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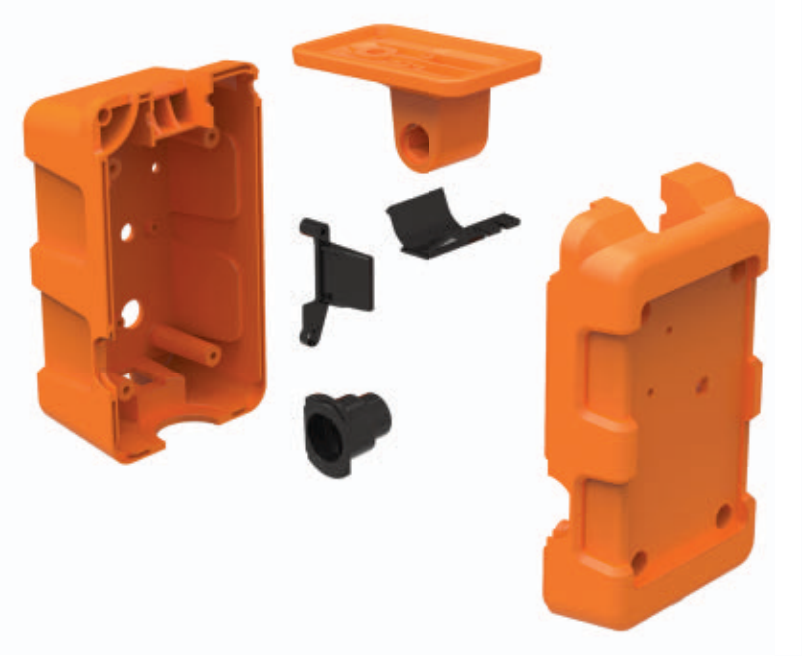

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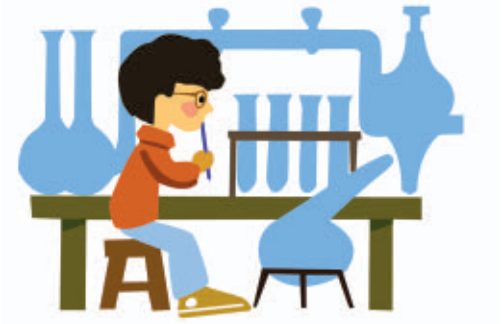
My new New Year's resolutions (sort of)

Happy New Year engineers! Like most people, January is usually a time of year where I reflect on the past and think about things that I should be doing in 2015. I say should mostly because I've never really used that gym membership (but I do come up with increasingly creative excuses) and my eating habits remain mostly unchanged (thank goodness I already like salads.) On a personal level, my New Year's Resolutions have been, well, let's just say they haven't stuck.

But I'm pretty good at keeping up with my New Year's work resolutions. Last year, I made a note to really explore something at work that I was passionate about, but didn't necessary involve the latest widgets and gadgets. It turned out to be working on STEM education trends, and talking to college and high school kids about the potential for the future. I've developed a pretty good knowledge basis from talking to experts and it's been an absolutely



fascinating dive into the world of education and psychology. Plus, I occasionally get to test out toys made for kids, which is a fun way to do your job.

This brings me to my next question: What should my 2015 New Year's work resolution be?

Obviously, I'll continue writing about kids and STEM as well as diversity in engineering, along with all my usual articles about drones, driverless cars, drones, alternative energy, drones and drones. (Yeah, we have developed a bit of a drone habit here at ECN, but they're just so darn fascinating.)

In short, I'm not sure what this year's challenge will be, but since I didn't see last year's opportunity and it turned out to be an amazing one, I think I might just let the universe take this one. Who knows, maybe this will be the year Google calls me up to test out one of their driverless cars! A girl can dream, right?

What won't change in 2015, is that every issue of ECN will continue to offer up the latest and greatest in engineering trends and technologies. In the first issue of 2015, we're talking about UAVs (I warned you about our obsession) and the military (page 14). The UAVs are pretty fascinating, because onboard computing allows them to make calls on their own without consulting a land-based computer. Pretty crazy.

We're also looking at how sensors are going to change the world (page 18) and the White Board (pg 34) is offering up some fascinating stats about wearable electronics. If you want to know whether they're going to change the world or end up dusty in the closet by December (I'm looking at you Fitbie), definitely flip to the back page and take a look.

I hope you all are a little better at the resolutions than I am, but good luck!

Until next issue,

Kasey
@kcpanetta

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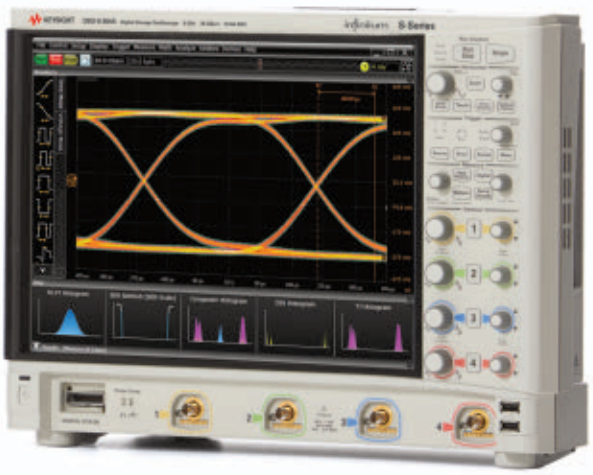

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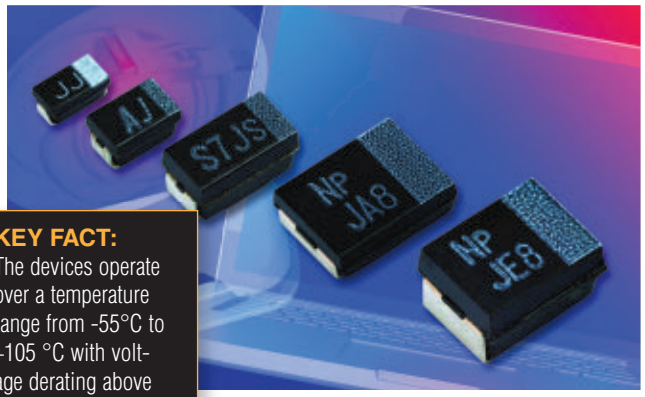


KEY FACT:
The devices operate over a temperature range from -55°C to +105 °C with voltage derating above +85°C.

Chip capacitors designed for telecom, industrial applications

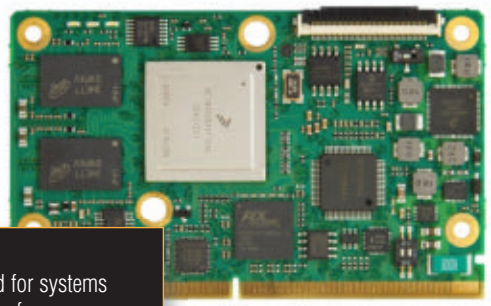
Vishay Intertechnology, Inc. (Malvern, PA) announced a new vPolyTan™ series of surface-mount polymer tantalum molded chip capacitors in five compact case sizes. Optimized for computer, telecom, and industrial applications, the devices feature ultra-low ESR down to 30 mO at +25°C and 100 kHz. Polymer cathodes offer enhanced performance over manganese dioxide devices. The series offers ripple current rating up to 1.78 A IRMS and provides low equivalent series resistance for enhanced charge and discharge characteristics. The capacitors will be used for power management, battery decoupling, and energy storage in computers, tablets, smart phones, and wireless cards.

For more information, visit www.vishay.com.

Form factor computer-on-module utilizes a Freescale processor

ADLINK Technology (Taiwan) introduced a new SMARC® (Smart Mobility ARChitecture) form factor computer-on-module (COM) running a Freescale i.MX6 processor based on the ARM Cortex-A9 architecture with a choice of dual or quad-core processors running from 800 MHz to 1.2 GHz with soldered memory up to 2GB DDR3L-1066/1333. The ADLINK LEC-iMX6 delivers efficient power consumption that targets a new generation of mobile applications requiring industrial-grade stability and reliability, and supports a operating temperature range from -40°C to +85°C.

For more information, visit: www.adlinktech.com



KEY FACT:
Especially suited for systems requiring high performance graphics in mobile applications.

Adapter cards allow re-use of legacy boards

VadaTech (Henderson, NV) offers a range of adapter cards that allow standard mezzanine cards of multiple formats to be utilized within the system. The adapter cards and carriers allow the re-use of legacy boards and the leveraging of existing technology. VadaTech offers 17 adapter/carrier cards in the AdvancedTCA form factor. This includes blades that accept standard VME/VME64x, CompactPCI, PCIe/PCI-x, PMC/XMC, AMC, and COM Express modules. In the AMC format, the company has carriers for PMC and XMC modules. Another seven Xilinx®-based and one Altera®-based AMC FPGA Carriers are available that hold an FMC module per VITA-57.

For more information, visit www.vadatech.com.

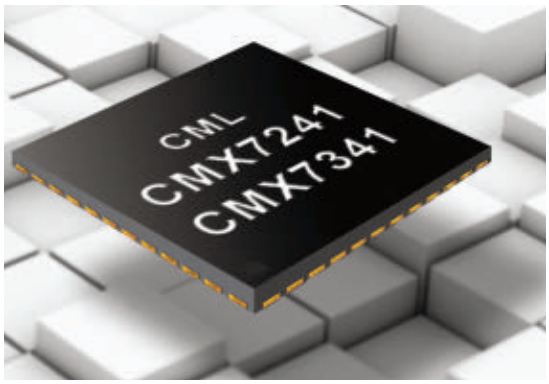
KEY FACT:
The VPX board holds an FMC module and the VXS carriers are for COM Express or PMC mezzanines.

Platform processor designed to support digital/analog FDMA PMR/LMR

CML Microcircuits (Maldon, Essex) has released a PMR common platform processor to support digital/analog FDMA PMR/LMR and 2-slot TDMA digital systems. During the migration of two-way radio from analog to digital, a number of digital FDMA and TDMA PMR/LMR systems have emerged along with the on-going requirement for a radio platform to support legacy analog. With each system potentially having different requirements and specification down to radio architecture level, the radio manufacturers' goal of a single cost-effective radio platform to fit all has become complex.

For more information, visit www.cmlmicro.com.

KEY FACT:
A function image can be uploaded into the device to determine the CMX7241/7341 overall functions and operating characteristics.



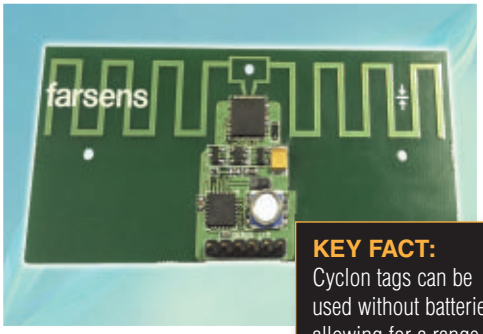
EtherNet/IP-equipment can be remotely monitored

The Netbiter Remote Management solution from HMS Industrial Networks (Halmstad Sweden) now allows automation devices using EtherNet/IP to be monitored and controlled via the web. By connecting a Netbiter EasyConnect 300-series gateway, users of EtherNet/IP-based equipment can do maintenance from any location.The solution has previously offered connectivity to Modbus devices, but HMS can also offer direct, onboard compatibility with EtherNet/IP. Via the LAN port on the Netbiter Gateway, users can connect via UCMM (UnConnected Message Manager) which is an acyclic messaging channel separate from the control loop messaging.

For more information, visit www.hms-networks.com.

KEY FACT:
Users will receive alarm or event notifications whenever critical thresholds are reached.

Battery free RFID pressure monitoring tag designed for various applications



The Cyclon-05BA from Farsens S.L. (San Sebastián, Spain) is a battery-free RFID sensor tag capable of transmitting a unique identifier and the associated absolute pressure measurement data to a commercial EPC C1G2 reader without the need of a battery on the sensor tag. The device features a MS5803-05BA sensor from Measurement Specialties to monitor pressures up to 6 bar. The tag comes in a variety of antenna designs and sizes to adapt the performance to the required application in the 860-960 MHz band. The reading distance for the battery free pressure sensor tag is around 1.5 meters (5 feet) and it can be embedded in a variety of materials such as plastics or concrete. Evaluation kits are available. Alternatively, the Cyclon-700A covers the same range with an analog sensor for a reduced accuracy. The Cyclon-30BA includes a MS5803-30BA to cover ranges up to 30 bar.

For more information, visit www.farsens.com.

KEY FACT:
Cyclon tags can be used without batteries, allowing for a range of applications where the accessibility is restricted.

BLOG

This is what happens when an editor gets a GoldieBlox

By Kasey Panetta, Editor

Generally speaking, my job is really fun. I get to meet all types of people, write about really cool technology, and work on a lot of projects that are very important to me. One of those projects is the *ECN* push for STEM education. In particular, many of the pieces I've written have focused on toys and how they influence children's skill sets. I've written a few times about GoldieBlox, which is a toy targeted specifically at younger girls (though I think young boys would enjoy it as well).

6 minutes

Time to wait for military backup via the PCAS system designed by Raytheon and DARPA

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@kcpanetta
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@JasonECNMag
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@djamesmanny

30 to 60 minutes

Average wait for military backup

TWEET

GoSyracuseU: @EngineeringSU senior Anthony Cifarelli was named @ecnonline's #STEM student of the week! bit.ly/1vG5LEX

2020

Year by which Volvo plans to eliminate car deaths

Engineering Update

Lockheed Martin's supersonic commercial aircraft

➤ *Russia's nuclear missile train*

One of the more unique contraptions from the Soviet Union was a nuclear missile train capable of traveling more than 1,000 km a day across Russia's railways and deploying their arsenal along any part of their route.

➤ *Lockheed Martin's supersonic commercial aircraft*

Lockheed Martin is working on an aircraft for commercial airlines that would cut the time spent traveling across the United States from five hours to just two and a half, and seat 80 passengers.

➤ *Robot security guards*

Robot security guards (aka K5) have been created by the company called Knightscope. They're designed to act as security guards on campuses or at business in an effort to replace human guards and also offer protection when a human guard isn't an option.

TWEET

ecnonline: DelVecchio: @LEGO_Group are good, computer scientist @Barbie is bad #engineeringlive

TWEET

TXInstruments: Why is #Bluetooth Smart perfect for #M2M? Read the part 1 of our Bluetooth Smart for Industrial series @ecnonline ow.ly/FbcrD

"Don't let computers replace your imagination." - *Advice from an ECN reader*

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The extreme environment of MILSPEC

How to leverage MILSPEC-COTS platforms for ultra-rugged solutions.

By Major General Steve Sargeant, USAF (Ret.), and CEO of Marvin Test Solutions

While many industries benefit from more durable test equipment, the term "rugged test and measurement" reaches new heights when it comes to military specifications that include extreme temperature, vibration, humidity, and salt requirements.

In recent years, the military's need for more readily available, ruggedized maintenance and sustainment test and maintenance equipment has become increasingly apparent, as more organizations deploy forces regionally and globally.

The industry's solution for this, in many cases, has been to produce custom designs that typically only meet the requirements of a specific military organization or application. This purpose-built approach can greatly increase test equipment cost and time-to-market, a detriment to today's military organizations that operate under reduced budgets and are challenged to support sophisticated aircraft and munitions with extended life cycles.

The challenge and alternative solution lies with military and aerospace organizations leveraging previously qualified, military standard commercial off the shelf (MILSPEC-COTS) products that serve as the basis for next generation test sets capable of operating in rugged environments.

Using a core platform

PCI eXtensions for Instrumentation (PXI) is a card-modular, industry proven standard used globally in military and aerospace solutions to achieve reliable test results under harsh conditions.

Figure 1. The MTS-206 Maverick Field Test Set is a based on PXI technology and used for testing the AGM-65 Maverick and AGM-114 Hellfire Missiles as well as their launchers. (Images courtesy of MTS)

The flexible and robust basic construction and configuration of the PXI platform is used today in a wide range of demanding ground and airborne test sets. Because of its modular and scalable nature, military and aerospace organizations often find success in leveraging PXI-based, MILSPEC-COTS test systems for their core test platform, knowing they can enhance or build upon the core technology as their test requirements change, especially as aircraft and munitions service lives are extended.

While the basic PXI technology is rugged enough for many applications, some enhancements may be needed for military applications.

Common considerations and enhancements to a PXI-based platform for use in military applications include:

- **Temperature**. Most PXI hardware operates in a temperature range between 0°C and 50°C. While this range is sufficient for many environments, military test sets often require more extreme temperature ranges. There are several ways that a PXI-based system can be adapted to extend the operating temperature range of the system or to facilitate operation within the core temperature zone.

For example, adding a heater to the card cage can help with operations below 0°C and additional fans can help cool PXI cards at higher temperatures. However, it is important to be mindful of the temperature range in which the system performs best. Custom electronics can help the COTS product perform optimally in safe temperature ranges. Custom electronics or additional circuitry, used in conjunction with temperature sensors located within the PXI card cage and on PXI instruments, can be used to control heaters and ensure that the COTS products are not used at temperatures under 0°C. For example, when the system is powered

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up at sub-zero temperatures, circuitry will only apply power to the on-board heaters and only allow the PXI card cage to be powered up once the internal temperature exceeds 0°C.

- **Shock and Vibration.** When operating test equipment in rugged environments, COTS hardware will often be subjected to great shock and vibration. To account for this, MIL-SPEC-COTS systems should feature extra shock absorbers. Extensive analysis and experience with field test sets has shown that multiple shock absorbers attached to the PXI chassis will protect the custom electronics and PXI card cage from shock, vibration, and lateral movement.
- **Humidity.** Since COTS product are typically not hermetically sealed, humidity can affect operation of the electronics. For this reason, all circuit cards should be conformably coated and all harnesses potted.

Leveraging the core platform for new test specifications

MILSPEC-COTS products are successful as a core platform for rugged test needs and can be used to meet new test requirements. Sometimes the hardware adjustments discussed above are required to better meet the needs of a specific application. However, making adjustments to achieve MILSPEC requirements with COTS hardware is often more effective and less costly than new, customized test sets due to reduced design and development costs normally associated with these efforts.

Figure 2. Marvin Test Solutions collaborated with the United States Air Force to create the modern, portable flightline test set for the A-10/C Thunderbolt II.

For example, when the 309th Software Maintenance Group (SMXG) at Hill Air Force Base was tasked with developing a new solution to test the upgraded digital avionics and precision weapons capabilities of the A-10/C Thunderbolt II, the premier attack aircraft used by the United States Air Force for close air support, they turned to Marvin Test Solutions to supply a field-tested and proven MILSPEC-COTS test platform that could easily and quickly be customized for the PATS-70, the A-10/C's next-generation flightline test system.

By leveraging a MILSPEC-COTS platform instead of a new custom test solution, the 309th SMXG was able to develop the new PATS-70 flightline test system under budget and within its tight development timeline. Because the MILSPEC-COTS platform was well suited for rapid fielding, few adjustments were required to meet the A-10/C Thunderbolt II's test requirements.

The **Smart UAVs** solution

Autonomous applications and onboard computing could change the way humanity interacts with UAVs.

By Andrew Simpson, Content Developer, Gumstix,Inc

Few things have captivated the technology world's imagination over the last two years like unmanned aerial vehicles. From airborne home videos, to lifting tanks out of the sea in a swarm, both the fun and practical applications of UAVs seem virtually limitless. Though these applications seem simple, many of them require intensive computational power in order to be smarter. It's a difficult challenge given the limited power resources and weight restrictions on most UAVs. Small form factor computers, with customizable features and low power consumption, offer smarter onboard computers without big resource draws, making intelligent applications possible.

UAVs are popular not just with hobbyists, but increasingly are finding a wide array of commercial, educational, and civic uses. With consumers, UAVs for everything from aerial photography to fun and games are gaining popularity. Parrot, the French headset manufacturer, recently released its platform for high-quality, aerial home videos, the A.R.Drone 2.0, offering home users a fun new way to bring photography to life. UAVs like these aren't limited to the home user either: camera-equipped drones captured action-packed television shots of athletes in many sports, notably skiing events, during the 2014 Winter Olympics in Sochi, while in the classroom, UAVs offer many educational opportunities, not just for mechatronics and electrical engineering, but in solving high-level problems through the development of artificial intelligence and sophisticated algorithms. Researchers at Czech Technical University have developed AgentFly, a multi-agent system that simulates air traffic control. The system is written in Java and is deployed on each UAV using an onboard computer running Linux. At EPFL in Lausanne, Switzerland, researchers have developed a fast-deployable flying WiFi network using UAVs with onboard computers; this flying network could be deployed in the event of a crisis to ensure continued network connectivity over a large area.

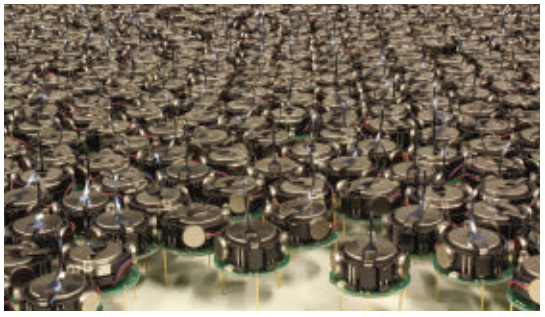
Autonomous applications

Many of these applications have significant computational requirements, even if the UAV itself is controlled manually by a human operator (using a joystick radio transmitter, for instance). For safety reasons, virtually all applications require fail-safes that need a certain degree of autonomy in controlling the UAV; as an

example, if the connection to a ground station is lost, an airborne UAV needs a system to safely land and shut down without causing any damage or injury. The capacity for autonomous decision making is something that can only be provided by some sort of onboard computer.

The case for onboard computing is not purely safety-driven. With the ability to make decisions on its own, or even simply follow a pre-programmed course using an autopilot algorithm, autonomous UAVs remove the need for human intervention and participation in what are otherwise costly and labor-intensive tasks. As examples, UAVs have been successfully used for crop dusting and for effectively and safely fighting forest fires, eliminating some of the cost and safety risks incurred by using manned aircraft.

The ability to create intelligent swarms of UAVs is particularly important, especially in applications, such as fighting forest fires, due to the need to lift heavy cargo (water, in this case). While it is difficult for one UAV to carry heavy cargo, distributing it over many UAVs is a robust solution with some serious software requirements. Peer-to-peer, intra-swarm communication via networked, onboard computers offers better performance and makes swarms more adaptable



Kilobot is a thousand robot swarm developed at Harvard University. (Photo credit: Asuscreative)

to new situations and challenges than requiring all UAVs to communicate via a base station.

In any case, all UAVs ultimately require communications capability in order to reach a ground station and receive instructions.

For long distance applications this is best achieved using technologies like radio or satellite, but when working at short range, ubiquitous technologies like Wi-Fi and Bluetooth are a convenient choice. Small form factor computers are available with Wi-Fi, Bluetooth, and high-speed cellular modems built in — making communication between a computer on the ground and a computer in the air a relatively simple task.

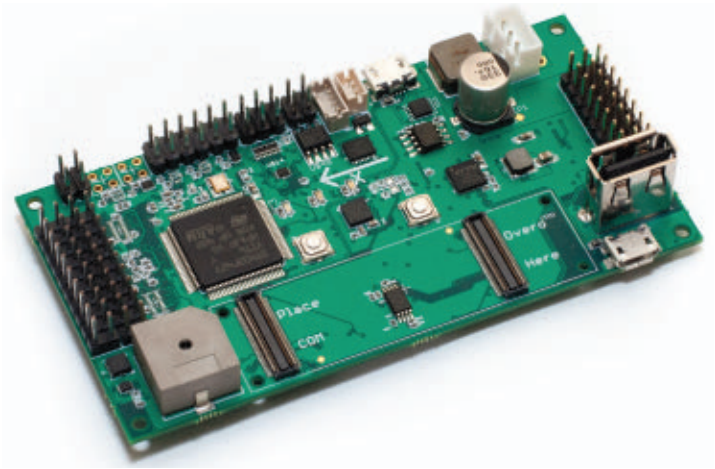
With these communications in place, some of the very intensive computing tasks can be moved completely off the UAV onto the ground station computer, where resources are not as constrained.

Matching onboard demands to onboard resources

Owing to their small size, the resources available on a UAV are generally constrained. This is significant to onboard computing for two reasons: very little power is available for a computer to use because of the battery size on a UAV, and the size of the computer need to be as small as possible in order to conserve power by minimizing weight. Power electronics, in particular, can be

heavy and consume a lot of space, so optimizing the requirements of the UAV's core systems to the requirements of any onboard computer is critical.

ARM-based architectures have come to dominate in electronics where power conservation is of the utmost importance (95 percent of the world's smartphones, for example, run on ARM-based processors). For this reason, ARM-based systems are ideal for UAVs, with the capability to run familiar operating systems



Compatible with Overo COMs, the AeroCore 2 gives UAV developers greater selection and enhanced flexibility in finding a computing solution tailored to their needs. (Photo credit: Gumstix)

(e.g., Linux) and software development environments (e.g., C++ or Java environments) while needing far less power than x86-derived systems.

Many ARM-based systems are available today, with single-board computers (SBCs) and computers-on-module (COMs) being popular in UAV applications due to their low cost, small footprint (some as small as a stick of gum), and modularity.

Designing an autopilot with COM connectivity offers users the capability to swap in different COMs with different features to achieve a particular set of requirements. The ability to customize available computing features on the UAV while consuming only a few watts of power and taking up a small amount of space make COMs a simple choice in deploying advanced applications onboard UAVs.

As the demand for new and interesting autonomous applications on UAVs grows, so too will the demand for smarter, more capable vehicles. The field of UAVs is rapidly evolving, and with more of them in the sky and soon-to-be released regulations from the FAA, the need for smarter vehicle controllers is only set to grow. Small, power efficient, and capable onboard computers running a familiar development environment will continue to open an even wider array of innovative applications for UAVs, with developers able to safely deploy any idea with the best software solutions they can dream up.

The new commericial drone industry

By Jason Lomberg, Digital Editor

The ruling states that unmanned aerial vehicles are, in fact, aircraft, which places them within the purview of the Federal Aviation Administration (FAA) and opens the door for massive regulation. The FAA could, for example, fine drone operators for flying their UAVs in a manner deemed reckless or careless. Or impose arbitrary restrictions on airspace, operating hours, or any regulations in the "public interest."

According to the FAA, an "aircraft" is any "device ... used for flight in the air" ... including "manned or unmanned, large or small." This includes anything from large, commercial drones to (presumably) small, hobbyist devices.

Because the FAA's definition is so broad, the ruling has created a quagmire of uncertainty and, by any definition, uncertainty is always bad for business. According to CBS news, the fledgling drone industry could be worth more than $13 billion and generate more than 70,000 jobs.

Now that's on hold until businesses can sort through the impending regulatory framework. Let's face it, no one wants a swarm of reckless aircraft — manned or unmanned — clogging our skies and putting bystanders and property in danger. But placing a commercial sector entirely under the thumb of the FAA gives the federal agency nearly unlimited clout in a budding industry.

Most of us probably see the need for a federal agency to oversee American civil aviation (lest we forget the mid-air collisions of the '50s that spurred the creation of the FAA). But unmanned aviation? What imminent danger does pizza-delivering quadcopters or packages weighing <5 pounds pose to public safety?

And the ones clamoring the loudest for regulation? Strangely, the industry, itself.

"It's important to have regulatory structure in place to allow for the utilization of this technology. "People say 'well the technology has outpaced the regulatory,'" said Michael Toscano, president and CEO of the Association of Unmanned Vehicle Systems International. "That's true with any revolutionary type technology … we need to have rules in place. This is one of the few industries that wants to be regulated."

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The home of the future

How sensor fusion will shape the Smart Home.

By Cees Links, CEO, GreenPeak Technologies

The evolution towards the smart home and the day when sensors truly integrate intelligence with your house and your smart phone is well on its way. This process has been in progress for many years and can be broken down into three phases: The Connected Home, The Smart Home, and The Really Smart and Intelligent Home.

The Connected Home has been around for years. Dominated by DIYs, and system integrators, this sector consisted of a wide range of home automation devices that didn't talk amongst themselves, used individual remote and management solutions, and required a good level of technical expertise to make the system work.

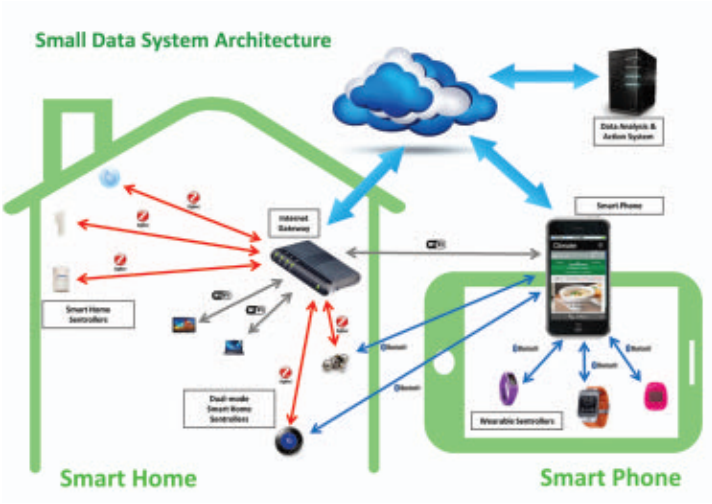
The Smart Home is happening now as various systems providers roll out solutions that can monitor and control a variety of in-home sensing and control systems via a connection to the internet and a smart phone. These include home security, health monitoring, lighting, energy and environmental management (heating and AC), and many others.

The Really Smart Home — the intelligent home — is when intelligence links together the network of sensors. That essentially enables the house to learn how the inhabitants live and respond to it without a human being in the loop to make decisions. The recent Google acquisition of Nest is a good indication of that trend.

Currently, most homes have about ten Wi-Fi devices in them, including laptops, smart phones, streaming TVs, gaming devices, tablets, etc. In the near future, we expect to see a hundred or more sentroller devices in each home — these include the actual sensors, as well as controllers and actuators that activate devices. All of these sensors can connect to the internet via a local hub and can be monitored, programmed, and controlled by a web connected device (i.e. a smart phone or tablet.)

Imagine the house full of sensors — motion, temperature, position — all talking among each other and having intelligence to make decisions. For example, when the home is empty during the middle of the day, a movement might activate a motion sensor. Realizing that no one should be in the home, it sends out a security alarm. However, in the late afternoon, as the residents arrive home, the sensor knows this motion is appropriate and can activate the right environmental system, like turning on the heat, and activating music and entertainment systems. In the middle of the night, recognizing someone stirring from their bed, this very same motion sensor turns on lights, safely guiding the resident to the kitchen so they can get a midnight snack.

Suppose you are on a trip with your family, and you suddenly realize that you may not have locked the back door. Yes, there are some connected and Smart Home technologies that enable you to check the locks and remotely lock the house. But wouldn't it be smarter for your house to recognize it was empty and lock all of the doors and windows?



The new Really Smart Home ecosystem includes a network of controllers talking to one another via ZigBee, other communication technologies (like Wi-Fi and Bluetooth), a connection to the web and cloud based intelligence, and smart phones to monitor and manage the system. (Image Credit: Greenpeak)

Family Lifestyle Systems

A Smart Home Family Lifestyle System is a network of sensors connected to the internet that can be monitored and controlled from within the house or remotely via a smart phone. A cloud-based application connects all the sentrollers, regularly collects all of the data in the home from each device, and then learns the normal patterns in the home.

The system can learn things. For example, when do people get up in the morning? How much energy are they consuming, when, and from which appliances? When do the residents leave and come back? Where are the people in the house and do they need light?

The list is endless. The Family Lifestyle application learns what is "normal", and also recognizes what is not normal.

In a way, a Family Lifestyle System is also a social media application. It can inform family members and friends about your whereabouts, or send alerts for specific or concerning situations. It can create a social environment where people feel safer and more secure, because their physical life is seamlessly interconnected with their social media life and communications.

A Family Lifestyle System includes an app on the smart phone that integrates the capability of having the phone's owner inter-

preting an alert and translating it into an immediate call or into taking action. For example, the command could unlock the door in a situation when the owner is not home and her son rings the bell, because he forgot his key. You can designate that this happens only after you have checked with the front door camera to ensure it is your son. The Smart Home needs a smart phone as a dashboard, so this is a natural progression from where we are today into the future.

Family Lifestyle systems were developed to specifically address the needs of senior citizens. We have all heard stories of someone having a serious accident, falling and breaking a hip, or simply not being capable of getting out of bed, and unable to get help for days. Using a fall detector or an alarm button (or just a smart phone) could help solve the problem, but often these accidents happen when a communication or alert device is out of reach. In a serious medical emergency, the person may not be able to trigger the device for help. It would be easy for a sensor system to notice that something unusual has happened. For example, nobody left the house, there is no movement in the home, the toilet is not being used, the fridge is not opened, and no coffee is being made. Whatever that person normally does, is not happening. The really smart home will recognize a person's daily activities and will send an alert to their family, friends, and neighbors if there is a sudden or unexpected change.

Smart Homes and Family Lifestyle Systems are predicted to launch a complete new market segment for device and system makers.

Today, 600 million homes are connected homes with, on average, 10 Wi-Fi devices per household. Fifteen years from now, it is predicted 700 million homes will have 100 ZigBee devices networked (motion sensors, lights, thermostats, white goods, etc.) leading to the stunning number of 70 billion devices worldwide, requiring 70 billion radio devices. Both (cable and telco) operators as well as retailers installations are preparing to take advantage of this new opportunity.

In the coming years, sentrollers will become commonplace in our homes. This includes components like motion sensors, temperature sensors, open/close sensors, as well the web connected equipment being controlled by sentrollers. Even more importantly, we will be better able to understand, measure, and influence and control the quality of our lives, hopefully increasing our security and level of comfort, while reducing our energy bills, and enabling ourselves to live healthy lives at home. ECN

JOSHUA ISRAELSOHN | DIRECTOR JAS TECHNICAL MEDIA , @IZ_TECH

Notes from an IoT Forum

I recently attended an Internet of Things (IoT) forum in Cambridge, MA, and was pleasantly surprised by the quality of presentation, the quantity of interaction, and the technical depth of discussion. For a meeting unaffiliated with a larger technical conference or trade show, it attracted a knowledgeable and engaged audience with a good mix of engineering and management staff.

Ascent Venture Partners sponsored and co-hosted the event, as they do for several industry meetings during the year in the Boston/Cambridge area. I give a tip of the hat to them for keeping the session free of commercial messaging, save one tastefully brief announcement at the meeting's start. Another hat tip goes to Ascent and co-hosts INEX Advisors for assembling a panel of industry participants with a wide range of application foci. Doing so makes more work for the moderator, who must juggle topics and pull together disparate threads of discussion to keep the session moving. However, such a panel makeup provides the audience with a broader range of perspectives and a more multifaceted view of the topic — a valuable attribute for a session on IoT at this point in its evolution.

The panel included Stephen Pavlosky, Equipment Insight Lead at GE's Intelligent Platforms Division; Doug Merritt, SVP of Field Operations at SPLUNK, an operational intelligence platform that analyzes and visualizes machine data; Jamshed Dubash, COO of Senaya, a supply chain technology company focused on the IoT for remote and mobile asset management; Mike Helfrich, CEO of Blue Force Development, which focuses on mobile IoT for national security, public safety, and distributed enterprise; and Carl Levine, Community Manager at Dyn, which uses IoT technologies and methods for monitoring, control, and optimization of online infrastructure; and moderator Christopher Rezendes, President of INEX Advisors, a global firm focused on IoT technologies.

When things learn to talk

The panel's range of interests demonstrated, perhaps, why many discussions about the IoT seem to lack cohesiveness: the IoT is, I'd assert, is varied in application, scope, and technology, so one tends to view the capability and requisite resources through the lens of one's primary interests. For example, GE's Pavlosky, Senaya's Dubash, and Blue Force Development's Helfrich use IoT capabilities to monitor distributed physical assets and to collect, process, and deliver data about those assets to decision makers, both in the field and in central offices.

Pavlosky observed that, the sensing technologies aren't new but "it's an interesting time, driven by ubiquitous connectivity, large amounts of computing power in small devices, along with cloud-based infrastructure that allows us to deploy a large number of applications at a small price point."

In many cases, asset monitoring provides machine health data. Combining and comparing data from large numbers of distributed assets allows asset providers like GE to refine prediction models to minimize unscheduled downtime of, say, power generation equipment, railroad traction systems, or jet engines. For example, GE systems monitors every Delta flight, three times during each flight, and collects data that allows the company to detect anomalies in an engine's operation that trigger non-scheduled maintenance. This protects the lives of passengers and crew, minimizes schedule interruptions, and lowers costs to the airline by keeping expensive assets in service with greater safety and reliability.

Senaya's Dubash mentioned of the $80 trillion global GDP, $8 to $10 trillion is in the supply chain. For the supply-chain sector, the IoT provides means of determining asset status without adding on to or depending on infrastructure at ports or transfer points not controlled by asset owners or shipping services providers.

Helfrich of Blue Force Development offered one of the most compelling use cases of the evening. Blue Force builds software for the military and counter-terrorism space. As is the case in many other IoT applications, the use models for military predate ubiquitous bandwidth access. Blue Force's goal was to build secure software to allow rapid (i.e. within 10 seconds) formation of asset teams — confederations of people, sensors, and software-based services.

The software needed to support non-traditional partnerships such as coalitions or interagency security teams. Among other outputs, the software provides to field personnel and command and control staff what Helfrich described as a common relevant operational picture. Instead of giving forward forces a roster of people, resources, and sensors, the software allows users to create a view of machine and sensor data, correlate between them, and set up a notification framework that allows the team to get information and make decisions quickly. For example, the system can deliver time-and-distance-to-threat information, which directly affects safety and operational efficiency.

When data is the product

By contrast, Dyn's Levine and SPLUNK's Merritt focus less on physical assets and more on data about data flows. While Levine focuses more on internet infrastructure, Merritt's interests focus on traffic within IT data centers. Doug noted that IT data centers generate massive amounts of log data which is unstructured and which can vary from system to system. Historically, the ability to analyze that data has been, at best, limited. With increasing use of interactive online services and the growing market for cloud-based computing, traditional use models, which were heavily weighted toward file serving, are shifting to include app delivery and app management.

With increasing use of interactive online services and the growing market for cloud-based computing, traditional use models, which were heavily weighted toward file serving, are shifting to include app delivery and app management.

The heterogenous use models have complicated an already difficult security environment: Millions or billions of non-structured data items pass through the environment and, if analyzed properly, they could reveal an impending breach or other malicious behavior.

Dataland security

Security was one of the topics that resonated with the forum's audience. Data security remains a seemingly intractable problem online. For example, Forbes reports that one breach of Home Depot servers

yielded data on 56 million credit cards. As Forbes contributor Gene Marks comments, "it's more than the entire population of Spain…" Meanwhile, let's not forget that records are made to be broken.

As the IoT brings objects online to interact as data sources, security extends to a new dimension: hardware-level authentication. The panel and attendees could only identify two semiconductor manufacturers — Maxim Integrated and Atmel — that provide hardware authentication at the IC level. If you know of others, let me know but, two is a shockingly low number considering the rapidly growing risk of counterfeit and hacked equipment with online access. As risky as unauthenticated (or unauthenticatable) data sources and data consumers are, IoT-enabled devices with actuators are potentially many-times more hazardous. The current safeguards may be adequate for closed networks, but the IoT breaks that model in ways that potentially put systems, equipment, inventory, and nearby personnel in harm's way.

Follow-up

I caught up with moderator Christopher Rezendes of INEX Advisors a couple of weeks after the IoT forum. He offers a crisp perspective on the IoT, its potential, and its deployment that could alone easily fill a column.

One of the many interesting examples he gave of IoT applications was water well sensing. A startup, Wellntel, creates a three-dimensional model of a water well and its domain in the aquifer including aquifer top and bottom, well bottom, water surface, pump location, and vent location. Well owners monitor water level, trend direction, and plots of historical data.

INEX's analysis determined as many as 20 interested parties as potential data clients. These include, for example, the homeowner or farmer, pump OEM, and well-service provider—all with stakes in delivering safe, clean water to a home.

As risky as unauthenticated (or unauthenticatable) data sources and data consumers are, IoT-enabled devices with actuators are potentially many-times more hazardous.

Wellntel is providing groundwater data to the UC Berkely Groundwater Research Laboratory. Berkely's model for groundwater is one of the most accurate in the world. It's highest accuracy, however, is at 100 square mile resolution. Wellntel data could increase that resolution 800 fold. Direct measurements provide what Christopher calls ground truth: measurements over estimates, verifiable facts over inferences. As such, data like these can drive public policy for greater water-source safety, reliability, and equitable availability.

MODERATED BY JASON LOMBERG
DIGITAL EDITOR

CES

Sensors are everywhere, but what products matter?

By Chad Lucien, Senior Vice President, Sales & Marketing, Hillcrest Labs

The Consumer Electronic Show (CES) will be defined by more sensors, in more products, in more categories than ever before. Incredibly, one in 10 U.S. adults own an activity tracker today. The latest smartphones contain as many as 16 sensors, and with Google Fit and Apple's Healthkit, the latest operating systems put sensor data at the heart of the smartphone. Augmented and virtual reality devices, such as Google Glass and Oculus Rift, are constantly in the news, and the promise of the Internet of Things (IoT) is ringing loudly (even if it is not yet resonating with you).

So how are all of these products going to make our lives better? We've all seen headlines reporting that one-third of consumers are abandoning wearable devices, that virtual reality has failed before (and will again), and that no one needs a smartwatch. Is this all just technology for technology's sake or is there real value for us as consumers?

Yes, many of these products are just an amalgamation of features seemingly thrown together to stay current with the latest trends. Yes, there are innovative products that are providing real end-user value. As the sensor technology which underlies these products has matured, users no longer see these products as futuristic novelties but are evaluating whether products deliver a compelling user experience. Successful companies will figure out what matters to end-users and focus on creating products that deliver tangible value to consumers.

Figure 1. The iPod had a clear value proposition; new CE devices need this as well.

I'm always reminded of the amazing reaction to the original iPod back in 2001. Launched with the tag-line '1000 songs in your pocket', the value to the consumer was immediate and clear. Compare that to some modern wearables, which have a feature list as long as your arm, and you can see why consumers may stop using or even avoid purchasing the products.

At CES this year, the trick will be to find those products that have a crisp, clear, end-user value and present it in an elegant way. So let's take a look at a few of the products that appear to be on the right track.

Useful smartwatches and activity trackers

Activity trackers are closest to being a mature wearable category, and smartwatches have also reached their second or third generation of products. We are starting to see some segmentation among these products, with differentiation ranging from a focus on fashion, to a focus on end-users with a common need, or providing that often-needed encouragement to get moving. The Moto 360 and Withings Activité smartwatches are fashion statements — beautiful designs that are aimed at users who care about style as well as the technology. Smash is a wearable bracelet that helps tennis players to analyze their technique. These are just a few examples of the specialization which will be key to wider adoption and greater longevity of wearable devices.

Figure 2. The Moto 360: A fashionable wearable device. (All photo credits: Hillcrest Labs).

Concussion monitoring – Linx IAS:
Up to 3.8 million people per year are affected by a sports- or recreation-related brain injury, according to a 2013 Institute of Medicine report. The Linx Impact Assessment System (IAS) is a real-time sports impact monitoring system that uses sensors embedded in a head-worn device to help users manage potential concussions. While this is not a new category, its awareness is growing, and the Linx IAS promises to provide real-time feedback to coaches, parents, and medical professionals in early 2015.

Healthy back – Valedo:
Back pain can severely impact your quality of life. Valedo pairs a body worn device that has a gyroscope, accelerometer, and magnetometer together with a mobile app that gives you therapeutic exercises to train your back into shape. The game-style exercises motivate users to exercise their backs and use the motion sensors to provide feedback and quantify the performance improvements as they go through the exercise program.

Bicycle safety – Visijax:
Cyclists often share the road with cars, trucks, and pedestrians, which creates safety hazards for all involved. The Visijax commuter jacket has motion sensors in the arms that automatically activate LED turning signals on the jacket when you raise your arms to signal a turn, just as cyclists normally do. This gives drivers and pedestrians a heads-up on the cyclist's next move, day or night.

Better smart TVs – LG WebOS TV:
Smart TV is another product category that has suffered from a long feature list held back by a poor user experience. At CES 2014, LG intro-

Figure 3. LG WebOS TV: Making smart TV simple.

duced their WebOS TVs with the public aim of 'making TV simple again', centered around a better user interface that includes the Magic Remote with Freespace motion control and voice activation, which makes the system a pleasure to use. In 2015, we expect LG to expand on its success using the motion-sensing Magic Remote to navigate more apps and content to let users relax and enjoy more content more quickly.

CES 2015 will be the Internet of Things' coming-out party

By Jason Lomberg, Digital Editor

CES — now in its 48th year! — has always been the premier showcase for new and emerging technologies. While several heavyweights, including Microsoft, have bowed out (and Apple never had a presence), the show is bigger than ever with 150,000 attendees in the last few years. This year will showcase several "blue skies" technologies, one or two emerging technologies, and possibly a few that just refuse to go away.

One of the key technologies making a huge splash in the printed (and digital) pages of ECN is the Internet of Things (IoT). It'll be here sooner than we think. New York-based market research firm ABI Research estimates that, by 2020, more than 30 billion devices will be wirelessly connected to the IoT.

And judging by the pre-show press, OEMs will be touting IoT as one of the preeminent "next big things".

CES will have host several related exhibits, including the Smart Home, Zigbee, and smart watches, and ECN's own digital editor will get the scoop on all the various technologies and innovations enabling the IoT.

Of course, the largest gathering of consumer multinational corporations in the world has always been a convenient platform for the latest and greatest TVs and other white goods, and this year I expect to encounter curved displays, thin displays, 4K (or ultra-HD) displays, and even a few, lingering 3D displays (despite the public's collective indifference).

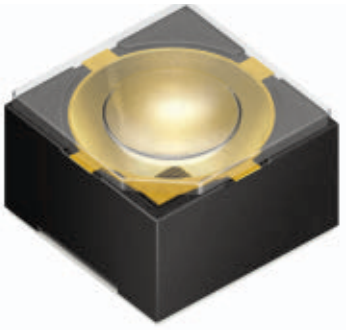
Be sure to check out ECN's extensive coverage of the 2015 International CES at www.ecnmag.com and follow the action on twitter @ecnonline. For those lucky enough to make the trip to Sin City, I'll see you in Vegas.

Chip capacitors offer low ESR

Illinois Capacitor (Lincolnwood, IL) XMPL Series Polymer Chip Capacitors are sized for applications where space is at a premium. With low ESR and ripple current ratings, they will outperform surface mount electrolytics of greater size, according to the company.

- Standard capacitance values are from 6.8 to 470 µF, with a maximum working voltage of 16 VDC.
- Well-suited to high-frequency compact power supplies, DC to DC converters and inverters.
- Designed for applications including decoupling and noise suppression in environmental controls, LED lighting, instrumentation, office automation, and medical equipment.

For more information, visit www.illinoiscapacitor.com.



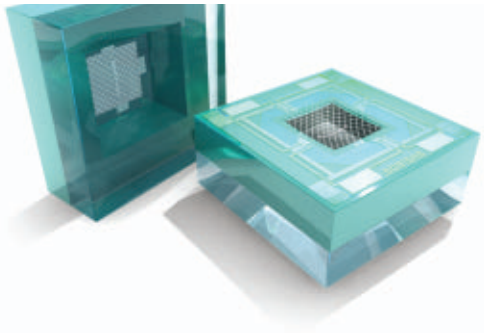
Iris scanner offers narrow emission angle

In addition to fingerprint scans, many manufacturers are now considering iris scanning as the new biometric unlocking method. The eye is illuminated with infrared light and the camera on the device takes a picture of the iris so that its characteristic features can be identified. The Osram (Munich, Germany) SFH 4780S offers the best performance-to-size ratio.

Features include:

- A wavelength of 810 nm.
- A very narrow emission angle at a low height to provide optimum performance.
- High radiant intensity for its compact size.
- an emission angle of only ±10 degrees.
- Radiant intensity of 2900 mW/sr at an operating current of 1 A.

For more information, visit www.osram.com.



Pressure sensors designed to determine pressure from 0 to 30 bar absolute

Melexis (Ypres, Belgium) has introduced two new pressure sensor products which combine high sensitivity and strong linearity. Fully automotive qualified (exceeding AEC-Q100 requirements), the MLX90815 and MLX90816 are discrete micro-electro-mechanical (MEMS) devices for measuring absolute pressure in demanding operational environments.

Features include:

- MLX90815: designed for optimal performance when determining pressures from 0 to 30 bar.
- MLX90816: covers full scale pressures ranging from 30 bar to 50 bar absolute.
- Both have a maximum deviation in their linearity of just 0.2 percent FS.
- Both offer a sensor element with piezo-resistive Wheatstone bridge connected to a micro-machined silicon pressure membrane.

For more information, visit www.melexis.com.

Digital oscilloscopes offer 7" touch panel

Saelig Company, Inc. (Fairport, NY) has introduced the GDS-200/300 series of battery-powered, compact 2-channel 1GSa/s digital oscilloscopes featuring a large 7" touch panel LCD for portrait or landscape operation. Available in 70 MHz, 100 MHz, and 200 MHz bandwidth versions, the maximum sample rate per channel is 1GSa/s and memory depth is 5 Mpts.

Features include:

- A built-in digital multimeter (5,000 counts for GDS-200; 50,000 counts for GDS-300), which can simultaneously measure and monitor A/C and D/C voltage and current, and temperature.
- The ability to store and retrieve waveform images and raw data via a USB interface.
- The oscilloscope can be connected with smart phones to transmit the recorded data to a remote location.
- A built-in engineering calculator with attenuation calculation analysis and resistance indication.

For more information, visit www.saelig.com.

Optical enclosures simplify complex fiber optic mapping issues

Molex Incorporated (Lisle, IL) recently launched its OptoConnect™ Custom Optical Enclosures. Designed to simplify complex fiber optic mapping issues, OptoConnect fiber routing system using integrated FlexPlane™ optical circuitry provides a complete end-to-end optical management system that interfaces with various manufacturers of high density telecom and datacom equipment used in communications systems.

Features include:

- High density fiber optic circuits, interconnects, and optional passive components.
- A sophisticated enclosure system that can streamline complex ingress and egress fiber port mapping for interconnect intensive technologies, including mesh networks, wavelength selective switching, and software defined networking / network function virtualization topologies.
- Complementary products such as MPO and LC loopback connectors and MTP/MPO LC cable assemblies.

For more information, at www.molex.com.

Handheld enclosures designed for outdoor electronics

OKW (Bridgeville, PA) has launched DATEC-COMPACT a new range of UV-stable IP65 (NEMA 4) handheld enclosures for outdoor electronics.

Features include:

- Modern and ergonomic cases that feature integrated contacts as an option.
- An all-in solution for charging and data transfer.
- All units in the range — enclosures, desk stations and wall holders— can be specified with built-in contacts.
- Options for the cases also include a 3 x 1.5 V AA battery compartment.
- Aimed at applications including mobile data recording and transfer, measuring and control, stock and sales logging plus digital control technology.

For more information, visit www.okwenclosures.co.uk.

MODERATED BY KASEY PANETTA
EDITOR

Q: What will be the "must-have" consumer product in 2015?

Tim Saxe, CTO, QuickLogic Corporation

The big thing that will happen in 2015 will be context-aware smartphones. Apps have been sprouting like weeds because they bring great value to our lives by helping us make nearly every aspect of our lives more efficient. At the same time, the phone is making the rest of our lives more efficient, the vast number of apps on the typical user's phone is making the phone experience less efficient and more frustrating as the user has to flip through screens or dive through folders to find the appropriate app. To exacerbate the problem, the more we use the phone to manage our lives, the more we drain the battery, creating the fear of being disconnected from our friends and colleagues and the services we have come to rely upon.

The context-aware phone will restore the simplicity that we had a few years ago without reducing the rich capabilities that have developed over the past few years

A context-aware phone,- one that knows where you are, can start to anticipate your needs. Sitting on a train? Then it is more likely that you are going to be listening to music and reading digital media, so the phone will know to make those apps more easily accessible. Sitting down to breakfast? Then it is more likely that you are going to want the news and see how you did on fantasy football. Sitting in your car? Then you are probably going to be listening to music and using the navigation function, so they all need to be easily accessible. Also, you don't want to waste power logging into all of the Wi-Fi networks that you drive past, so turn off the Wi-Fi, and if you are the driver you do want to use Bluetooth, so turn that on.

The context aware phone will restore the simplicity that we had a few years ago without reducing the rich capabilities that have developed over the past few years, making this the big win for 2015.

Liz Robinson, Vice President, Mobile Devices & Accessories, TESSCO Technologies Inc.

The market has witnessed an increasing number of consumers who prefer large-screen smartphones, considered to be devices with 4.7-inch screens or larger. Apple's recent launch of two larger-screen iPhones reflects what many analysts see as a major catalyst for explosive growth in the large-screen market.

What is driving this demand? The way consumers use their devices has evolved from traditional voice calls to email use, web surfing, gaming, and viewing video and high-resolution media on the go, and so too has the need for a larger, more feature-rich screen experience.

As phone screen sizes get bigger and demand grows, wireless data consumption is also increasing. According to the NPD Group, monthly Wi-Fi and cellular data consumption on smartphones with screens 4.5 inches and larger is 44 percent greater than it is on smartphones with screens smaller than 4.5 inches. Per the ADI 2014 U.S. Mobile Benchmark Report, large-screen devices are driving 30 percent of smartphone Web traffic, up from just 19 percent last year. In contrast, Web browsing by smaller-screen phones (four inches or less) is down 11 percent, year over year.

Wi-Fi and cellular data consumption on smartphones with screens 4.5 inches and larger is 44 percent greater than it is on smartphones with screens smaller than 4.5 inches.

The ADI report also shows that Wi-Fi use is at an inflection point, while cellular data connection is on the decline. Smartphone browsing via Wi-Fi, according to ADI, has surpassed 50 percent of all visits to websites, and a whopping 93 percent of tablet Web browsing now comes through Wi-Fi.

The owners of the newer, large smartphones are protecting their investments with new cases that must balance protection with weight, grip and access to camera – and even support the phone's use as a substitute for tablets with covers that double as stands in landscape mode.

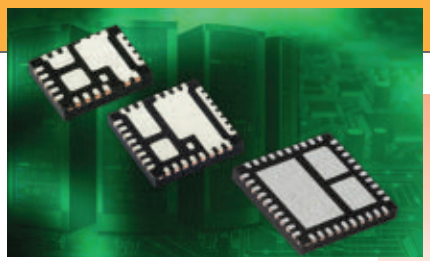
In addition, battery life and recharging has to be monitored closely. Some of the newer large-screen smartphone models are enabled with QualComm Quick Charge™ 2.0 charging, which repowers phones 75 percent faster than conventional USB charging.

Manny Patel, Broadcom

An 802.11ac router is the "must-have" consumer product for 2015, a device whose importance to the modern family is on par with everyday appliances like refrigerators and microwaves. Today's home needs a router up to the task of connecting multiple devices, networking the smart home and streaming HD content — all at the same time. Since 802.11ac offers speeds rivaling wired connections at up to 1.3 Gigabits per second, picking up one now will future proof your home network for devices yet to come.

Today's home needs a router up to the task of connecting multiple devices, networking the smart home and streaming HD content — all at the same time.

Power stage solutions designed for high-power multiphase POL applications

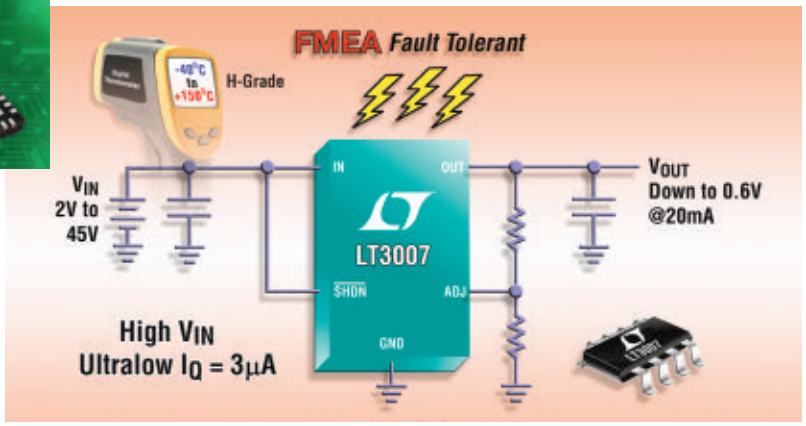


Vishay Intertechnology, Inc. (Malvern, PA) introduced a new family of VRPower integrated DrMOS power stage solutions in three PowerPAK® package sizes to meet the various design challenges in high-power and high-performance multiphase POL applications. The Vishay Siliconix SiC789 and the SiC788 are offered in the MLP66-40L with an Intel® 4.0 DrMOS standard (6 mm by 6 mm) footprint, while the SiC620 and the SiC620R are offered in the new 5 mm by 5 mm MLP55-31L package and the SiC521 is available in the 4.5 mm by 3.5 mm MLP4535-22L.

Features include:

- Optimized for on-board DC/DC converters in computing and storage equipment, telecom switches and routers, graphics cards, and bitcoin mining hardware with high current requirements and limited board space.
- A 6 mm by 6 mm package of the SiC789 and SiC788 that offers an easy upgrade path to higher output power in designs already using the Intel standard DrMOS 4.0 footprint.
- The 5 mm by 5 mm and 3.5 mm by 4.5 mm footprints are for new designs where board space constraints require more compact voltage regulators.
- Design enhancements that bolster the dynamic performance of Vishay's state-of-the art Gen IV MOSFETs by improving package parasitics and thermals.

For more information, visit www.vishay.com



Linear Technology Corporation (Bensalem, PA) announces a new wider temperature range, H grade version of the LT3007, the latest member in a family of high voltage, micropower, robust PNP-based LDOs, featuring an ultralow 3µA quiescent current.

Features include:

- FMEA fault tolerant.
- Output stays at or below regulation voltage during adjacent pin short or if a pin Is left floating.
- Quiescent current: 3 µA.
- H grade operating junction temperature range: -40°C to +150°C.
- VIN range: 2.0 V to 45 V.
- Adjustable VOUT: 0.6 V to 44.5 V.

For more information, visit www.linear.com.

Transformers offer mode noise reduction

Pulse Electronics Corporation introduces its HDBaseT™ transformers that provide common mode noise reduction for improved EMI performance and isolation for power over HDBaseT (PoH) applications.

Features include:

- Qualified for Valens chipsets VS100/010/020/202.
- HDBaseT technology enables the 5Play™ feature set, which includes ultra high definition 4K video, audio, 100BaseT Ethernet, various control signals, and up to 100W of power, on a single 100m/328ft CAT5e/6 Ethernet cable.
- Transformers are RoHS compliant and meet IEEE802.3af standards.
- Offered in 13.72x14.99x5.72mm, 24-pin SMT package and are available in trays or tape and reel.

For more information, visit www.pulseelectronics.com.

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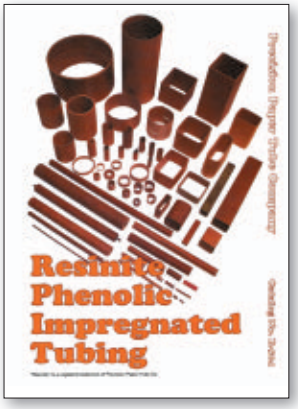

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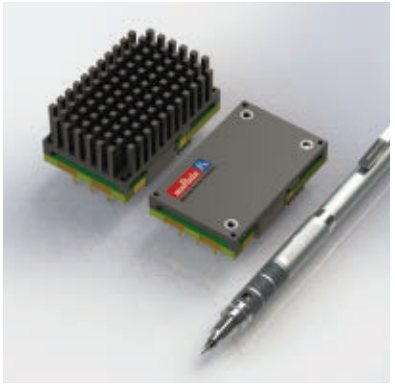

Murata (Mansfield, MA) announced the DRQ series of single output digitally controlled 500 and 600 Watt DC-DC converters from Murata Power Solutions. Incorporating a 32-bit ARM7 Processor, the 600W DRQ-12/50-L48 & 500W DRQ-12/42-D48 models are the second product families offered by Murata Power Solutions to include a PMBusTM compatible digital interface. Features include:

- Industry standard quarter-brick format incorporating the Advanced Bus Converter (ABC) pinout for PMBus communications to an isolated DC-DC converter.
- L48 module: 12 VDC 50 Amp output, accommodates an input voltage range from 44 to 57 VDC and is ideal for Intermediate Bus Applications (IBA) with a tightly controlled power source.
- D48 converter:11.5 VDC 43.5 Amp output and supports the TNV 2:1 wide input voltage range of 38 to 75 VDC.
- Both are ideal for use in modern space constrained telecoms and data networking equipment. Applications include MicroTCA, servers, Storage, Networking equipment, POE applications, wireless networks, industrial applications, and test equipment.

For more information, visit www.murata.com.

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The White Board

Wearables by the numbers

By Kasey Panetta, Editor

Wearables are the new must-have item in the world of consumer electronics. A recent boom in the amount of wearables purchased, and the types that are available, has been driven by both the consumer health industry and the increase in the popularity of smartphones and mHealth. Part of the reason for the industry growth is items like Fitbit and Apple's soon-to-hit-the-shelf smart watch, which target specific demographics who have demostrated interest in the services of wearables.

Current wearables market: **10 billion**

Projected 2018 market: **30 billion**

Wearable technology includes **25** different product categories

Source: IHS Technology

Smart watches

Top reason for purchase:
Convenience (followed by addiction)

How smart watches were selected:

- 81% Functionality
- 79% Comfort

75% of current owners are "early adopters"

48% of wearable owners are between 18 and 35

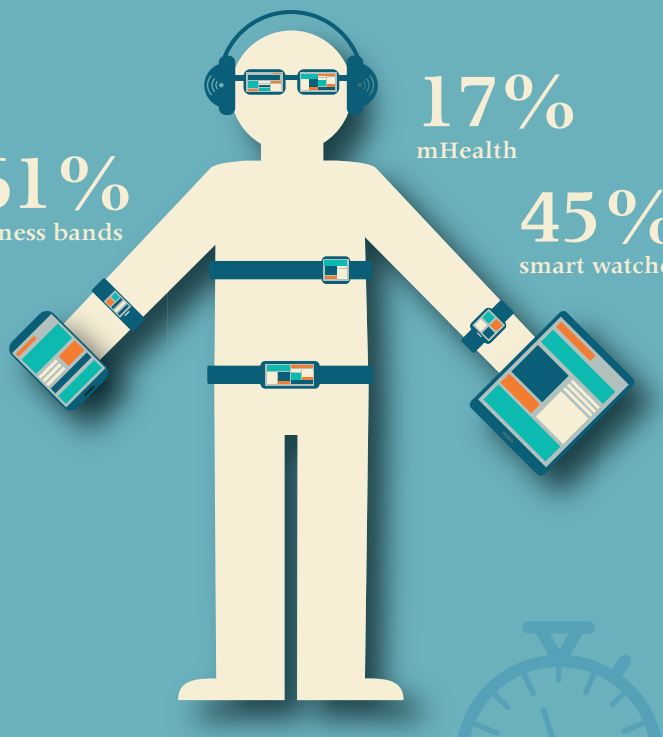
If wishes were horses... horses would have wearables

72% said they wished wearables were cheaper

62% said they wished for more fashionable options

Source: Nielsen's Connected Life Report

1 in 6 consumers who have heard of wearables are using them



49% of fitness band owners are between 18 and 34

12% are over 55

57% self monitoring was the reason for purchase

Fitness band owners rank **accuracy** and **battery life** as most important attributes

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