utilizes Intel® Atom™ processor (codename Denverton) based COM Express Type 7 modules with the real-time hypervisor from Real-Time Systems. Customers benefit from application-ready, virtualized, fanless embedded server platforms with up to 16 cores, enabling them to deliver highly flexible, real-time carrier-grade edge, Industry 4.0 and M2M/IoT services of all types. In addition, dedicated infrastructure components such as firewalls, load balancers, and routing systems can be standardized using software-based solutions and consolidated on fog servers. All of this helps OEMs to increase the agility and cost-effectiveness of their communications infrastructure.

With power consumption starting from 11 watts, the new, real-time low-power Server-on Modules provide up to 4x 10GbE of network performance with up to 16 cores. The feature set is designed for modular industrial micro servers

as well as rugged telecom and network equipment—such as small cells, factory gateways and storage systems—and even allows use in the extended temperature range of -40 °C to +85 °C. One solution based on PICMG's new COM Express 3.0 specification is the congatec conga-B7AC module. This Server-on-Module is available as a standardized building block and perfectly suited for efficient custom development of very compact, passively cooled embedded edge devices.

System Configuration Options

There are generally many different ways to implement a system design, which is one of the advantages of Server-on-Modules. For example, you can mount two conga-B7AC modules on a COM Express Type 7 carrier board from Connect Tech, which has the same dimensions as the COM Express module itself, i.e. 125 x 95 mm. If you sandwich hard disks in between the modules and place the heat sinks on the outside, the complete design is barely larger than 125 x 125 x 95 mm (H x W x D) and even fits in control cabinets (Figure 4). It is therefore only a matter of time before OEMs bring the first DIN rail fog server to market; the right embedded computer technology is already available off the shelf.

Custom Carrier Boards

Industrial OEM customers will not always find a solution with standard products. They often need very specific carrier board designs, for example to connect fieldbuses or industrial Ethernet protocols that cannot be addressed with standard controllers. The combination of standardized Server-on-Modules and carrier boards is ideal for such adaptations, allowing developers to save at least 50% and up to 90% in development time and NRE costs compared to a full-custom design. For this purpose, Server-on-Modules offer a standardized, processor-independent feature set that can be reused for multiple processor families and sockets. They ship with complete Board Support Packages (BSPs) covering all module interfaces, and there is extensive documentation on how to design the individual carrier board. In addition, the standardized COM Express ecosystem provides evaluation carrier boards, for which the layouts can also be obtained and used as templates for your own solutions, with best practice designs utilized via copy and paste.

Dan Demers is the Director of Sales & Marketing - Americas at congatec, Inc. He holds a B.B.S degree in International Business from Grand Valley State University, Grand Rapids, Michigan and an M.B.A. from Ashford University, Clinton, Iowa. Mr. Demers has over 19 years of experience in embedded computing having worked with Fortune 500 companies in the Industrial, Medical, and Communications markets.

How Intel PSG Takes the High Performance Road

High-level tools to dial FPGA power and efficiency up while cutting through complexity help

By Chiman Patel, WIN Enterprises

FPGA technology has origins in the early eighties with the advent of PROM, EPROM, and EEPROM solid-state memory devices. Although seemingly mature, the technology keeps threatening to emerge as the next big thing. Its early history saw healthy growth, first in telecom and networking, then in consumer, automotive and the industrial markets. Because it can be applied to any programming task, FPGA technology can address whatever the trending applications du jour are. Today's application environments require increased computing performance and blistering data stream throughput for IoT, cloud, gaming, robotics, automotive, and more.

Sales for FPGA products in 2013 were $5.4 billion USD and are projected to be $9.8 billion in 2020, so it is safe to say growth remains solid. There was, however, trouble in paradise along the way. The traditional knock-off on FPGA technology was an over-complexity and the limited availability of experienced designers. Due to technology advancements this is rapidly changing.

To make FPGA technology a friendlier environment, a plethora of programming and implementation options are now available. These new design options are high-level tools that provide powerful, efficient building methods. They have also resulted in a new form factor, the FPGA System on Computer (SoC), also known as a hybrid SoC.

The traditional High-Level Design (HDL) approaches offered by Verilog and Altera (now Intel® Programmable Solutions Group) remain most popular. They are stable and proven. However, they are now joined by OpenCL, which is based on C and C++ and provides an object-oriented development environment for developers needing to turn faster projects without the time to develop a knowledge of the traditional environments.

High-Level Synthesis (HLS)

FPGA development environments can now incorporate low- and high-power microprocessors. They are also able to integrate Intellectual Property (IP) that is built using High-Level Synthesis (HLS) tools based on C/C++ and other object-oriented programming environments like JAVA.

Like OpenCL, HLS tools enable object-oriented design plus the placement of these design segments in the floorplan. FPGA project managers can now choose to create totally new IP or, through their pre-project discovery efforts, identify and purchase tools that provide a good fit from a growing list of third-party sources.

Some IP products enable very high-level object-oriented design techniques, such as drag and drop placement for quickly adding video features. Ready-made IP includes a breadth of tools, including both high and low power microprocessors from Intel and other manufacturers. The very flexible Intel PSG (Altera) Nios II Soft Processor is available to satisfy the applications required by a real-time SoC. Many more IP solutions are available from Altera and are listed on its website, including the now mature, but ever popular MCU, i.e., Intel MCU 8051.

In addition, Intel is taking a 3D System-in-Package (SIP) approach in recent product launches, e.g., the Altera Stratus 10 MX integrated FPGA that includes 16 GBytes high bandwidth DDR Memory, four channels 100GbE MAC, and even a Heterogeneous 3D SiP Transceiver. Intel's Embedded Multi-Die Interconnect Bridge (EMIB) technology can serve

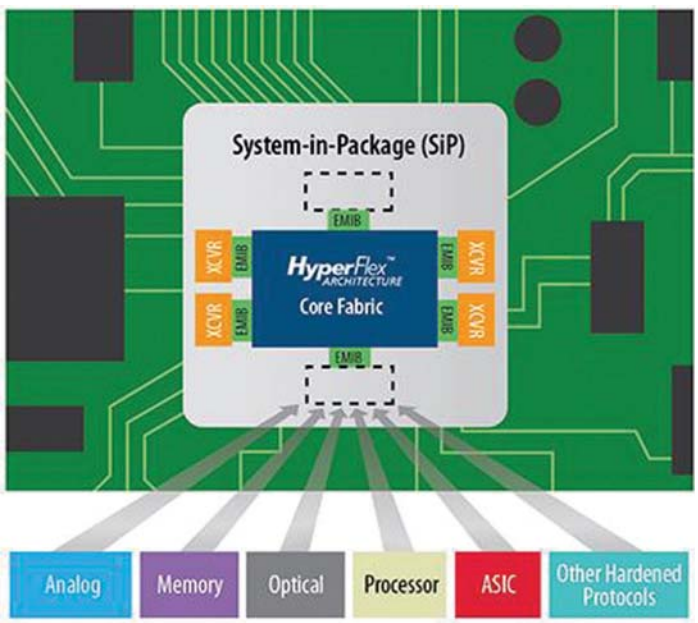


Figure 1: (Image source: Intel's Programmable Systems Group (HPC)

extremely high-performance environments. As Figure 1 shows this opens up many possibilities for the future.

IP Tools for Object Oriented Development (Partial List)

- OpenCL
- Handel-C
- Impulse C
- Catapult C
- JHDL (JAVA-based)
- System C
- MYHDL (Python-based)
- Gaming and Networking Applications

WIN Enterprises was quick to realize the value of enhancing our own embedded and networking solutions (later, we also targeted IoT) using FPGA co-processors for enhanced data stream throughput. On-board BGA FPGA ICs are combined with other micro-architecture on Single Board Computers (SBCs) and inside of networking platforms for efficient gaming, networking, robotics, and IoT.

In networking applications FPGAs are used for data-stream acceleration that may be used for online transaction processing (OLTP) or other time-sensitive applications.

In WIN's gaming SBCs the FPGA chips are soldered to the boards and perform the following two major tasks:

I/O Expansion and Real-Time Control

Gaming machines typically use Microsoft Windows or Linux as their operating system, neither of which is a real-time OS. Display is a game's highest priority in order to deliver the best user experience possible. This means the CPU is often not able to handle the demands of its I/O sources, such as push-button switches, lamps, coin-ins, coin hoppers, LED's, etc., and do this in real time. The FPGA IC features a dedicated smart intelligence I/O handler able to off-load these tasks from the CPU.

FPGA co-processing is even more important in today's multiplayer games because of the increased number of I/Os all connected to a single CPU. FPGA's ability to deliver massively parallel processing handles this challenge.

Today's gaming machines are designed to be attention grabbers. They feature a multitude of LED lights around their cabinet to attract players. They display in different modes, such as Attract mode, Winning mode, Jackpot mode, etc. These FPGAs are designed with serial output interfaces that drive this large number of LEDs while showing the most appropriate scenes as they receive commands from the game's software.

NVRAM Management

Casino gaming regulations require strict security. Machines must handle all gaming and financial data such as Credit, Wins, Losses, Payouts, Jackpots, etc.

Games are normally designed to make two or three copies of this sensitive data. This, in turn, can negatively influence the gaming experience. FPGA, as a hardware solution with parallel processing, provides robust throughput to handle this incremental task without experiencing degradation of the display experience.

IoT

The Industrial Internet of Things (IIoT) builds on traditional control engineering and the Information Technology (IT) previously in place in manufacturing organizations. As implemented in manufacturing organizations, IoT can be thought of as a technology stack with integrated layers that increase in intelligence over four or so layers.

At the base-level of the industrial IoT system are sensors, devics, and actuators that interface with the production machinery on the factory floor (Figure 2). The sensors, devices, and actuators monitor and react to the various production events.

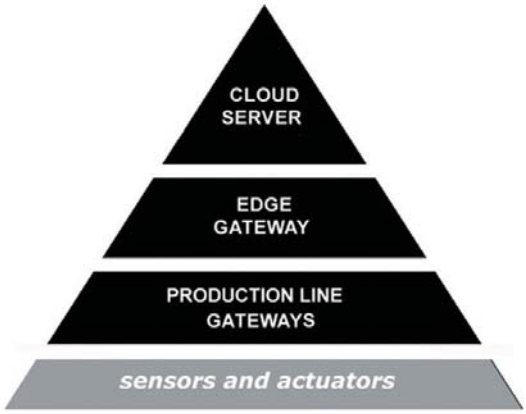


Figure 2: For a fast and efficient IoT system, FPGA processors can assist production edge gateways. This enables data from the sensors and actuators to be processed in parallel for virtual real-time reaction to events. (Image source: WIN Enterprises)

Generally, analog data is generated. This data is fed to a production-line (i.e., edge) gateway located between the manufacturing line and a more powerful gateway deployed at the network's upper edge. This gateway, in turn, communicates with a cloud server. The initial IoT gateway is where we offer an FPGA-augmented system.

The WIN IoT-380 Gateway is an entry-level embedded IoT compute solution. It records and monitors the online components on the manufacturing line and streams data from sensors and actuators via wired or wireless links to more high-level servers at the network's edge for doing analytics and data aggregation (Figure 3). These higher-level gateways transfer data directly to the cloud for additional processing, longer term analytical reporting, and archiving.

The production-line gateway translates analog data to a digital format and then refines the information for reporting. It can issue human and M2M alerts when required and store appropriate volatile data. Processing at this level is sometimes referred to as fog computing, as it occurs before the network's edge.

Figure 3: IoT-380 Gateway with Intel® Atom™ Processor E3800 SoC. (Image source: WIN Enterprises)

FPGA solutions ease the task of dealing with several protocols in the manufacturing environment. For instance, machine-to-machine communications can occur between physical or wireless links. Other typical operations are self-monitoring the health of machines for predictive maintenance, detecting machine failure, monitoring logistics, and ordering parts. These gateways can also facilitate the processing and disposition of faulty production output. Protocol translation from analog to digital and the ability to integrate RFID information with other data is considered essential for the production-line gateway. Data translations can be done in parallel by the FPGA chip. The parallel processing of the FPGA-assisted gateway helps maintain overall system efficiency. Another of today's trending application areas for FPGA-assisted processing is robotics.

Robotics

When we think of robotics, we naturally think of industrial applications where they are already deployed to the tune of around 1.4 million machines, but today they are used widely. With advances in AI, convolutional neural network engines (CNN) and precision multi-axis control, they are poised to profoundly affect the way we live. Robotics provides a natural home for massively parallel processing techniques like FPGA and hybrid systems for applications like real-time detection for automotive, mobile robotics, industrial production, etc.

Here are some of the top robotics markets that should see robust growth over the next decade:

- Medical (patient care, advanced prosthetics, etc.)
- Agriculture
- Food preparation
- Industrial / factory floor
- Education (language training, etc.)
- Military
- In home assistance
- Stable and Comprehensive

First and foremost, future development will follow the needs of the major trending markets that include high-performance networking, IoT, robotics and automotive. The autonomous automotive market with its need for near real time response to maintain lane integrity, safe vehicle distance, automatic parking and self-driving, is expected to provide a robust market for FPGA solutions. Current research and development on fiber-based, chip-level connectivity can be expected to come online in the near to moderate term, and as new manufacturing techniques drive down the cost of custom solutions, expect to see the integration of analog, ASICs, and CPUs with FPGA.

The acquisition of Altera by Intel and subsequent launch of products that combine Intel® Xeon® and Altera FPGA technology is another major step in providing stable, comprehensive environments for designing, testing, and implementing FPGA solutions within an integrated environment. This environment has the further advantage of being supported by Intel's IoT Alliance Program.

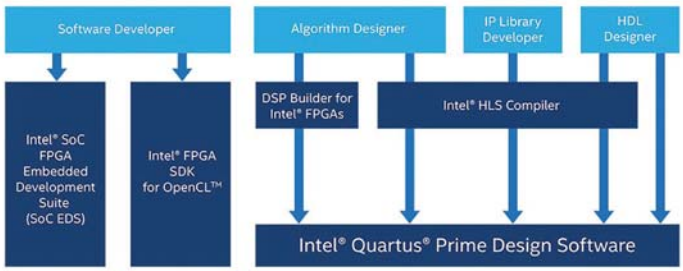


Figure 4: (Image source: Intel)

Intel's goal is to provide developers with a complete suite of tools for every stage of the design and testing process. Figure 4 shows Intel is well on its way to providing an easy to use, comprehensive environment for the creation of FPGA and FPGA hybrid systems.

Suffer? No

Articles like this often mention Moore's Law in their conclusion, but we all agree transistor growth on a per chip basis is slowing. That doesn't mean, however, that improvements to the computing experience will suffer. In the short term (i.e., before quantum computers, etc.) co-processing architectures using FPGAs and standard processors from Intel and other manufacturers will provide us with the high data stream performance that we require for Cloud and other application areas.

With over 30 years of experience in the electronics industry, Chiman Patel is the founder, CEO, and CTO of WIN Enterprises. Patel holds two patents and is also a charter member of TiE-Boston, a nonprofit Massachusetts organization with a mission to foster and support entrepreneurship.

In-Vehicle Infotainment Turns to the Experts

Certain technologies are key to customizing passengers' experiences.

By Lynnette Reese, Editor-in-Chief, Embedded Intel® Solutions

Considering the price of modern cars, it's not unreasonable to expect an in-vehicle digital experience that works as well as one's smartphone. However, the design life cycle for automobiles extends over several years, and many manufacturers in the automotive industry lag behind the sophisticated functionality of smartphones. To catch up with technology and maintain the pace, automakers must design ahead of the game. One solution that automakers look to comes from companies whose core competency is embedded hardware, software, and surrounding ecosystems of development environments, tools, and operating systems. The in-car digital experience of playing music, dealing with phone calls, and navigation is identified as In-Vehicle Experience (IVE) or In-Vehicle Infotainment (IVI) in the automotive industry. The market for IVI is forecasted at $33 billion by the year 2020 with a Combined Annual Growth Rate (CAGR) approaching 13.3%.[1] Bringing the richness of experiences capable of smartphones and tablets, features such as live streaming audio/video, voice recognition, and advanced connectivity options will become increasingly common.

The most promising future IVE-related platform, envisioned within self-driving vehicles, takes advantage of a temporarily captive audience. But whether IVI is implemented today or in the future, the development of sophisticated and connected infotainment platforms is labor-intensive and expensive. Thus, it makes sense that Intel® Corporation would connect with automakers and Google's Android Operating System (OS) to create a customizable IVI platform with a familiar Android-based Human Machine Interface (HMI) framework. Intel's Open Source Technology Center has been contributing to the Android Open Source Project since 2009, contributing nearly 50,000 patches, and working directly with the Android engineering team in the process.[2]

Many IVIs today are not fully integrated but rather an overlay that allows the automaker to add smartphone activity without large expenditures in software development. All the same, Google Android OS has been extended to automotive IVI as a fully integrated system extending into the dashboard and is not an overlay. Engineers have optimized Android for running on an Intel automotive SoC with optimized processing security features and up-to-date software versions. The functionality extends beyond in-vehicle entertainment to instrument clusters and Advanced Driver Assistance Systems (ADAS). Altogether the solution, enabled by the Intel® GO™ Development Platform for In-Vehicle Experiences, provides several vital technologies for customizing IVIs for automakers. The automotive extension of Google Android is a complete operating system and not just an overlay such as Android Auto, Apple Car Play, or proprietary versions such as Toyota's ETune, which require one's smartphone to operate.

Whereas the number of smartphone operating systems has narrowed down to Apple, Android and a very few others, the IVI market is still fragmented, with several proprietary systems in place as well as Android and Apple solutions. The majority of car makers have provided a means for the car to act as an extension of the user's smartphone, with limited success, as car makers have had to support the two major smartphone platforms, Apple and Android, with various applications that tie in navigation, messaging, phone calls, and other phone functions. The Intel GO development platform provides integration into other dashboard functions such as instrument cluster, HVAC controls, and ADAS in addition to traditional IVI functionality, which includes navigation, integration with the car's audio system, and phone calls. According to Intel, "Google has extended its Android OS so that it runs seamlessly in an IVR system. It will also offer a dedicated ecosystem of apps designed for automotive." ii Google's integrated Android Automotive also makes it easier for automakers to design their own user interfaces. Since Google Android has been around for some time, the talent pool and ease of use of the Android operating system translates well for developing IVI and dedicated apps for automakers.

Imad Sousou, Vice President, Software and Services Group at Intel, says, "Intel has secured multiple design wins on Android Automotive, thanks to internal development expertise and efficiencies that help us achieve our industry leadership in Android. Today we are among the fastest in keeping time to market with Google on new Android releases. Our ability to scale enables Intel to support many major customers, empowering them to get products to market faster."[3]

Challenges to the Google Android operating system include the ever-present concerns about security, data, and privacy of users. Addressing security starts at the silicon layer on the Intel SoC and extends through the operating system and beyond. This

Figure 1: Proposed Google Volvo XC60 interior. Volvo announced plans to use a Google Android-based infotainment and connectivity solution that is fully integrated beyond traditional smartphone-based IVI, extending to the instrument cluster, HVAC control, window/mirror/seat adjustment, and other IVI, in-cab functions. (Image: Volvo)

Figure 2: Volvo plans to integrate the Google Android OS into next-generation connected cars, enabling drivers to use Google local search without requiring a separate smartphone. (Image: www.media.volvocars.com)

means that the Android operating system running on the car will need to receive timely updates, just like smartphones. Data collection and privacy are similar to those facing smartphone users, as well. Use of Google-based navigation in an integrated automotive platform means that the driver's whereabouts and travel plans can potentially be used freely by either Google or the automaker, just as data gathered through smartphone use is utilized today. Will automakers ensure that customer privacy is taken into account?

Smart Phone on Wheels

In May 2017, Volvo announced "a premium partnership with Google" to develop an Android-based infotainment and connectivity solution "in-car infotainment and connectivity solution based on Android, offering access to a wide array of apps and services" that will launch on new Volvo models in the next two years, according to a press release from Volvo.[4] Audi announced similarly. Google Android holds the largest global share of smartphones, is open source, and has excellent prospects of extending to in-cab, non-safety critical functions in vehicles. The benefits of an excellent IVI include the enormous convenience of our car presenting as a true smartphone. If you get into your car and forget your phone, it will not be a problem. Software development on the Android platform would be in the hands of software developers rather than car manufacturers. Automakers can leverage the Google Android ecosystem. Google Android holds the largest market share in the smartphone segment, and therefore is familiar to a majority of users and application developers alike. Finally, there is an obvious extension of IVE into autonomous vehicles. In late 2017, Intel announced at the Los Angeles auto show "a collaboration with the entertainment company Warner Bros. to develop in-cabin, immersive experiences in autonomous vehicle settings."[5] According to Intel CEO Brian Krzanich, "the rise of the AV industry will create one of the greatest expansions of consumer time available for entertainment we've seen in a long time. As passengers shift from being drivers to riders, their connected device time, including video viewing, time will increase. In fact, recent transportation surveys indicate the average American spends more than 300 hours per year behind the wheel."

It is no secret that Intel has a great interest in the future of Autonomous Vehicles (AVs). It is also clear that the IVI market exists across a highly fragmented landscape of multiple operating systems, ecosystems, and customer experiences extending from excellent to extremely poor. Those of us driving with a poor, albeit "modern" IVI, may continue to use smartphones affixed with a suction cup to the dash in spite of having large touchscreens mounted in-vehicle. Mainstream competitors for IVI platforms are Apple Car Play, Automotive Grade Linux, and Google Android.

Intel has plans to drive entertainment in autonomous vehicles and is positioning to be the global leader in this area. Nevertheless, Intel adds value today by partnering with Google to create a much less costly and more competent solution to In-Vehicle Infotainment.

References

1. "In-Car Infotainment Market by Type (OEM and Aftermarket) and Components (Hardware and Software) - Global Opportunity Analysis and Industry Forecast, 2015 - 2022." Allied Market Research, Apr. 2016, www.alliedmarketresearch.com/press-release/in-car-infotainment-market.html.
2. "Reduce Development Costs with Familiar, Intuitive Android." 2017, www.intel.com/content/dam/www/public/us/en/documents/brief/automated-driving-android-v8-business-brief.pdf.
3. (Intel), Imad S. "Intel Helping to Drive New Google Android* Experiences." Intel® Software, Intel, 3 Jan. 2018, software.intel.com/en-us/blogs/2018/01/03/intel-helping-to-drive-new-google-android-experiences.
4. "Volvo Cars Partners with Google to Build Android into next Generation Connected Cars." Volvo Car Group Global Media Newsroom, 15 May 2017, www.media.volvocars.com/global/en-gb/media/pressreleases/208072/volvo-cars-partners-with-google-to-build-android-into-next-generation-connected-cars.
5. Krzanich, Brian. "Autonomous Driving Is Today's Biggest Game Changer." Intel Newsroom, 29 Nov. 2017, newsroom.intel.com/editorials/autonomous-driving-todays-biggest-game-changer/.

Lynnette Reese is Editor-in-Chief, Embedded Intel Solutions and Embedded Systems Engineering, and has been working in various roles as an electrical engineer for over two decades. She is interested in open source software and hardware, the maker movement, and in increasing the number of women working in STEM so she has a greater chance of talking about something other than football at the water cooler.

"…a nice head start" Q&A with JC Ramirez, ADL Embedded Solutions

How legacy support challenges have changed and how Intel® Trusted Platform Management is helping

By Anne Fisher, Managing Editor

(U.S. Air Force photo by Staff Sgt. Joshua Kleinholz)

Editor's Note: "Not all the answers are coming from the hardware-level guys," JC Ramirez, Director of Engineering at ADL Embedded Solutions, Inc., tells EECatalog. During a quick conversation that Ramirez made time for while preparing to showcase solutions applicable to unmanned or autonomous vehicle mission/payload computing, the Industrial IoT, and more at Embedded World, we spoke about supporting legacy systems, cybersecurity, and processor choice. Edited excerpts follow.

JC Ramirez, ADL

EECatalog: Please tell our readers more about your Edge-Connect architecture and applicability to unmanned systems.

JC Ramirez, ADL: While our Edge-Connect architecture is not unlike other small form factor expansion architectures like Qseven or SMARC COM modules, it is first and foremost a single board computer. That's the key difference, and it makes possible very small, compact solutions with just the CPU board alone. (See ADLEPC-1500/ADLE3800SEC).

Also, the Edge-Connect expansion interfaces are architected in such a way that many of the PCIe x1 lanes are shared (multiplexed) with SATA and USB 3.0 interfaces in addition to being available for custom use. The result is a much smaller expansion bus footprint, allowing for SBCs as small as 75mm x 75mm and full system solutions on the order of 3"x3"x1" (See ADLEPC-1520).

EECatalog: How is the discussion about legacy support different today than it was even a few years ago?

Ramirez, ADL: Up to about two to three years ago the exercise was simply that of figuring out how to adapt the latest interfaces. For example, in PC/104 architecture, the latest interface is the PCIe/104 interface. Legacy buses include the PCI Bus and previous to that the ISA Bus.

When you have a lot of legacy ISA stuff still hanging around, and the customer wants to update to the latest and greatest CPU processors, for companies like ADL, WinSystems, and Diamond Systems—the exercise for the longest time was just, "How do we adapt from one bus to a legacy bus?" If you have the space and the stack height available to you, you can adapt your way back. ADL makes adapter boards that can take you from PCIe/104 back to PCI/104. Other vendors have adapter boards that go from PCI/104 to ISA.

That's up to two or three years ago. The latest challenges with supporting legacy not only include adapting the buses to the legacy hardware, but also helping customers meet the latest cybersecurity requirements—we're talking things like FIPS 140-2 from NIST or [Trusted Platform Module]

TPM 2.0 from the Trusted Computer Group (TCG)[1]. The latest cybersecurity is only supported on the latest OSes. So now you somehow have to do something at the OS level to be able to still support the legacy stuff that was designed 10, 15 plus years ago when there wasn't any inkling that we would reach the kinds of security requirements we have today.

The answers aren't easy, and not all the answers are coming from the hardware-level guys like ourselves. One solution that end users are using is software emulation, for example, to support those old legacy functions. Many of those old interfaces are slow enough that if your software emulates them with the latest processors you can actually meet the speed requirements of that old hardware, whereas at the time the only way to get that level of speed was with a hardware rather than software solution.

Customers are also using tools like VMWare to simulate the old operating system inside one of the latest operating systems such as Windows 10 or Linux 16.04 and others.

The hardware requirements so that customers or software engineers can do these kinds of things—usually means multicore processors. For PC/104 quad core would be typical. For larger form factors you can even go octal core or higher.

From a cybersecurity perspective—people are still latching onto TPM as a key hardware component of any security solution. It is not clear that we have optimal, discrete chip kinds of solutions for TPM today, so this is where Intel® is beginning to solve this problem nicely for a lot of computing vendors.

Intel has a TPM 2.0 firmware solution, which is part of their Intel PTT [Platform Trust Technology] feature of the chipset. So to the extent that Intel continues to promote the Intel PTT feature of its chipsets, that makes it possible for embedded CPU vendors such as ourselves to enable firmware TPM 2.0 solutions for our customers, so that they can continue to meet their security requirements.

Something to note is that in lieu of discrete TPM kinds of solutions, the storage vendors are also looking to figure out how they can add security and encryption components to their SATA modules.. We have other vendors incorporating a full TPM solution on to their SATA modules. The storage vendors might be a little bit late to this party, but all of this is work-in-progress, and it will be interesting to see where it eventually winds up.

Intel has a nice head start. If you look across at the various vendors, not just ADL but our competitors, and you look at the TPM part of their solutions, you'll see that a lot of them are touting the firmware TPM solution, and that relates directly back to the Intel PTT function of their chipsets.

EECatalog: As noted here, ADL accommodates a gamut of Intel processors to span a range of small form factor and ruggedization requirements. What is it crucial to consider when choosing among processor options?

Ramirez, ADL: For military and rugged industrial embedded engineers, the critical factors beyond CPU performance and power involve the longevity or long-term availability of the processor, and the design/engineering support services behind it. For this reason, we work exclusively from the Intel Embedded Roadmap whose lifetime availability ranges from seven years to 15 years for the Intel E3800-Series Atom™. Our engineering and BIOS teams provide support for custom BIOS settings and features (logos, etc.) or custom services such as firmware development to enable security features such as Intel PTT firmware TPM, or interfacing to custom encrypted modules, for example. These are areas where Arm and RISC still lag significantly and therefore, are not ideal candidates for these types of applications.

1. https://en.wikipedia.org/wiki/Trusted_Platform_Module

New to OpenVPX?

If you have a project on the horizon which demands minimal size, weight, and power, here's why it will behoove you to get past any awkwardness or unfamiliarity with OpenVPX and put your software to work on a rugged platform.

By Ross Newman, Abaco Systems

This short guide is designed to help you get started with OpenVPX, even if your experience only entails taking this VITA technology to the evaluation stage.

Not Necessarily Obvious

Step one is to identify what your processing requirements are. This may seem obvious, but there are several processor architectures you can choose from: Intel®, PowerPC, and Arm. Each will have different core counts and clock frequencies. Also, not all processors can run all operating systems, although for Linux, pretty much anything goes.

> "If you need maximum performance, the latest Intel® processors (CPU options for 8 or 12 physical cores—and double that with hyperthreading enabled) give the best performance per watt."

Be aware too that if your application is thread-aware and will benefit from a higher core count, it's not enough to have an OS that is Symmetrical Multi Processing (SMP) capable. You will have to work to parallelize your application code using threads or OpenMP. One option is to utilize Single Instruction Multiple Data (SIMD) type functionality on Intel® AVX512 or AltiVec on PowerPC. With the T Series of NXP PowerPC processors likely to be the last with a 15-year availability. PowerPC will be around for at least another 10 years in full production with the final EOL expected in 2027 giving customers time to migrate over to Intel or Arm.

For determinism and real-time performance, one of the popular real-time operating systems (RTOS) can be tailored to meet your requirements such as 32/64 bit application support, I/O drivers,and Built in Test customized to meet your program requirements, and most will run on multiple architectures: think VxWorks, LynxOS, INTEGRITY, and so on. For avionics safety certification, take a look at the QorIQ PowerPC processors such as are featured on the Abaco Systems SBC314 with its quick start time and certification artifacts.

If you need maximum performance, the latest Intel processors (CPU options for eight or 12 physical cores—and double that with hyperthreading enabled) give the best performance per watt (Figure 1). If you need more processing cycles and greater performance, consider adding a GPU for accelerated graphics or parallel processing using CUDA. The GRA113 can add 630 processing cores to your system when connected to the CPU over PCIe running at Gen3 (providing 16Gbps throughput); there is always a limit to what the CPU can do.

Figure 1: SBC347D single board computer featuring Intel® Xeon® D processor (D1559 12-core/8-core D1548)

Calm in the Face of Interfaces—Even Special Ones

Address your I/O requirements and consider your thermal cooling solution. This will narrow down your options to a set of possible processor boards. As a general rule, the smaller 3U boards can dissipate around 75 watts and the larger 6U boards around 150 watts, depending on the type of thermal solution used (convection or conduction). 6U boards have more I/O and dissipate more power for maximum performance. Conduction-cooled boards

Figure 2: A conduction-cooled SBC314 (choice of T2081/T1042 PowerPC processor) 3U VPX single board computer

now available include those, such as the Abaco Systems SBC347D shown in Figure 1, which use heat pipes to realize an efficient thermal solution and enable faster- and hotter-running boards.

For the I/O, check the configurations guides to see what I/O options are available on the board. If the board has all the I/O you need, you simply need to identify the correct rear transition module (RTM) to match the board and provide all the I/O on standard connectors. If you require special interfaces or more of a certain type of I/O, don't panic—there is a large number of expansion boards available in PMC and XMC format to allow for I/O expansion (much like PCIe cards in a PC). If you don't see something that will meet your needs, then speak to your local applications engineer for guidance. It may be possible to get a custom option or integrate a new board to meet your I/O requirements. Our applications engineers are a great source of knowledge and will provide detailed technical support, visiting you onsite if needed.

Up and Running

Now's the time to pull it all together. This can be the most onerous task, depending on the system complexity, but there are off-the-shelf solutions that will allow you to get up and running in the lab quickly. The OpenVPX specification extends to backplanes and chassis, and common configurations can be purchased off-the-shelf. Backplane profiles allow for small and large cluster configurations to meet a variety of needs. From three to 21 slots, the OpenVPX specification has modularity built in, allowing boards from different vendors to be rapidly integrated and deployed.

The simplest system may just consist of a single PC-type Intel board with integrated graphics—much like a laptop computer with a single mezzanine site. The system shown in Figure 3, for example, has all the I/O integrated into the box (Abaco Systems 3U VPX SBC239). These systems are quick and easy to put together and can be done with a limited amount of hardware experience (just a few screws). Much like building a PC, it's plug and play all the way.

Figure 3: One example of a system which can address SWaP requirements in a rugged environment is the Abaco 3U VPX SBC329 single board computer based on Xeon® E3 6th Gen Intel® Core™ technology shown here, where all I/O is integrated into the box.

Abaco Systems has a number of cards for evaluation that can run on the bench in boxes and can be pre-loaded with the operating system of your choice for short term evaluations.

Ross Newman is a Field Applications Engineer with Abaco Systems, supporting Abaco customers throughout EMEA. He has worked extensively in the defense industry with companies including BAE Systems and Lockheed Martin. Newman enjoys travel and robotics, and for the last three years has taught coding to young children at a local school as part of a national network of Code Clubs (codeclub.org.uk).

NEW! Compact, Modular and Fanless Industrial PC

Applications

- Industrial IoT (IIoT) Network and Cloud Computing
- Cyber Security Edge Devices for ICS and SCADA threat security
- Secure Networking (Secure Routing, Traffic Monitoring and Gateways)
- Intelligent Machinery and Equipment Controllers

The ADLEPC-1520 is a rugged, compact industrial-grade chassis constructed from 6063 aluminum, with thick-walled design and a fanless, conduction-cooled CPU for wider temperature operation. It features a durable anodized finish, flush-mounted screws, and flexible mounting options. At only 2.3" x 3.4" x 3.7", it is ideal for a variety of industrial applications and environments...whether on the factory floor or in the external environments.

Features & Benefits

- Compact footprint: 2.3" x 3.4" x 3.7"
- Intel® E3800 -Series Atom processors
- Stackable Extension Connector
- Modular I/O Expansion

- Fanless Design
- Custom I/O and Power available to support specific application requirements
- Operating Temperature: -20C to +60C (optional extended temperature available

Embedded Solutions
SMARTER BY DESIGN®

ADL Embedded Solutions
855-727-4200
sales@adl-usa.com

NEW! Intel® Core™ / Celeron® 6th Generation Stackable SBC

Applications

- Secure Networking, Secure Routing, Traffic Monitoring and Gateways
- Cyber Security Edge Devices for ICS and SCADA threat security
- Unmanned and Drone Payload Computing
- Industrial IoT Gateways and Controllers

The ADL120S is a high-performance, compact 120mm x 120mm SBC based on 6th Generation Intel Core and Celeron processors. It is full-featured with robust I/O including USB 3.0, LAN, M.2 PCIe/SATA and a wide operating temperature range (-40C to 85C) and high-resolution DisplayPort outputs. Eight PCIe X1 expansion lanes allow for customization for any application-specific environment.

Features & Benefits

- Compact 120mm x 120mm Footprint
- 6th Generation Intel® Core™ and Celeron Processors (Formerly Codenamed Skylake)
- Intel® Q170 Chipset
- Long-term available Intel Embedded Processors
- Up to 32GB DDR4 , 4x USB 3.0

- 8x Stackable Expansion PCIe lanes with up to 4x SATA and/or 4x USB3.0
- Wide operating temperature range (-40C to 85C)
- 2x DisplayPort Outputs

Embedded Solutions
SMARTER BY DESIGN®

ADL Embedded Solutions
855-727-4200
sales@adl-usa.com

sensors expo & conference

JUNE 26-28 2018

EXHIBIT DATES JUNE 27-28

McEnery Convention Center

SAN JOSE, CA

THE INDUSTRY'S LARGEST EVENT DEDICATED TO

Sensors, Connectivity, And Systems.

Sensors Expo & Conference is where you'll find the best of the best in the sensors industry, along with new and innovative ways to jump start your sensor solutions. Be a part of the ONLY event where technologists find opportunities and engineers innovate solutions. This year's event features three exciting days of all-new Pre-Conference Symposia, Conference Technical Sessions across 10 updated tracks, visionary Keynote Presentations, Networking Events, Exhibits, and much more!

6,500+ ATTENDEES // 300+ EXHIBITORS //
100+ SPEAKERS // 65+ CONFERENCE TECHNICAL SESSIONS //
5 PRE-CONFERENCE SYMPOSIA // 2 KEYNOTES

OFFICIAL PUBLICATION: sensors ONLINE

INDUSTRY SPONSOR: Extension MEDIA

CO-LOCATED WITH: Autonomous Vehicle Sensors Conference 2018; medical+ sensors Design Conference

www.sensorsexpo.com

#Sensors18

Register today!

Use code **EXT100** for $100 off Conference Passes or a FREE Expo Hall Pass!

*Discount is off currently published rates and cannot be combined with other offers or applied to previous registrations.

EMBED PERFORMANCE

Embed Success in Every Application

WinSystems' embedded single board computers are designed to support a broad range of industry applications in challenging operational environments, from energy and transportation management, to industrial IoT and automation. Our industrial embedded computer solutions enable the collection, processing and transmission of real-time data requirements at the heart of your overall system.

From standard components to full custom solutions, WinSystems delivers world-class engineering, quality and unrivaled technical support. Our full line of embedded computers, I/O cards, and accessories help you design smarter projects offering faster time to market, improved reliability, durability, and longer product life cycles.

EBC-C413
EBX-compatible SBC with latest generation Intel® Atom™ E3800 Series Processor

EPX-C414
EPIC-compatible SBC with latest generation Intel® Atom™ E3800 Series Processor

PX1-C415
PC/104 Form Factor SBC with PCIe/104™ OneBank™ expansion and latest generation Intel® Atom™ E3900 Series processor

ENERGY | AUTOMATION | TRANSPORTATION | INDUSTRIAL IOT | TEST & MEASURE | MEDICAL | SCADA

Single Board Computers | COM Express Solutions | Power Supplies | I/O Modules | Panel PCs

WinSystems®
The Embedded Systems Authority

817-274-7553 | www.winsystems.com
ASK ABOUT OUR PRODUCT EVALUATION!
715 Stadium Drive, Arlington, Texas 76011

intel IoT Solutions Alliance

QUALITY ISO 9001:2015 CERTIFIED