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Trade in counterfeit products is worth $120bn, tackling it will require communication and awareness

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When I started covering this industry as a reporter with *Electronics Times* in 1980, we were getting excited about things like the Intel 80286, which integrated 134,000 transistors and was produced on a 1.5µm process. We saw the beginning of the PC era with the launch of the IBM PC and Japan threatening to dominate the electronics industry.

But there was hope for UK electronics. Inmos was making a serious pitch for part of the memory market, while Ferranti had developed something called an uncommitted logic array – the forerunner of the FPGA – several years before Xilinx appeared on the scene. They were heady times.

When I joined *New Electronics* in 1994, we were beginning to talk about something called ‘deep sub micron’ and companies made their own chips – I’m not sure we knew what a foundry was.

Engineers were still specifying components from catalogues, but we were starting to talk about this thing called ‘the internet’. We dialled up using a 56k modem and sat in front of the one connected PC in the office, watching pages slowly appear, courtesy of Netscape. But we knew the web had potential and *New Electronics* launched its first website in 1997. Today’s site is significantly different to our original ideas, which included doors you had to pay to pass through.

Fast forward to today. Chips are shortly to be made on 7nm processes, while devices like Qualcomm’s Centriq 2400 feature 18billion transistors. Intel says it is now fitting 100million transistors in a square millimetre of silicon using its 10nm process.

All the while, Moore’s Law has been the heartbeat of the industry. Although an observation made by Intel founder Gordon Moore in 1965, the Law has not only driven – but also demanded – innovation. We’ve been expecting Moore’s Law to ‘hit the wall’ for years, but engineering ingenuity continues to push that day into the future.

My 37 years and change in the electronics industry have been an amazing ride; I’ve rubbed shoulders with and interviewed some of the leading figures in electronics history and have had the privilege of commentating on the world’s fastest moving industry.

Now, I’m stepping off. If you have been, thanks for reading.

Graham Pitcher, Group Editor (graham.pitcher@markallengroup.com)
Beyond FPGAs

XILINX UNVEILS NEW PRODUCT CATEGORY KNOWN AS ‘ACAP’ WHICH BOASTS CAPABILITIES BEYOND FPGAS. NEIL TYLER REPORTS.

Xilinx has announced, what it describes as, a new breakthrough product category called Adaptive Compute Acceleration Platform (ACAP) that provides capabilities significantly beyond that of an FPGA.

An ACAP is a highly integrated multi-core heterogeneous compute platform that can be changed at the hardware level to adapt to the needs of a range of applications and workloads and can be done dynamically during operation.

The ACAP is intended to accelerate a broad set of applications in the emerging era of big data and AI, such as video transcoding, database and network acceleration. According to the company, both software and hardware developers will be able to design ACAP-based products for end point, edge and cloud applications.

The first ACAP product family, codenamed “Eveerst” will be developed using TSMC’s 7nm process technology and will tape out later this year.

“This is a major technology disruption for the industry and our most significant engineering accomplishment since the invention of the FPGA,” said Victor Peng, president and CEO of Xilinx. “This revolutionary new architecture is part of a broader strategy that moves the company beyond FPGAs and supporting only hardware developers. The adoption of ACAP products in the data centre, as well as in our broad markets, will accelerate the pervasive use of adaptive computing, making the intelligent, connected, and adaptable world a reality sooner.”

Graphene flakes for future transistors

Graphene nanoflakes have shown promise for nanoelectronic applications. A study by SISSA revealed that these nanostructures would allow exploitation of quantum effects to modulate the current flow. The intrinsic magnetic properties could also be used to make further progress in spintronics.

SISSA said that it observed two key phenomena through its analysis of graphene nanoflakes. The first is that in nanoflakes the electrons interfere with each other in a destructive manner if the current is measured in a certain configuration.

This means that there is no transmission of current—a typical quantum phenomenon, which occurs in very reduced sizes. What the researchers have suggested is that it is possible to bring this reaction to larger systems and therefore, into the nano world and to a scale that is observable and can be exploited for nanoelectronic applications.

The magnetic properties presented by the nanoflakes emerge spontaneously at their edges, without external intervention, enabling the creation of a spin current. Together with quantum interference, the researchers believe these effects will allow almost complete spin polarisation.

This could be used in the memorising and processing information technologies, interpreting the spin as binary code.

Charging technology able to supercharge an EV delivery fleet

UPS has developed a charging technology that it says will overcome the challenge of simultaneously recharging an entire fleet of electric vehicles (EVs), without the need for the expensive upgrade to the power supply grid.

The current maximum number of EVs operating from UPS’s London site is 65 and it believes this could be increased to 170, enabling the “beginning of the end” of a reliance upon combustion engines.

The discovery is a result of the Smart Electric Urban Logistics project, and UPS says that this is the first time these systems have been deployed at this scale anywhere in the world and will help to improve air quality and lower the acquisition costs of putting an EV on the road.
Battery revolution

RESEARCH TEAM DESIGNS TRUE LITHIUM-AIR BATTERY. BETHAN GRYLLS REPORTS

A lithium-air battery that works in a natural-air environment, while still being able to function after a record-breaking 750 charge/discharge cycles, has been designed by a team from the University of Illinois at Chicago and at Argonne National Laboratory.

The teams say that the battery works by combining lithium, present in the anode, with oxygen to produce lithium peroxide on the cathode during the discharge phase. The lithium peroxide would be broken down into its lithium and oxygen components during the charge phase.

Experimental designs have previously failed due to the oxidation of the lithium anode and production of undesirable byproducts on the cathode that result from lithium ions combining with carbon dioxide and water vapor in the air.

The team said it overcame this by using anode, cathode and electrolyte to prevent anode oxidation and buildup of battery-killing byproducts on the cathode.

It coated the lithium anode with a thin layer of lithium carbonate that selectively allows lithium ions from the anode to enter the electrolyte, while preventing unwanted compounds from reaching the anode.

In a lithium-air battery, the cathode is where the air enters the battery. In experimental designs, air enters the electrolyte through a carbon-based spongy lattice structure.

The researchers coated this structure with a molybdenum disulfate catalyst and used ionic liquid and dimethyl sulfoxide to facilitate lithium-oxygen reactions, minimise lithium reactions and boost battery efficiency.

6SigmaET brings VR to thermal simulation

Future Facilities has launched Release 12 of its thermal simulation software, 6SigmaET, which incorporates a number of significant modelling enhancements that the company says will help to boost overall simulation speed.

Release 12 features a prototype VR visualisation mode, that Future Facilities says offers an insight into the potential for VR to open up new possibilities for thermal design analysis and optimisation.

The main focus of the release however, is improvements that enable faster and more accurate modelling. This has resulted in the addition of a series of new modelling objects, the ability to simulate heat radiation and solar radiation through transparent materials and new leak detection functionality for liquid cooling systems.

Power solution suppliers form industry alliance

Four leading suppliers of power solutions, Artesyn Embedded Technologies, Bel Power Solutions, Flex, and STMicroelectronics have announced an industry alliance.

The Power Stamp Alliance (PSA) has been set up to create collaborative solutions for 48V-to-low-voltage on-board DC-DC power converters.

These power stamps are used to target high-performance computers and servers being deployed in large data centres, many of which follow the principles of the Open Compute Project. By creating and sharing a specification for a standard product footprint and functions, the PSA has been formed to create a multi-vendor ecosystem to assure practical levels of alternate source capability to server and storage system manufacturers, while encouraging a more competitive supply chain through differentiation in topology, circuitry, and performance from multiple, independent manufacturers.

“The PSA has developed an onboard power solution that meets the needs of hyperscale data centre operators with a particular focus on supporting high-performance compute servers,” said Maggie Shillington, research analyst for IHS Markit, a global information provider.

Piezo fabric powers up

Researchers at Chalmers University of Technology have developed a fabric that converts kinetic energy into electric power. According to the team, which is working with the Swedish School of Textiles and Swerea IVF, the greater the load applied to the textile and the wetter it becomes, the more electricity it generates.

The fabric features a piezoelectric yarn made of 24 fibres woven together with an electrically conducting yarn. It currently generates enough power to light an LED, send wireless signals or drive small devices.

Fab process of nano-structures improved

Researchers at the Rochester Institute of Technology (RIT) claim to have found a more efficient fabricating process to produce semiconductors. RIT also confirmed that materials other than silicon can be used successfully in the development process and increase performance of electronic devices.

RIT adds that its process – the I-MacEtch – can help meet the growing demand for more powerful and reliable nano-technologies needed for solar cells, smartphones, telecommunications grids and new applications in photonics and quantum computing.

The process combines the benefits of wet etching and reactive ion etching, or REI. Indium-gallium-phosphide is one of several materials being tested to complement silicon as a means to improve current capacity of semiconductor processing.
Securing the supply chain

COMMUNICATION AND AWARENESS ARE KEY IN THE BATTLE TO COMBAT COUNTERFEIT COMPONENTS. BETHAN GRYLLS REPORTS.

The fight is not over’, were the opening words of the Anti-Counterfeiting Forum, by co-owner, Ian Blackman. ‘And it will be a hard fight’.

The global trade in counterfeit electronics and equipment currently stands at $121billion, but counterfeit products don’t just cost companies money, they also ruin reputations, are dangerous and, what’s worse, are becoming harder to identify.

Held at BAE Systems’ headquarters in Hampshire, the Forum – now in its ninth year – brought together a range of speakers who explained the steps that should be taken to prevent and combat counterfeit products which have been proven to fund terrorism and the trade in drugs.

A key topic proved to be the importance of ‘knowing your supply chain’.

Jo Vann, TC107 technical secretary of GE Aviation Systems stressed the risk of having products manufactured outside of the UK, such as in the Far East. The distance means it’s difficult to control the supply process. She also warned counterfeiters were salvaging components from discarded PCBs.

Recycling, although beneficial, can create plenty of opportunities for counterfeiters. The industry needs to be more aware and careful with recycling components to avoid being taken and resold as new, Vann said. “Anything that can be manufactured has the potential to be counterfeited,” she warned.

“The US Department of Defense has identified upwards of a million counterfeit components in its military supply chain, caused by poor supplier control and weak buying practises,” Vann continued.

Caution was also given towards using unfranchised distributors. “They are the ones mostly likely to be exposed to counterfeit products,” Vann said.

Paul Chaplin, director, Axis Electronics, highlighted the essentials of ‘investing in supply chain risk management’. It’s not something done overnight, he explained. It’s something that needs time and care.

He explained that obsolete products are one of the main opportunities for counterfeiters. To combat this, he suggested better anticipating the demand for products and stocking up on them.

Peter Smeeth, director of the Approved Cables Initiative, pointed to the Trading Standards and HSE, expressing that ‘more needed to be done’ by these bodies, including harsher punishments and more market surveillance.

He also said confidentiality was an issue. “When reporting counterfeiting to the Trading Standards, it isn’t allowed to provide details of the outcome”, and Smeeth believes we need more transparency to ensure appropriate measures are being taken.

Traceability was raised as an issue and highlighted as a vital weapon against counterfeiter.

Blind trust in your supply chain is not enough Smeeth, said. He explained that rather than ensuring traceability is possible or testing components, suppliers and distributors were tending to rely on signed documentation only to confirm legitimacy.

When sourcing parts, Chaplin advised telling subcontractors the full manufacturer’s part number, the current name and, if relevant, any previous names. He also said to avoid only identifying a component by using a distributor’s part number.

The problem of counterfeiting isn’t new, so existing stock should also be checked. Visual inspection alone is not sufficient, so the best course of action is to send suspicious products to a testing company.

Retronix, which offers this type of service, said that industry was improving when it came to handling counterfeit products. “The amount of times we find counterfeit products is falling,” Rob Ronan, UK sales and support manager, concluded. “We’re certainly getting smarter at identification. The problem is, counterfeiters are getting smarter too.”
What’s cooking at Raspberry Pi?

RASPBERRY PI USES CUSTOMER FEEDBACK TO DEVELOP UPGRADED BOARD. 
BETHAN GRYLLS REPORTS.

Through a combination of focus groups and user feedback generated through Farnell element14’s online community, Raspberry Pi believes it has ‘perfected’ its previous board, Pi 3, with the release of Pi 3 B+.

Among the customers’ asks was a dual band wireless LAN and the board offering has now moved from 2.5GHz to 5GHz.

Peter Wenzel, global director of Raspberry Pi, Single Board Computers, explained that this channel was less crowded and has led to a ‘much more stable and reliable’ product for its customers.

Power over Ethernet was a second request from customers, which has been addressed via the inclusion of Gigabit Ethernet over USB 2.0. This is said to deliver a maximum throughput of 300Mbps through the board’s four USB 2.0 ports and retain the 40-pin General Purpose Input Output header connector.

Making Li-metal batteries commerical

Lithium-metal batteries can hold up to 10 times more charge than lithium-ion batteries, but haven’t been commercialised because they charge and discharge, lithium is deposited unevenly on the electrodes. This means battery life is too short and batteries can short-circuit and catch fire.

Researchers at the University of Illinois at Chicago claim to have developed a solution: a graphene-oxide coated ‘nanosheet’ that, when placed in between the two electrodes of a lithium-metal battery, prevents uneven plating and allows the battery to function safely for hundreds of charge/discharge cycles.

Data storage through quadrupole topological insulators

Following a recent theoretical prediction that quadrupole topological insulators (QTI) could exist, researchers at the University of Illinois have created what they call a ‘human scale’ demonstration of how the phase of matter might behave and suggest that, one day, it might be suitable for data storage applications.

The team built a workable-scale analogue of a QTI using a material created from PCBs. Each board holds a square of four identical resonators, with the boards arranged in a grid pattern to create the full crystal analogue.

According to Peterson, the results pointed to the existence of predicted protected states that would be filled by electrons to form four corner charges and the team believes those corner charges be capable of storing data.

Power measurement tool for IoT applications

Qotech Ab, a Sony Group company, has announced a distribution agreement with Digi-Key Electronics for its Otii power measurement tool and software.

The Otii solution is able to provide developers with the means to simplify power measurement of applications and devices, especially those targeting the IoT space and aiming for optimised, long battery life.

It combines the measurement capabilities of several different test and measurement hardware tools into the Otii Arc, a device that makes it easier for developers to pinpoint which sections of code, associated peripherals, and hardware contribute most to the application’s power consumption.

Bendable silicon wafer

Researchers from Glasgow’s Bendable Electronics and Sensing Technologies (BEST) department, says they have made a silicon wafer which is only 1.5µm thick, yet capable of delivering high-performance computing while remaining flexible.

Professor Ravinder Dahiya, the head of the BEST group, said: “Silicon-based circuits have advanced in complexity with remarkable speed since their initial development in the late 1950s, making today’s world of high-performance computing possible.

“However, silicon is a brittle material which breaks easily under stress, making it difficult to use in bendable systems on anything other than the nano-scale.

“We’ve adapted existing processes to transfer wafer-scale ultrathin silicon chips onto flexible substrates. The has been demonstrated with wafers 4in in diameter, but can be implemented for larger wafers too. This scale is sufficient for manufacturing ultra-thin silicon wafers capable of delivering satisfactory computing power.”
With UK utility companies on high alert over the threat of a serious cyber-attack in the wake of the ongoing diplomatic confrontation with Russia, following the Salisbury chemical attack involving a former Russian spy, Sergei Skripal and his daughter, we’re seeing UK institutions working more closely with the UK government’s National Cyber Security Centre (NCSC) to assess potential risks.

Cyber-attacks and cybercrime are, however, nothing new and are, in fact, increasing in both frequency and in terms of their impact.

Criminals are innovating their modus operandi as they look to breach systems and their attacks are continuing to evolve.

According to John Moor, Managing Director of the IoT Security Foundation, “The general trend is that cyber-attacks are increasing and we’re aware of more state-sponsored activity (often disguised as business hackers), a rise in ransomware, DDoS and the weaponising of the Internet of Things (IoT) to help conduct attacks too.

“Most recently we’ve seen websites hacked to mine cryptocurrencies which have helped to heighten anxiety among individuals, business and agencies such as the European Commission and the US National Security Agency.”

“Cyberattacks are becoming larger and more comprehensive in scale,” says Art Dahnert, Managing Consultant at Synopsys. “Millions of users are now being affected and we’re seeing the bar raised when you consider the amounts of traffic now being sent in an attack.”

Dahnert makes the point that they are becoming more sophisticated too.

“Everything is now organised. They’re no longer conducted by the ‘400lb’ loner sat in his bedroom. That view of the hacker is no longer valid. Attacks are coordinated and usually comprise loosely connected hackers motivated by a mutual idealistic vision. We’re also seeing state sponsored cyber-attacks, there’s a growing list of nations with the sophisticated capabilities necessary to infiltrate and attack another.”

As connectivity increases though, so the world becomes more vulnerable to cyber-attacks.

**Connectivity brings vulnerability**

Analysts Gartner predicted that there were over 8 billion connected devices in use at the end of 2017 and in just three years’ time we could see over 20 billion devices, representing an increase of 150 percent.

At present cyber related crimes are said to cost the global economy $400 billion each year, but when trillions of devices become connected, that could prove to be ‘small change’.

Why is the cost of cybercrime so high? Well, according to Simon Segars CEO, Arm, it’s because, “System and device security across all sectors is simply not good enough.”

“The IoT is heavily implicated of course,” says Moor, “as this is the next wave of internet technology.”

The IoT is extremely vulnerable. Its use of sensors and connected devices gives hackers clear routes of access since most of the devices are configured poorly with weak credentials.

“More mature companies are addressing this,” suggests Dahnert. “Where it’s a concern is among smaller companies working in the consumer space. They are resistant to security on the grounds of cost, they need to be shown how a failure of security can affect them negatively. You need to engage them by discussing the financial impact or...
particularly the critical infrastructure resilience of all connected systems, needed to strengthen the safety and be done to investigate measures will bring with it increased risks.

As cyber-attacks become more sophisticated, companies will need to view security as a primary design consideration and ensure that security scales in the face of growing threats. When it comes to addressing security, the first thing is to avoid the common pitfalls. Namely, speaking in security shop language and spreading common pitfalls. Namely, speaking in security, the first thing is to avoid the common pitfalls.

Design considerations
As cyber-attacks become more sophisticated, companies will need to view security as a primary design consideration and ensure that security scales in the face of growing threats. When it comes to addressing security, the first thing is to avoid the common pitfalls. Namely, speaking in security shop language and spreading a sense of fear,” says Moor.

“In essence, security professionals understand that security risk needs to be translated into business language and business risk. In this way, it can be assessed, quantified and managed appropriately. It is important not to lose interest because of hyperbole and spreading of fear - it is important to understand the business appetite for risk and mitigate against that, it is also important to know how risk can be insured against if specific investment is not possible.” According to Moor, “To understand the risk is to assess it properly and communicate in a language that managers can understand.”

Many technology providers are embracing what Segars calls the ‘Digital Social Contract’ which obliges them to protect users no matter what. “It means we lean into problems, but we can always do more,” he writes in Arm’s Security Manifesto, published last year. “We are working with our ecosystem to improve communications and transparency around attacks and exploits to ensure mistakes aren’t repeated.”

Is there a risk that such a non-legally binding commitment could be undermined by a changing competitive landscape?

Where industries are already operating under a legal duty of care, such as the automotive sector, this is seen as less of a problem.
Speed to market, according to Seagers, is the greatest source of risk to the Contract and warns that the fast to market segment model could prove to be a “disaster for security as weaknesses in products once deployed may not be correctable in the field, so a system may be left vulnerable.”

He argues that a new, more resilient business model is required, one that makes, “Secure by design technologies available to developers. “This will enable a specific new business model that will be suitable for the IoT, but also aligns with the responsibilities inherent in the Contract.”

Regulatory role?
In this fast-moving world, the role of standards and regulations is, according to Seagers, limited. He believes that product makers need to be anticipatory, flexible and resilient when it comes to handling the challenges being thrown up by today’s hackers.

But while Seagers sees a limited role for standards and regulations, Moor disagrees.

According to Moor, increasingly concerned governments and regulators are looking to bring in additional controls for new technology.

“The speed at which markets and innovation are moving, and the concerns around security, safety and privacy is building pressure to introduce new laws and regulations,” he believes. “There are concerns that blunt regulation will stifle future innovation as the situation is complex and far from simple. Regulation is not as simple as it sounds and there are new problems to consider.”

Security is a moving target, according to Moor.

“What is secure today may not be tomorrow, as new vulnerabilities and techniques emerge. This means we have to have a different mind-set from a pre-market compliance and certification scheme that is largely associated with safety regulations.

“Durability is now required over the life-cycle of products and systems and this will have major implications for product maintenance and support.

“At the plus side, a great deal is already known about security so the route forward can be immediately served by promoting best practice and the uptake of known good standards.”

Regulation is coming, he suggests. “It’s not a case of if, but when.”

“I don’t believe that new regulations will affect innovation,” says Dahnert. “We’re working in an industry that is always innovative no matter the regulatory environment. But that’s not to say that the costs of regulation might not have an impact.”

A lack of user awareness and of security by design means that the cybersecurity industry is either repurposing traditional cybersecurity products or creating new and advanced products and services, says Moor.

“This will continue for the foreseeable future, especially when we consider the prospects of quantum computing and the application of AI and machine learning.”

Using machine learning and Al to accurately predict and identify attacks is seen as a boon for the cyber world.

According to Dahnert, when he looks at the cybersecurity industry, he sees, “Blood in the water. Every company is faced by snake oil salesmen offering products that will save you from everything, and that’s simply not possible.”

“Anyone employed to defend an application, a network or organisation will have to understand the scale and scope of their attack surface. They will have to understand the different flavours of the pie from network security to physical security. One methodology or product isn’t going to work, you will have to build a defence that can cope with specific types of attacks.”

There are too many companies who are less than ethical when it comes to selling security products, Dahnert warns.

“Most products will only address a specific scenario, they can’t solve all your problems, no matter what you’re told. To manage security you need a suite of partners, products and processes. Keep that in mind. And it’s only through education and training that we will be better placed to tackle security. It’s becoming a crucial part of business.”

Much talk is being made of AI and machine learning and the development of predictive security, according to Dahnert.

“It’s certainly the new flavour but is primarily the streamlining of existing methodologies making them easier to understand. As for AI and data analytics, watch out for the snake oil salesmen. I doubt your business will be expert in AI and you’ll be dependent on someone selling you tools. Your adversary can adapt and adjust his attacks. Will your AI solution be able to do the same?”

Dahnert says that businesses also need to look at their supply chain.

“The entire supply chain has to work together. You have to work with suppliers and understand their security posture and what they have in place. Also, what do they insist from their own supply chain?”

For people unversed in security it can be overwhelming.

“There’s a lot going on in this space,” Dahnert concedes. “Most will need a partner that can guide them, but who can also come up with a plan explaining what happens when you have to deal with a breach and engage with media and analysts. You will need to show that you understand the problems and are planning for a resolution.

“Take your beating and work hard. Most stakeholders are forgiving.”

“Never stop learning and don’t operate within a silo,” says Moor.

“Collaborate and share knowledge because effective defence is a team sport.”
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When Panasonic showed its conceptual design for the cabin of a self-driving car at the Consumer Electronics Show (CES) earlier this year, one of the demonstrations used thermal cameras to paint an image of the occupants’ body heat on an overhead flat-panel display. Although future travellers might enjoy watching thermal images of themselves as they ride along, thermal sensors already have a role to play in vehicle design, and other sensors are joining them.

Joris Roels, temperature sensors marketing manager at Melexis, says their use is currently limited to high-end vehicles, but infrared (IR) imagers have advantages over conventional heat sensors. Comfort is one reason; the air-conditioning can tune its output to what the occupants feel, rather than aim for a specific temperature.

IR sensors can also supplement the simple designs already in use, such as strain gauges in the front seats. They inform both the seatbelt warning indicator and the airbag-firing controller. But such sensors are easily fooled by a heavy case sitting on the seat. Body-heat sensors help overcome the problem of mistaking a bag for a body, especially when combined with other sensor and camera technologies.

Another imager-based technology likely to take hold is the time-of-flight (ToF) camera, which measures the time it takes for reflections from pulses of light transmitted by a nearby laser or LED to arrive at each pixel within the image sensor. For automotive use, the cameras are designed to measure distances accurately over a range of up to 2 or 3m in the vehicle cabin.

Dealing with the speed of light in the confined space of a vehicle is challenging, says Norbert Bieler, senior marketing manager for emerging automotive technologies at Analog Devices. But the information that results is a high resolution VGA image and accurate depth map indicating the distance of an object to the camera. That makes it easier for software to discriminate between parts of the vehicle and people and objects sitting or moving in the cabin.

ToF cameras in vehicles will typically use IR for illumination rather than visible light to avoid distracting the driver. Dealing with driver distraction is a key part of the initial wave of applications for the cameras. Bieler points to the increasing complexity of in-car controls as a driving force for a shift to user interfaces that let the driver make changes to the air conditioning or entertainment without forcing them to take their eyes off the road. A simple wave of one hand can fast-forward through a song instead of forcing the driver to look around for the appropriate dial on a dashboard or centre pillar touchscreen.

The camera provides a way for the car to check on the driver in situations that will become more common as the vehicle provides greater levels of autonomous control. At CES, Analog Devices demonstrated a combination of touch sensors in the steering wheel with a ToF camera to help determine whether the driver is able to take control after autonomous driving mode or simply to tell whether the driver is texting when they should be watching the road.

In a similar demonstration at CES, Infineon Technologies showed how a ToF camera can make the car’s driving behaviour respond to movements by the driver and front-seat passenger. “The camera can be employed in a lot of use-cases such as adjusting the airbag,” says Martin Lass, ToF marketing manager at Infineon. The driver might, for example, recline in their seat while...
IR in combination can be useful to distinguish between a live person and an object with the apparent shape of a human being.

Gualtiero Bagnuoli, optical sensors marketing manager at Melexis, says: “IR in combination can be useful to distinguish between a live person and an object with the apparent shape of a human being. A combination of the two might be necessary for safety reasons or to ensure much higher reliability.”

One application for a combination of IR technologies is to detect whether an infant has been left behind in the vehicle. The system can activate the air-conditioning to prevent overheating while sending a message to the driver’s phone.

Israel-based Guardian Optical Technologies won $5 million in Series A funding last year to work on its own sensing technology. The company claims a roof-mounted sensor can detect movement down to 1 µm resolution and can use that as a way of spotting how many people are in the car at any time. Like ToF, Guardian expects to use the sensor technology to handle a range of gesture-recognition tasks.

In the short term, manufacturers such as Kia are using simpler proximity sensors, which can be based on IR or capacitive techniques depending on usable range, to pick up on simple gestures. To be launched later this year, the K900 luxury vehicle will adjust the lighting around the dashboard dynamically when an occupant’s hand reaches toward it.

Other sensors are focused less on the occupants than on the environment they are in, with air quality a potentially major target although uptake is likely to be regionally focused, depending local concern over pollution and legislation. Recirculating air can lead to the build-up of unwanted gases such as volatile organic chemicals, and engine-exhaust gases picked up from the traffic flow and recirculated by the air-conditioning system. If the system detects concentrations approaching a limit it can trigger the intakes to collect more fresh air.

In principle, air-quality detection is another good application for IR sensors. However, metal-oxide semiconductor sensors have advantages for automotive designs. IR chemical sensors need to be focused on specific wavelengths absorbed by a target molecule. The semiconductor sensors detect a broad range of gases because they focus on resistance changes that occur as the molecules adsorb onto the surface.

Although the rise of autonomous driving will lead to a forest of sensors being deployed around the exterior of the car, manufacturers are clearly not neglecting the interior. The will use a variety of sensors to keep a closer eye on what is happening inside the vehicle.

Working together

For a supplier like Analog Devices, it means bringing together the work of multiple groups, such as the healthcare, consumer and industrial divisions. The additional technologies include sensors to monitor the vital signs of the driver, such as heart rate and skin conductance, which can indicate levels of stress and body-fluid levels. Bieler says: “Dehydration helps detect drowsiness. But our vital-signs monitoring technology may in the future enable even more breakthrough functions going beyond health and wellness parameter sensing.

“Overall, the high-level target is to get a clear view of who or what is in the cabin and what is happening there,” Bieler says.

Although both ToF and thermal imagers use IR, they cannot be integrated into one sensor technology. The heat sensors need to work at lower resolution as they work in the far-IR region and employ different sensor elements to the imagers used in ToF applications.

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As automotive designers try to balance limited cabin space with additional display elements, many are turning to light guides as a solution. **Terry Moss** explains.

Vehicle makers see autonomous driving as key to their future market strategies. It will transform their businesses and require some radically different approaches in terms of automotive design.

Internal styling choices will become more important, having a knock-on effect on the designers of electronic subsystems. They will need to integrate their products into surfaces that will make use of complex curves to make the most of confined space. Electronic controls and their associated displays will be built into the arms of seats and ceiling door panels so they can remain active and accessible no matter the configuration of the internal space.

There’s a long road ahead before the autonomous vehicle becomes a mainstream, but the safety considerations that make self-driving cars practically inevitable will inform the design of the next wave of vehicles. Cars are not just becoming more automated but are more complex in terms of features that are intended to supplement the travelling experience rather than help with driving. As a result, some refer to the modern car as a ‘smartphone on wheels’. But it cannot be designed to have a user interface that relies on a single large touchscreen.

Driver distraction is a key issue for any control surface in a moving vehicle. The touchscreen exacerbates this issue in two ways. One is the need for the driver to look away from the road ahead to look for virtual buttons and dials. The second is the sheer volume of information – much of it non-essential – that a high-resolution display can present.

Manufacturers are now looking to gesture-based touchless interfaces for controlling in-car systems. They also need to find ways to put critical driving-related displays in the eyeline of the driver. That means making the most of regions such as the steering wheel and the upper parts of the dashboard as well as mirrors and the doorframe.

Simple icon-based displays mounted on the steering wheel and these other areas can present vital, immediate information that aid driving instead of distracting from it. LED-driven icons on the mirror or close to it on the inner doorframe can warn of vehicles in the driver’s blind spot that have been detected by external sensors. Icons on the steering wheel can provide visual confirmation of guidance from the navigation system and warn of conditions such as excess speed. Even when the journey is over, strategically mounted indicators on the door can ensure continued safety – blind-spot sensors can pick up approaching cyclists and flash a warning on the doorframe to the occupant as they reach for the door handle.

The problem facing the automotive designer is fitting the necessary displays into the car’s structure. When it comes to installing the touchscreen elements, the dashboard designer has the advantage of working with a large volume able to accommodate what is a relatively inflexible structure. For rear passengers, seat-back panels can fit into the headrest section with reasonable ease. Some automotive designers have even made the touchscreen a structural feature of the dashboard and central-piller region.

Display elements that need to be mounted on door panels or on the steering wheel do not have that luxury of space. Many of the best surfaces for visibility will have structural elements running through them close to the surface. As a result, the depth behind the surface panel will be extremely limited. However, there will be usable voids nearby that can be used to hold control electronics and other support components.
Light-guide technology will ensure carmakers can deploy advanced user interfaces for systems inside the vehicle.”

Terry Moss

Similarly, as designs mature and adapt to changes in consumer preference, it seems likely automotive designers will look to alternative display technologies to complement flat touchscreens so they can make more use of the structural elements that hold the screens in place. But this will often make placement of the display elements harder to achieve. Whereas the touchscreens often sit in front of what may be a large void, the smaller displays built into the curved framework will have very little depth with which to work. They will need to be arranged around structural elements that cannot be moved. A technology that can take advantage of these factors is based on light guides.

Light guides

Light guides make it possible to place LED-based backlight indicators into extremely confined spaces. The only requirement is to have enough depth behind the surface to implement colour filters and cutouts. In these structures, light is steered according to Fresnel’s Law of Refraction such that, at low incidence angles, the photons are confined to remain within a translucent material. At a large enough angle, the photons escape through the surface of the material. Careful selection of materials and constructions makes it possible to guide photons to a pre-defined point, such as an icon cutout, some way from the driver and control electronics.

Important both for styling and for reducing driver distraction, light-guide technology makes it possible to build invisible-when-inactive indicator panels. If the icon is not lit up, the surface looks seamless. When the icon appears, it is immediately apparent, providing clear visual feedback.

One problem that has faced designers wanting to use light-guide technology is that of construction. Conventionally, the display elements are assembled onto injection-moulded plates, which can be expensive and restrictive in terms of design. An alternative is to use a technology that makes greater use of moulding allowing multiple light guides to be integrated on a single moulded substrate that can be just 1.2mm thick. Stadium IGT uses a process that cuts a cavity into a polymer layer into which laser-cut acrylic optics are placed. The approach makes it possible to place driver LEDs anywhere on the substrate. Alternatively, they can be optically coupled to the light guide at the edge. The cavity material is optically opaque so that light does not bleed from one adjacent light guides to another.

The result is a structure that allows visible indicators to be placed on almost any surface with the control electronics and driver LEDs located in available voids that are easily accessible to production and maintenance personnel.

The light-guide display technology can be combined with touch controls so that the driver need not look elsewhere to make a change to a setting. For example, they can indicate a roadblock ahead to the navigation system or suspend it by pressing a virtual button on one of the indicators. A problem with conventional backlighting technologies is electromagnetic interference between the capacitive sensors and the control electronics. Our technology makes it possible to separate these elements spatially, so the interference between them is reduced practically to zero.

No matter where the industry is on its path towards full autonomy, light-guide technology makes it possible to tune the human-machine interface for the needs of the vehicle user and ensure manufacturers can support the trend towards increasingly safe driving. Even when full autonomy is achieved, light-guide technology will ensure carmakers can deploy advanced user interfaces for systems inside the vehicle that fit the many possible use-cases and styling possibilities they envisage.

Automotive Industry Approval for Mercury

Mercury has become an approved supplier to the Automotive industry, gaining approval to TS16949. This further reinforces Mercury’s commitment to longevity and ruggedness as well as design innovation in the taxing automotive component environment.

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**Part Number** | **\( V_{\text{IN}} \) Range (V)** | **\( I_{\text{OUT}} \) (A)** | **\( V_{\text{OUT}} \) Range (V)** | **Frequency** | **\( I_{\text{D}} \) (μA)** | **Package**
--- | --- | --- | --- | --- | --- | ---
LT8650S | 3.0 to 42 | 2A/3A Peak | 0.8 | 200kHz to 2.2MHz | 2.5 | 3x3 LQFN-16
LT8640S | 3.4 to 65 | 6A/7A Peak | 0.97 | 200kHz to 3MHz | 2.5 | 4x4 LQFN-24
LT8633S | 3.4 to 42 | 6A/7A Peak | 0.97 | 200kHz to 3MHz | 170 | 4x4 LQFN-24
LT8653S | 3.0 to 42 | 2x2A/3A Peak | 0.8 | 300kHz to 3MHz | 6 | 3x4 LQFN-20
LT8650S | 3.0 to 42 | 2x4A/6A Peak | 0.8 | 200kHz to 3MHz | 6.2 | 4x6 LQFN-32
LT8645S | 3.4 to 65 | 8A | 0.8 | 200kHz to 3MHz | 2.5 | 4x6 LQFN-32
LT8642S | 3.0 to 19 | 10A | 0.8 | 200kHz to 3MHz | 160 | 4x4 LQFN-24
LT8652S | 3.0 to 19 | 2x9A | 0.8 | 300kHz to 3MHz | 20 | 4x7 LQFN-36

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The creation of reference designs and development kits for electronic devices has normally been a job for the manufacturer. Today, some distributors are dipping their toes into the ‘supplier’ role. The question is: why?

“Suppliers normally use as many of their own parts as they can in their boards,” Amir Sherman, director of engineering solutions and embedded technology, Arrow, said. “But different supplier parts have different qualities. We need to be unprejudiced. If we aren’t, our customers will question why we didn’t use the best products available.”

Sherman said this service has been well received. “They see Arrow as offering a board that uses a range of best products, rather than a board developed using a single supplier from parts it had on the shelf.”

He added that it was easier for distributors to do this because of their connections with suppliers. “The days of distributors simply moving boxes is over, he said. “Arrow is no longer just a distributor; it is also a technology provider.”

Future Electronics’ centre of excellence manager Etienne Lanoy, agreed that distribution has changed, but stressed this new service is a ‘collaborative process’. “We’re working with manufacturers, rather than on behalf of them, to create these designs,” he clarified. “Suppliers don’t have a mass-market approach, nor the integration with customers that we have. It’s easier for them to work in collaboration with us and it benefits everyone because we’re adding value to the products.”

Farnell is also extending its offering and has two in-house manufacturing companies – Embest and Avnet Technologies. Cliff Ortmeier, global head of technical and commercial marketing, believes this makes it ‘unique’ and enables Farnell to be a ‘leader in the industry in terms of developing kits and solutions for suppliers and customers’.

Ortmeier explained the distributor’s role involves relationships with a number of suppliers and this, he said, enhances the manufacturer’s offering. “We’re saving from them having to make and develop those connections themselves,” he said.

But Graham Maggs, vice president of marketing EMEA at Mouser, feels differently. “We don’t believe there is a need for us to develop and build a product, as well as ship it,” he argued. “I don’t believe many companies are doing this and those that are, are trying to redevelop who they are.

“I also don’t believe that customers want to buy a design board from distributors because that’s not what our role entails. If distributors decide to do other areas of business, that’s fine, but I don’t believe more than one or two distributors are going in this direction.

“It’s not something that is changing the face of the industry. It’s just something those companies are doing in addition to their core business.”

Maggs explained that Mouser did not have the same expertise as manufacturers. “If you don’t have the expertise, don’t go in that direction,” he contended. “Why would we want to compete with our suppliers?”

But, like Sherman, Lanoy believes there is a need for distributors to take on this role. “We can now highlight complementary devices from different manufacturers,” he explained.

He added that Future could also control the cost because it could select ‘affordable, yet high-quality parts’.

Although distributors already have product know-how, consensus is the ability to impart specialist knowledge is becoming more crucial. Distributors like Future, Arrow and Farnell are now responding to the new avenues they’ve opened by investing in design studios and field application engineers.

“We’ve had to create a strong design team and FAES to work with suppliers on board...
development specifics,” Ortmeyer said. “We also have a strong technical marketing and engineering team to test the hardware and software.

“Distributors taking on this kind of role need industry-proven design and manufacturing capabilities. They need to be able to provide a true high-quality solution that is certified, safe and ready to go to market.”

However, with the electronics industry reaching into complex areas, such as IoT, security and displays, it’s rare for FAEs to have in-depth knowledge of all markets. To support this growing industry, Future said it is organising itself in a ‘vertical’ way, with a team of specialist FAEs, armed to deal with specific technology.

And with technology expanding at such a rate, Lanoy believes it’s only set to become more complicated. As a result, distributors seem to be focusing more on creating solutions, rather than only offering just hardware or software.

“Suppliers will normally create a board to promote a part,” Lanoy said. “It’s got a very specific objective to help users understand that part.

“We produce a board that helps the customer come to a solution using not just one part, but a multitude that we feel are best suited to the marketplace.”

The challenge is that system solutions are harder and Ortmeyer feels that distributors are relieving suppliers from a time-consuming task. “The more time you spend developing these kits and solutions, the less time you’re developing products,” he explained.

He believes that by taking on this responsibility, distributors not only address customer’s needs more quickly, but also give suppliers more time to focus on product development. “It can be a burden for suppliers to constantly produce these types of solutions,” he justified.

Ortmeyer feels that suppliers are now looking to distributors because they have realised they understand the mass-market better and, as such can provide targeted system solutions.

Farnell, Arrow and Future Electronics all agreed that suppliers can’t capture such insights because they do not have the same contact with engineers as distributors.

“We provide a lot of key elements that suppliers can’t achieve on their own,” Ortmeyer continued. “We’ll work with manufacturers and tell them what the market is looking for. We use communities such as element14 to gain this feedback and, from there, can suggest introducing another supplier to bring a needed solution together.

As for the future, it’s difficult to tell whether more distributors will add to their services in this way or follow Mouser’s firm route.

“The market is a tough thing to push in any direction,” Lanoy said. “We have to react to it and, at the moment, engineers tend to want us to help them more and more. But who knows what will happen in five years’ time? There may be a complete reversal where every customer wants their own in-house engineering.”

Sherman predicts the future will be all about scale and time. “If 20 boards were being produced a year, it’ll be 50. Suppliers will give six months’ notice, rather than a year, and teams will become bigger.”

It seems that distribution is evolving and its role is changing, but whether every distributor is equipped – or willing – to adapt in this way is unclear.

While distributors like Farnell, Future and Arrow are looking to create development boards, other distributors like Mouser are investing in application support.

Maggs said distributors undertaking board development could no longer be called distributors. “You need to call them a ‘company’ now,” he said. And with Arrow calling itself a ‘technology provider’ and Farnell describing itself as a ‘development distributor’, perhaps those companies heading this direction will start to re-brand themselves as something more.

Whatever happens, design engineers will choose which approach suits them best.
While voice has been the natural means of communication between humans, it hasn’t been quite so important when it comes to electronic devices. With the exception of the various telephony devices developed over the years, voice has only been used for one way communication – the television and the radio being the obvious examples.

The emergence of cloud computing has changed all that. Today, a range of companies are producing what could be termed audio assistants. Leading examples include Amazon’s Alexa and Google’s Home, but there are many other applications, including smart TVs. The power of the cloud allows such devices to hear commands, interpret them and deliver the expected result – whether that’s streaming music, ordering something

Is anyone listening?

Voice interfaces are becoming more popular, but what are the analogue signal chain requirements? By Graham Pitcher

for the house or telling the vacuum cleaner to start work.

Just as when the iPhone exposed users to the benefits of touch technology, creating the expectation that all devices would offer similar functionality, it’s entirely likely that designers will now be looking to integrate voice technology into their next products.

We all know it’s a ‘wiggly world’ – voice is analogue – but processing voice is best handled by a digital component – such as a DSP. How much of the signal chain between microphone and speaker should be analogue and what should you be bearing in mind if you’re looking to develop a voice interface?

Jim Jacot, director of marketing with Cirrus Logic’s Smart Home business, said: “If you look at a voice system, there are a number of elements: there’s a microphone at the front end and a module which performs some kind of digital voice processing. There will also be some kind of audio clean up, speech recognition and probably an interface to the cloud. At the ‘far end’, there will be some kind of playback system.”

In Jacot’s opinion, one of the first things an aspiring voice interface designer should consider are price, performance and power. “Is it going to be used in a battery powered product? How many microphones do you need? What performance are you hoping to achieve?”

The first two elements – price and performance – are closely linked. Part of the decision relates to whether you select analogue or digital microphones and, as he noted, how many. “At the front end, you need to achieve a certain level of performance,” he noted. “For example, you might want to capture far field voice, in which case you’ll need multiple microphones – maybe up to eight. While digital and analogue mikes are pretty similar in performance, cost is an issue.

“With higher end systems,” he continued, “cost may not be an issue. But if you’re building a low end system, then it becomes a big deal. Analogue brings lower cost – a mike may cost about 15cents – so if you’re using a large number, the savings add up.”

“We are pushing towards 32kHz parts with a 16bit word length with hearable applications in mind.”
Mark Melvin

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Mark Melvin, product manager, hearing solutions, with On Semiconductor, disagreed. “Digital mikes consume more power; even supposedly low power parts. Analogue parts have the lowest power consumption.”

If you decide to use analogue mikes, the next block in the signal chain is an A/D converter. “The performance of this device will be important,” Jacot underlined. “If your A/D converter is of poor quality, it will affect the performance of the speech recognition engine, so you should provide the best signal possible.”

Jacot believes an A/D converter with an SNR of at least 100dBc should be selected. “You might be able to use a lower SNR to save power in battery powered systems, but it’s a trade off.”

Melvin suggested that A/D converters targeted towards hearing aid applications could be used. “These have a sampling rate of about 16kHz and are good for voice recognition. They provide a good trade off of power against quality. But it comes down to running at a particular sampling rate; those devices which run at Msample/s are not appropriate because they produce a lot of noise. However, we are pushing towards 32kHz parts with a 16bit word length with hearable applications in mind.”

Being able to bias the microphone and capture audio all the time for no current consumption is also important and that’s one of On Semi’s core competences,” he added.

Jacot contended that word length and sample rate are not so important for the A/D converters. “But they are important when it comes to the D/A converter. However, I would always point designers towards a better performing A/D converter because the speech recognition engine needs a full scale signal to work correctly. If you don’t have enough bits, it won’t work as well, especially if you think about environments where the input signal may be low – far field, for example.”

The ‘box’ in the middle has variable boundaries and where those boundaries are set depends upon how ambitious the designer might be. On Semi’s ‘box’ is BelaSigna R281; an ultra-low-power voice trigger solution for a range of applications. Typically, the R281 is ‘always listening’ and will detect a single, user-trained trigger phrase, asserting a wake-up signal when this trigger phrase is detected. “The simplest solution is to recognise a single phrase,” Melvin noted. “The device needs to be trained, but will then assert when it recognises that phrase, after which a higher power system might take over.”

Melvin also pointed out that a trigger word can be used to assert an action. “If you’re waking something up using a trigger word,” he continued, “you will need an MCU in the system.”

How integrated your system will be is likely to be closely related to the projected production volume. “As you expand into the mainstream,” Jacot observed, “it’s likely you will need an integrated solution that comes with hardware, software and tools.”

Not everyone is an audio expert and selecting the right amp, doing the tuning, verifying the results and trigger word recognition takes a certain level of expertise. Not everyone can do it.

“Cirrus is trying to enable the mainstream market,” he noted. “We have created a development kit with Amazon, which has two mikes and everything integrated. You can drop it in and take a solution to market quickly. The goal is to let people create their own systems,” he concluded.
The infrastructure to support and grow connectivity is constantly evolving, and encompasses telecommunications, data communications and data centres. The processing and storage applications in that infrastructure stretch from base stations to subscriber lines, through a hierarchy of routers and switches. As the amount of digital traffic continues to expand, the need for fast and reliable storage only increases.

Comms infrastructure requirements differ significantly from those found in the enterprise and consumer sectors. In enterprise, the focus is on speed and low latency, typified by redundant arrays of independent disks (RAIDs) standardised on PCI Express and SATA interfaces. This is a large market and has many ‘me too’ products, which is also true for the consumer sector, where the overriding requirements are cost and capacity, less performance and longevity.

With comms infrastructure, the emphasis is on reliability, quality and data retention. Of course, cost is a factor, but so too are continuity of supply and lifecycle support. Failing devices add significantly to the cost as is evidenced by the need to monitor the health of storage devices and, if necessary, perform failure analysis.

The ability to operate across an extended temperature range and support for diversity in the interfaces used are also requirements. The later includes also a need to support legacy interfaces with state-of-the-art flashes that are available in the market. Most manufacturers focused on the enterprise or consumer sectors aren’t able to meet these demands.

Legacy support and TCO
The specific challenges found in the comms infrastructure stem from the viewpoint of the ‘meta-system’, in which every sub-system is part of a larger overall system. Storage is an important element of this, but represents a small percentage of the total system. However, despite being small, storage devices form part of a critical path and any failure will have significant consequences.

Storage solutions for comms applications need to be designed to minimise the total cost of ownership (TCO) over the system’s entire lifetime, which is, as a consequence, significantly longer than comparable solutions in the enterprise or consumer sectors.

Elements of the system may need to be replaced or upgraded over that lifetime, which from a storage point of view can involve migration to the latest interface standard. Suppliers in this sector need to offer support for new and legacy interfaces, as well as the long-term availability of storage solutions.

The usage may be more diverse compared to other sectors. Random accesses and read performance together with read-disturb management is important for code and operating system storage. Random write performance and, coinciding small write amplification are vital to ensure endurance for logging of small amounts of incremental data or configuration updates. Rapid burst performance is required when writing DRAM-crash dumps to flash in the event of a power outage. A sophisticated wear-levelling and garbage collection is needed when these different types of use share the same physical NAND flash components.

In the enterprise domain, NVMe is emerging as a high-capacity, high-performance storage solution, which uses the PCI Express interface to connect non-volatile storage media. However, as a result of this format it also comes with high power requirements and elevated system costs. Coupled with high power and system costs, NVMe can be subject to comparatively lower power fail robustness due to increased user and management data-caching, all of which makes it unsuitable for Communications applications.

The embedded or eUSB module format is based on, and compatible with, the USB interface standard and compatible to USB 2.0 and 3.1. It integrates a controller to provide a managed NAND solution and can be a suitable replacement other form factors such as SSD or eMMC. Using NAND memory, the controller can handle wear levelling and provides a flexible storage alternative. eUSB modules are available focusing on industrial and embedded applications using different Flash technologies including MLC, pSLC and SLC. Capacities usually range from 2 to 128Gbyte with performances reaching 160Mbyte/s. The flexibility to properly dimension storage system according to storage requirements helps to keep power and system cost low while offering endurances and reliability higher than other formats, including SSD and NVMe.

As an alternative storage solution,
eUSB modules are a compelling proposition supporting full, high and super-speed transmissions as defined by the USB 3.1 standard, making it up to 30 times faster than USB 2.0 offerings, but with backward compatibility. Self-Monitoring, Analysis and Reporting Technology (SMART), allows the module’s health to be closely monitored. At the heart of the modules is the U9 USB 3.1 Flash memory controller and management technology developed by Hyperstone. Using hyMap Flash translation layer (FTL) and hyReliability firmware, it maximises endurance and data retention, and provides robust power and fail-safe functionality. Data integrity is ensured under all circumstances for the whole lifetime.

Featuring an embedded 32bit processing core with an instruction set optimised for flash memory management, along with an AES 128 and 256 encryption engine, the U9 family offers 16 general-purpose I/O and an API with SDK to support the development of customer-specific firmware extensions (CFEs). Figure 1 shows a block diagram of the U9 Flash controller.

**SMART about NVM**

Health monitoring has become integral to flash memory management in the communications infrastructure. Working in conjunction with a controller like the U9, it enables parameters such as total spare blocks, block erase counts and ECC/CRC errors to be captured at any time, as well as checking the status of global wear levelling and bad block management.

All of this data is accessible through the hySMART utility, using a GUI to access and decode the ATA/ vendor-specific data. The availability of C++ source code for the main functions, allows customers to incorporate SMART features at the system level. In addition, the data can be correlated and used for lifetime estimation helping customers evaluate their TCO.

An important part of calculating the TCO involves understanding the storage’s endurance. With flash-based NVMe, this is related to how the physical medium maps to the host’s logical storage patterns. This mapping is referred to as the flash translation layer, or FTL; all flash memory media uses the FTL to map where data are stored.

The physical storage locations in the NVM are arranged in blocks, pages and in some cases sub-pages. Mapping with finer granularity (sub-pages) enables the NVM to be used optimally; however, this puts a greater burden on the flash controller algorithm, so it becomes a trade-off for some controller manufacturers. Hyperstone’s hyMap technology uses sub-pages by default, which helps with another feature known as the write amplification factor (WAF). This is a figure that indicates how much additional information is written to the flash for every byte of data; a lower WAF is therefore better.

Achieving a low WAF depends on many things but starts with the granularity, the page and the block size, and the underlying flash technology; does it use single-level or multi-level cells, for example (SLC or MLC)? The WAF can also be impacted by where the mapping information is stored: in internal or external DRAM. As a rule, a lower WAF and finer mapping can boost endurance by a factor of as much as 100 especially for use-cases with frequent small random accesses such as boot drives for example.

Determining the WAF for a given write budget can help in selecting the most suitable Flash technology; using hyMap, it may now be possible to use MLC or pSLC instead of SLC.

**Conclusion**

Storage is a small, but integral, part of larger systems in the communications infrastructure; a fault in any subsystem could result in service failures. NVMe has become the default media for code and data storage across the entire infrastructure, meaning service providers rely on long-term support for new and legacy interfaces.

The way NVMe is used in communications demands an approach that is not only tailored to the needs of the enterprise or consumer sectors, where lifecycles are short; but also about endurance, reliability and TCO.
As the commercialisation of 5G becomes a reality the transition from 4G to 5G will be a radical one and brings with it enormous commercial implications.

At the end of last year the first 5G New Radio (NR) specification was approved by the 5G Consortium at the “3GPP Plenary Meeting” held in Lisbon, Portugal and in the UK bidding has begun for a share of newly released spectrum.

So, with the appetite for connectivity, bandwidth, and advanced high-speed, low latency networks growing, it appears that the race to deliver next generation 5G services has started.

5G is intended to provide more efficient communications systems which will be fast, up to 100 times faster than 4G and 10 times faster than the average broadband connection while, at the same time, enabling it to support the next wave of technological innovation from autonomous vehicles to smart factories, smart cities, virtual and augmented reality and edge computing.

The first 5G phones are due to appear in 2019 with both Samsung and Apple expected to lead the way – Apple engineers are said to be ‘engaging’ with Intel as they look to add 5G capabilities into a future iPhone.

It’s unlikely that we’ll see a pure 5G phone for some time, though.

While trials are underway around the world to test 5G one important issue that rollout brings is where the 5G phone will sit.

While 4G occupies 5MHz to 20MHz when it comes to Korea, the US and Japan the optimum frequency to support 5G is thought to be 28GHz; in Europe it’s seen as between 24GHz and 27GHz.

What that means is that for companies like Samsung and Qualcomm they will need to incorporate the entire range into their new chipsets so that 5G is able to work in different countries.

Another issue is the cost of deploying 5G. Because of the higher frequencies required to support 5G, signals wont be able to travel as far which will mean that more antennas will be required, which will raise the cost of implementation as the network is rolled out.

Despite that Dino Flore, Vice President of Technology, Qualcomm speaking at the company’s 5G day in San Diego, California last month expects 5G to arrive within the next three years.

According to Flore, “It could account for as many as 1.4billion connections by 2025 according to the GSM Association, which suggests that 5G networks are likely to cover one-third of the world’s population by then.”

Flore said that 5G would be able to provide fibre-like speeds as well as reliable performance such as 100+ Mbps, even in challenging environments or at the cell edge and added that 5G would provide lower latency and lower cost-per-bit – “significantly lower than today’s networks.”

It’s that ‘lower cost-per-bit’ that is crucial if the roll out of 5G is to be a
commercial success.

Analysts suggest that 5G’s economic potential could be enormous and that infrastructure spending on 5G might exceed $326 billion by 2025. That investment is expected to concentrate on: data centres; edge computing; network transformation and 5G network protocols and modems.

Established players like Intel, Qualcomm, Dell and Ericsson are expected to be among the biggest beneficiaries of the move to 5G with nearly 80% of 5G infrastructure spend expected to come from hardware and projects intended to transform the network. Data centre component suppliers, those who are involved in helping companies upgrade their networks and modem and IP suppliers are also expected to benefit significantly from the move to 5G.

Qualcomm, for example, has already started sampling the Snapdragon X24 LTE modem, the first commercially available Category 20 LTE modem capable of supporting up to 2 gigabits per second (Gbps) download speeds.

The device contains advanced cellular features and strengthens the LTE foundation for future 5G NR multimode devices and networks.

“The Snapdragon X24 LTE modem has been designed to provide enhanced mobile broadband and deliver an extremely important gigabit coverage layer for commercial 5G networks and mobile devices that are expected to start launching in 2019,” said Serge Willenegger, senior vice president and general manager, 4G/5G and Industrial IOT, Qualcomm Wireless.

“It will help mobile operators to fully mobilise their spectrum assets and maximise the capacity of their Gigabit LTE networks, and mobile device makers to offer consumers what will be a tangible glimpse of our 5G future”.

As 5G is rolled out both end-user devices and base stations will need to be able to manage multiple-input and multiple-output (MIMO) and beam-steering technologies which will have an impact in that it will require more channels and expanded demand for bulk acoustic wave (BAW) filters, antennae, power management and other devices.

The absorption of high-frequency 5G signals will require the transmission beam to be electronically “steered” if losses are to be reduced and the transmission efficiency of the system optimised.

The issue of power management will also be crucial and these systems are expected to employ more sophisticated envelope-tracking technologies.

While not completely new, these chips are currently used in RF power amplifiers to track the signal and boost the power, as and when it’s required, rather than having to constantly supply high power.

With the roll out of 5G and the increased speeds that it is expected to bring envelope-tracking technologies are likely to shift from employing laterally diffused metal oxide semiconductor (LDMOS) and gallium arsenide (GaAs) to gallium nitride (GaN) to better manage the need for higher power and higher switching speeds.

In order for 5G to succeed it will need to rely on new semiconductor technologies to support ground-breaking innovations.

A recently launched European research project called SERENA (“gan-on-Silicon Efficient mm-wave euRopean systEm INtegration platform”) has started a 36 month research project that will be looking at the development of a beamforming system platform for mm-wave multi-antenna arrays to enable the functional performance of a hybrid analogue/digital signal processing architecture that goes beyond mainstream CMOS integration.

The project’s aim is to develop a proof-of-concept prototype for optimising the power efficiency and cost of mm-wave multi-antenna array systems for a wide range of applications such as high-speed wireless communications which rely on active antenna arrays and electronic beam steering.

The fundamental challenge is to produce high-performance antenna systems for the mm-wave range at viable price-points and low energy consumption.

“RF-GaN technology offers crucial performance advantages over incumbent LDMOS or GaAs technologies, such as greater bandwidth and energy efficiency,” explained EpiGaN CEO Dr Marianne Germain, one of the industrial and academic institutions involved in the project.

“Our GaN-on-Si technology is able to deliver excellent power density and power-added efficiency (PAE), superior gain, and low RF losses up to 100GHz. By starting out with a fundamentally better semiconductor technology specifically designed for the mm-wave range, we will be able to deliver enhanced device performance for multiple RF applications.”

GaN is seen as being a key enabler of 5G wireless communication because of its requirement for exceptionally high-speed connections for, among others, multimedia streaming, virtual reality, M2M and autonomous driving.

As these innovations are commercialised so the services 5G will support will experience lower latency and better energy efficiency.

Many of the technologies associated with 5G are already running in laboratories and while the technical challenges facing 5G shouldn’t be downplayed there are plenty of researchers and technologist working to solve them.
When the Hereford University of Technology and Engineering – the New Model InTechnology and Engineering (NMITE) – opens its doors to a new intake of engineering, technology and science students, it will be the first new university to open in the UK since the 1980s.

Among its main ‘selling points’ are that it will not be offering traditional degrees. Instead, it will offer degrees in applied engineering, with its focus being on meeting the needs of industry; in particular, the defence, cyber security, agri-technology, advanced manufacturing and green technology sectors.

“Electronics, software and digitisation have been at the forefront of much technological innovation and the pace of innovation is seemingly accelerating every decade,” says Professor Janusz Kozinski, the founding president and chief executive of NMITE.

“But while the engineering profession has been at the forefront of making our lives better, the critical question for the UK and the companies based here is ‘are we producing enough skilled and bright people for us to compete successfully in the future’. Unfortunately the answer is ‘no’.”

We need many more engineers than the UK currently produces and that’s an issue that extends beyond the UK and to the rest of Europe and North America.

“Employers consistently report a shortage of graduate engineers, particularly those with the right breadth of skills for success in business … after all, what is the value of innovation if you can’t get it out of the workshop or laboratory?”

According to Prof Kozinski, a big problem has been how engineering is taught in the UK and, indeed, how it’s taught around much of the world.

“While electronic engineers are at the forefront of innovation, engineering tuition is stuck in a time-warp, with little having changed from the 1960s,” he contends.

“Lots of set textbooks, lectures and a syllabus that is likened to a math death march, all spread over three years so there is lots of time for academics to do research rather than teach!”

Prof Kozinski believes that, besides not equipping engineers with the right skills for today’s engineering challenges, the current approach to teaching ‘deters talented and suitable people from becoming engineers, and that’s the last thing we want when they are in short supply already!’

According to Prof Kozinski, NMITE will be taking a dramatically different approach to the curriculum and how it’s taught.

“We want NMITE to be an entirely new kind of university when its doors open in September 2019 to an initial pioneer cohort of students,” he said.

While the initial intake will be around 100 students, the university plans to raise the overall student
population to 1200 within a relatively short period.

“Our long term programme is to reach 5000 students, the majority of whom will be from the UK, although we’re looking to attract overseas students as well. We’re developing a curriculum and infrastructure to meet those numbers.”

Prof Kozinski wants the University to be considered as an ‘incubator of new ideas’, with the focus being on graduating employment-ready, industry relevant, culturally intelligent, creative, ethically aware and financially literate young people.

“We want to increase the pool of students interested in engineering,” he argues. “To do that, we need to create a new way of teaching and a new way of learning. We want our students to work together on practical projects that solve real problems. We’ll engage closely with industrial partners who will help with forming the curriculum.

“We also want a student body that better reflects society – and that’s about attracting more women to engineering. It’s an important subject and a real challenge for industry.

“While we’re looking to attract a broader mix of students, at the end of the day, it’s about their employability. Our aim is to produce graduates who are well rounded and prepared for a variety of jobs – not necessarily solutions focused, but rather able to think more broadly about how things are achieved.”

Instead of leaving with a graded degree, graduates will leave with a portfolio ‘bursting with completed projects’, according to Prof Kozinski.

“All this will be achieved in two years for the (BEng) degree, as students will work 46 weeks per year. The Masters engineering degree (MEng) will be delivered in an additional year.”

Prior to his position at Hereford, Prof Kozinski served as Founding Dean of the Lassonde School of Engineering at York University and home to the Renaissance Engineering programme, a curricular philosophy that includes interdisciplinary learning, industry collaboration and designing for positive social impact.

Prof Kozinski was also Dean of the College of Engineering at University of Saskatchewan and Dean of the Faculty of Science and Engineering at York University.

NMITE is intended to be the ‘boldest, most radical’ start-up in higher education anywhere in the world, according to Prof Kozinski.

“Firstly, there will be no lectures, no textbooks and no exams; instead, there will be real-time assessment.

“The University is developing a curriculum and what I believe is a radical approach to tuition that will prepare interdisciplinary engineers for a world in which technology is changing who we are.”

Prof Janusz Kozinski

“The University is developing a ... radical approach to tuition that will prepare interdisciplinary engineers for a world in which technology is changing who we are.”

Prof Janusz Kozinski

“shorter courses mean that we’re less expensive and that resonates with parents. But we’re also liaising closely with other established universities, like Warwick, when it comes to developing our curriculum and that’s helping assuage concerns about the approach we’re taking.”

“It’s certainly early days for NMITE and we’re at the educational ‘frontier’, “ Prof Kozinski concludes.

artificial intelligence, advanced manufacturing, food security, big data, advanced robotics and smart living.

“The academic programme we will create will insist that students are encouraged to learn by creating, doing and solving real problems supplied by our employer partners. As opposed to learning to meet a certain percentage on a premeditated exam paper, the challenges these engineering students will face will be real, everyday issues that are faced by engineers,” Prof Kozinski explains.

He talks of pioneering new methods of teaching and, to that end, the University will be deploying virtual reality/augmented reality labs in which students will be able to conduct experiments ranging from measuring the temperature of a flame to navigating driverless vehicles.

“It will be the first engineering laboratory of its kind in the UK,” Prof Kozinski suggests.

While the University is focused on engineering, electronics will be an integral part of the curriculum.

“It will serve as one of the horizontal platforms, integrating the entire academic curriculum co-developed with employers,” Prof Kozinski explains.

Over the coming months, the University will look to engage with industry sponsors, schools, students and their parents.

“It’s about explaining what will be a radical new approach to education and teaching. We need to reach students but also their parents, because while students like our proposition parents are more conservative.

“Shorter courses mean that we’re less expensive and that resonates with parents. But we’re also liaising closely with other established universities, like Warwick, when it comes to developing our curriculum and that’s helping assuage concerns about the approach we’re taking.”
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InnoSwitch-3-Pro integrated switcher enables micro-step of voltage and current for precise battery charge control and elimination of DC-DC post-regulators

Power Integrations [NASDAQ: POWI], the leader in high-voltage integrated circuits for energy-efficient power conversion, today announced the release of its InnoSwitch-3-Pro family of configurable off-line CV/CC and CP flyback switcher ICs. Capable of delivering up to 65 W and achieving up to 95% efficiency across line and load conditions, the new devices permit precise, dynamically adjustable, control of voltage (50 mV step) and current (50 mA step), via a simple two-wire DC interface. Devices may be paired with a microcontroller or take inputs from the system CPU to control and monitor the off-line power supply. Applications include virtually any rapid-charge/prolonging, including USB Power

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Lattice Releases Next-Generation FPGA Software

Lattice Releases Next-Generation FPGA Software for Development of Broad Market Low Power Embedded Applications

New Lattice Radiant Software Enables Predictable Design Convergence with Unparalleled Ease of Use

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• New software enhances Lattice soft IP portfolio with IP core support for the ICE40 UltraPlus™ family

• Lattice Radiant® is available for download from the company’s website free of charge; along with documentation and training videos

Lattice Semiconductor Corporation (NASDAQ: LSCC), the leading provider of customizable smart connectivity solutions, today announced the release of its new FPGA software, Lattice Radiant®, targeted for the development of broad market low power embedded applications. With its rich feature set and ease-of-use.

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Ledtech opens new facility in UK

Taiwanese LED giant Ledtech opens new facility in UK

Supports key industrial sectors with wide range of standard and custom devices

Ledtech, one of the world’s largest capacity LED manufacturers, has announced the opening of a European facility in the UK. The addition of a direct facility adds a range of value-added manufacturing services, design-in support, volume availability and security of supply on a wide range of opto parts including discrete LEDs, LED displays, lighting components and luminaries. Additionally, later this year, the company will install a full LED production line in the UK facility.

Ledtech’s solid-state lighting products and components are used by some of the best respected names in the industry and SMBs alike. Ledtech addresses sectors with products specifically designed to fit the particular requirements of each application. Key markets include commercial, consumer, industrial, office, retail, business & finance, transportation, signage, instrumentation, healthcare, vending & gaming machines, hotels, restaurants & leisure and public spaces. Ledtech products meet international standards and lead the way in efficiency.

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Mouser Celebrates Innovation at Embedded World 2018

Mouser Celebrates Innovation at Embedded World 2018 with Product Demos, Dev Kit Giveaway, Free Coffee and More

Join the Global Distributor in Hall 3A Stand 111 at Famed Conference in Nuremberg

Mouser Electronics, Inc., the New Product Introduction (NPI) leader empowering innovation, will once again exhibit at Embedded World 2018 — the world’s biggest exhibition and conference focused on embedded technologies, occurring February 27 – March 1 in Nuremberg, Germany. Mouser representatives will be in Booth 111 in Hall 3A to discuss the entire spectrum of embedded systems and display innovative solutions and technologies from a wide range of industry-leading manufacturers.

Visitors to the Mouser booth can pick up a free Mouser coffee mug and also register for a chance to win one of 11 development kits from some of Mouser’s leading suppliers, including Microchip Technology, Maxim, ON Semiconductor, NXP; and Linear Technology, now part of Analog Devices. To enter the drawing before Embedded World begins, go to www.mouser.com/embeddedworld

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New Keyed SMA fibre optic system

New Keyed SMA fibre optic system from OMC ensures consistent mated performance

Combines best features of multiple connector styles; eliminates rotational variation

OMC, the pioneer in optoelectronics design & manufacture, has launched a new, Keyed SMA (KSM) connector and diode receptacle system for its wide range of fibre optic transmitters and receivers which offers the rotational consistency of a keyed connector alongside the security and reliability for which the SMA connector is renowned.

The KSM fibre optic connector system combines a new connector and diode housing design, which OMC describe as delivering the best of all worlds. Unlike the standard SMA connector, which can be inserted at any rotation about the ferrule axis, OMC’s KSM system incorporates a mechanical keyway mechanism, thus eliminating rotational variation when a cable is mated to the transmitter or receiver.

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Red Pitaya

Red Pitaya – Company Background

Credit card-sized, multi-function, open-source, reconfigurable test & measurement platform.

STEMlab™ from Red Pitaya is a credit card-sized multi-function, open-source, and reconfigurable instrument. More than a product, STEMlab is a test and measurement environment that includes a board, an application marketplace and a source code library, all of which foster collaboration and ultimately unleash the inventiveness of users. Users – which vary from small student teams all the way up to large multi-national corporations - have described STEMlab as The Swiss Army Penknife for engineers. STEMlab is designed to be a low-cost alternative to many expensive measurement and control instruments and can function as an Oscilloscope, Logic Analyzer, Signal Generator, Spectrum Analyzer and much more.

Red Pitaya is a privately-owned company established in 2013 which span off from Instrumentation Technologies Inc, the leading company designing and building high performance instruments for particle accelerators. With the help of a successful Kickstarter campaign, deep engineering background and passionate, innovative individuals the company is changing the test and measurement market. As a confirmation of its innovative approach Red Pitaya was awarded the prestigious Frost & Sullivan Global Electronic Test & Measurement Tools New Product Innovation Award in 2014.

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