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SMALL | SAFE | SECURE | ADVANCED | FAST | EASY
While the current focus of the Brexit discussions is the terms of a transition period, along with Government’s desire to proceed to trade talks, some recent news that slipped out quietly could have a far-reaching impact on UK science. Via its website, the EU has made it clear, for the first time, what will happen to British participants in EU funded research, once the UK leaves the EU in March 2019.

The note, addressing UK businesses and institutions participating in Horizon 2020 projects, warns that if the UK withdraws from the EU during the grant period without any agreement being signed – the so called ‘hard Brexit’ – all UK participants will cease to be eligible to receive EU funding and will have to leave the project on the basis of Article 50 of the grant agreement.

The consequences of such a move for British science will be profound. Horizon 2020 has played – and continues to play – a vitally important part in a range of scientific and technology based research projects in the UK.

Without an agreement between the UK and the EU, not only will funding for UK-led projects end, but it also appears that UK participants could be forced out of wider European projects.

But hasn’t the UK Government promised to guarantee funding for projects currently funded by the EU, including science grants? Well, yes. But many UK scientists have already spoken about being asked to leave collaborations, while others have said they have been excluded from new bids.

UK science is facing an uncertain future. UK research and technology organisations are regularly part of extensive European-wide research projects and with the publication of this note they could now be seen as ‘unreliable’.

EU programmes aren’t simply about funding; even if the Government does deliver on its promises, it’s also about allowing researchers and scientists to collaborate across borders.

The risk to UK organisations, and the uncertainty around their role in European research, has been turned up a notch by this news and the Government needs to accelerate Brexit talks in order to provide much needed clarity. If the Brexit negotiations fail to make substantive progress, with some ‘meat’ put on the bones of a possible deal – whether that’s a transitional arrangement or a clearly defined agreement – then there is a real risk that hundreds of UK researchers could see collaborative projects end abruptly in 2019.

British businesses are becoming increasingly anxious over their immediate future post Brexit; it appears the scientific community should be equally concerned.

Neil Tyler, Editor (neil.tyler@markallengroup.com)
Heracles

Designed to Simplify Your IoT Device Making Process

Heracles provides a ready to use 2G cellular module embedding a SIM card with a prepaid data plan, valid for a long term period up to the year 2025, at no additional cost and without any monthly fee. The device is utilizing Orange’s high-quality cellular network and a large tier one roaming network covering 33 European countries through an extensive count of operators.

Heracles is fully certified and supports quad-band 850/900/1800/1900 MHz, GPRS multi-slot class 12/10, as well as GPRS mobile station class B and is compliant to GSM phase 2/2+ Class 4 and 1.

For more information and design support please contact your local partners of EBV Elektronik, the leading specialist in EMEA semiconductor distribution and visit also ebv.com/heracles.
NXP BLENDS MCUS AND APPS PROCESSORS TO MEET EMERGING NEEDS. GRAHAM PITCHER REPORTS.

NXP says it is creating the crossover processor with the introduction of the RT1050, which blends the benefits of applications processors with those of microcontrollers.

Geoff Lees, pictured, general manager of NXP’s microcontroller business, said the i.MX RT is intended for edge processing applications. “NXP sees this as relating to every connected device down to the MCU level. Everything will have some processing requirement, along with management, analytics, wireless connectivity and HMI support. And this device also has built in physical security.”

According to Lees, customers developing low cost applications have asked for a device which can support an RTOS running on a Cortex-A7 platform. “While we have done that,” Lees noted, “that carries a large overhead and the implementation is not as efficient as it could be.”

In the i.MX RT, the Cortex-A7 core is replaced by a Cortex-M7. “We use the M7 to increase real time performance,” Lees explained, “particularly latency. So we started with the i.MX6 UL, removed the A7 domain, along with the caches and so on, and dropped in an M7. The result is a device which is more optimised for real time applications. And we’ve gone from concept to production in less than 12 months.

“Running the M7 at high clock rates can bring power consumption penalties,” Lees continued, “but we are geared up to put the i.MX RT into production at 600MHz with 512kbyte of SRAM.”

At the moment, the part is targeted for production on an 40nm process and Lees claims the device will consume 100µA/MHz – up to three times less than comparable parts.

The first part in the range, the RT 1050, is sampling and will be in volume production shortly. “One thing we have focused on,” Lees continued, “is making sure real time response is in the nanosecond range – and the RT 1050 has a latency of about 20ns. We’ve also made sure that all SRAM on chip can be used either as tightly coupled memory or as general purpose RAM.”

As Lees noted, the RT 1050 resembles the i.MX6 UL. “We’ve retained the high performance communications features of the i.MX, but have added a number of peripherals to support MCU related tasks,” And he pointed out that, by removing the A7 core, enough die space was created to allow a DC/DC converter to be integrated on chip.

The BGA packaged device – which will sell for less than $3 – has been designed so that it can be used on a four layer PCB. “A typical i.MX needs six to eight layers,” Lees noted.

NXP will also be sampling a ‘cut down’ version of the chip at the end of 2017. The 1020 will come in a QFP with 256kbyte of SRAM, but some peripherals which don’t make sense for a QFP device will be omitted, Lees pointed out. “Wire bonding will mean it has to run at 500MHz.”

More RT parts are in development. “While the 1050 comes with 512k of RAM, we’re working on parts with many times that,” Lees said, “as well as working on 28nm variants. Our target is 5Mbyte of RAM and that makes no sense on 40nm. Moving to 28nm will also halve the power consumption, so that’s significant.”

Further down the line, Lees expects MRAM to appear in the chips. “It’s good for economies of scale and it’s a back end process. Being able to take a standard design and overlay MRAM without impacting cost is very attractive. NXP recently presented a test chip with 8Mbit of MRAM,” he concluded. “It’s not near production, but watch this space.”
ST-MRAM AGREEMENT

Engineering agreement looks to advance ST-MRAM devices

STT AND TOKYO ELECTRON SIGN AGREEMENT FOR NEXT GENERATION ST-MRAM DEVICES.

NEIL TYLER REPORTS

Spin Transfer Technologies (STT) and Tokyo Electron (TEL) have signed an agreement for a collaborative engineering programme for next-generation SRAM and DRAM-class ST-MRAM devices.

The agreement is intended to advance ST-MRAM, a new class of high-performance, persistent memory devices and brings together STT’s ST-MRAM technology and TEL’s advanced PVD MRAM deposition tool which will allow the companies to develop processes for the higher density devices quicker.

STT will be contributing its high-speed, high-endurance perpendicular magnetic tunnel junction (pMTJ) design and device fabrication technology, and TEL its industry-leading ST-MRAM deposition tool and knowledge of unique formation capabilities of magnetic films.

SRAM is pervasive in nearly all mobile, computing and industrial applications but while it is fast it is costly and uses a lot of power. ST-MRAM, being more compact, is less costly, requires little power when storing data and is non-volatile, retaining data for long periods without power.

5G data connection using a 5G chipset

Qualcomm Technologies has announced that it has successfully achieved a 5G data connection using a 5G modem chipset for mobile devices. Using the Snapdragon X50 5G modem chipset it was possible to deliver gigabit speeds and a data connection in the 28GHz mmWave radio frequency band in a move that, the company said, could not only help to drive a new generation of cellular technology but accelerate the delivery of 5G NR enabled mobile devices to consumers.

The 5G data connection demonstration took place in Qualcomm Technologies’ laboratories in San Diego, and achieved gigabit download speeds, using several 100MHz 5G carriers, and demonstrated a data connection in the 28GHz mmWave spectrum.

5G NR mmWave, now possible through the 5G NR standard, is expected to drive the next generation of mobile devices and significantly increase network capacity.

Paper based supercapacitor could power wearables

Using a simple layer-by-layer coating technique, researchers from Georgia Tech and Korea University have developed a paper-based flexible supercapacitor that could be used to help power wearable devices. The device uses metallic nanoparticles to coat cellulose fibres in the paper, creating supercapacitor electrodes with high energy and power densities – and the best performance so far in a textile-based supercapacitor.

“This type of flexible energy storage device could provide unique opportunities for connectivity among wearable and internet of things devices,” said Seung Woo Lee, an assistant professor at Georgia Tech.

The process uses an amine surfactant to bind gold nanoparticles to the paper. Using a repeating process, the researchers created a conductive paper on which alternating layers of metal oxide energy storage materials were added.

The maximum power and energy density of the metallic paper-based supercapacitor is estimated to be 15.1mW/cm² and 267.3μWh/cm² – said to be better than conventional paper or textile supercapacitors.

Anglia distributes Renesas microcontrollers

Anglia Components has extended its relationship with Intersil and will now distribute Renesas’ advanced embedded semiconductor solutions including microcontrollers, mixed signal ICs and system in chip devices in the UK and Ireland. The announcement follows the acquisition of Intersil by Renesas Electronics in February this year.

Commenting Achim Mescher, Sales Director for Distribution at Renesas Electronics said, “One of our first steps as we integrated the Intersil business into Renesas was to review its channels to market. It was evident that Anglia’s deep technical expertise and outstanding logistical service has been a factor in helping Intersil’s presence in the market in the UK and Ireland.”

Anglia will also be supporting Renesas products range including the Renesas Synergy Platform, on Anglia Live, and will train members of its Field Application Engineering team to support Renesas devices and technologies.
Analog Devices and imec to develop next gen IoT devices

ANALOG DEVICES AND IMEC BUILD ON EXISTING INITIATIVES TO TAKE IOT DEVICES TO ‘NEXT GENERATION’. GRAHAM PITCHER REPORTS

Belgian research centre imec has announced that it is to work with Analog Devices to develop the next generation of IoT devices. The move, building on two existing initiatives, is intended to produce devices that are not only low-power, but which also feature largely improved or completely new sensing capabilities.

One joint research initiative already underway focuses on localisation technology. A second initiative includes the creation and commercialisation of a highly-integrated liquid sensor that can be used in a variety of application domains, such as the analysis of water, blood or urine.

“Building on imec’s world-leading position in innovative ultra-low power implementations, ADI and imec will pursue the development of a low-power sensor for highly accurate indoor localisation in the context of smart building or smart industry solutions,” said imec programme director Kathleen Philips. “We want this sensor to … achieve up to five times better accuracy than today’s best-performing solutions.”

Peter Real, Analog Devices’ CTO, added: “We have chosen to take our collaboration with imec to the next level because its expertise in each of those domains – and its position at the crossroads of both the scientific and industrial communities – is fundamental to helping us successfully develop the next generation of IoT sensors.”

The research findings could help to eliminate key hurdles to using LEDs for wireless communications. Although it has long been known that LEDs can be used for wireless communications. Although it has long been known that LEDs can be used for wireless communications, questions have remained about whether this affects the LED’s ‘green’ benefits.

“Until now, the cooling structures have not been very close to the computer core itself, which means the coolers are mostly applied from above,” says Dr Hermann Oppermann, group leader at Fraunhofer IZM. “The closer you get to the heat source, the better the temperature can be limited or the output increased. In high performance computing it is important to have effective cooling in order to ensure a higher clock rate. Previous cooling systems were not so effective in this context. With this new cooling system, performance can be increased significantly.”

Microchannels cool processors

As part of the CarriCool project, researchers at the Fraunhofer Institute have worked with IBM to develop what is said to be an effective method for cooling processors by integrating microchannels into the silicon interposer along with hermetically sealed vias. Passive components for voltage regulators, photonic ICs and optical waveguides have also been integrated into the interposer.

According to the team at the Fraunhofer’s Institute for Reliability and Microintegration (IZM) in Berlin and Dresden the structure allows heat to be pumped through the microchannels.

LiFi doesn’t affect LED performance, says research

Energy-saving LEDs could help meet demand for wireless communications without affecting the quality of light or environmental benefits they deliver, according to research funded by the Engineering and Physical Sciences Research Council.

A University of Edinburgh team has found that transmitting digital data via LEDs at the same time as using them to generate light does not make the light dimmer nor change its colour. Neither does it make the LED any more energy-hungry. Dr Wasiu Popoola of the University of Edinburgh who led the research, says these concerns have held back the more widespread adoption of LiFi.

The research findings could help to reduce the lightbulbs’ brightness or life expectancy significantly, or to cause any significant change in the colour of the light. Both techniques also produced only a negligible change in the heat generated by the LEDs.

Dr Popoola noted: “Our results are encouraging for the future of light-based communications. It’s vital that LED manufacturers know what impact the incorporation of data transmission capabilities would have on their products. Our research shows that there’s no ‘dark side’ to using LED lights to supplement WiFi.”

Pi-top modular laptop

RS Components (RS) is now stocking the latest-generation of pi-top modular laptops, featuring new enhancements intended to assist learning and boost usability.

The pi-top comes with a 1080p full-HD 14-inch display, up to eight hours battery life, a full-sized sliding keyboard, and the Raspberry Pi 3 with state-of-the-art compute capability and extra power for maker projects.

Users will have access to the pi-top ecosystem, comprising software, accessories and teaching/learning aids, to help understand computer science and coding principles and build their own maker projects.

The advanced inventor’s kit provides expansion opportunities including LED lights, modular microphones and speaker accessories, and pi-topPROTO+ – a HAT-compatible board containing a breadboard for solder-less prototyping of electronic circuits.

www.newelectronics.co.uk 24 October 2017
Future trends

NATIONAL INSTRUMENTS’ TREND WATCH 2018 SAYS THAT WITH TECHNOLOGY ADVANCING AT AN EVER-FASTER RATE, A SOFTWARE CENTRIC PLATFORM APPROACH TO TESTING IS MORE IMPORTANT THAN EVER. NEIL TYLER REPORTS

Writing in the company’s annual Trend Watch survey, Shelley Gretlein, vice president corporate marketing for National Instruments, sees 2018 as another banner year for technical progress.

The survey identifies five key trends including: the continued proliferation of smart and connected ‘things’; 5G innovation; growing pressure on Moore’s Law at a time when it’s facing real challenges; the acceleration in vehicle electrification and the ramifications that means for infrastructure and the growing impact of machine learning.

With 95% of business leaders expecting their company to use the Industrial Internet of Things (IIoT) within the next three years, according to research by Accenture, industry is evolving fast and becoming smarter and more connected.

‘Late adopters risk losing market share and incurring unnecessary costs by not keeping up with the pace of innovation,’ says the report.

As IIoT is deployed attention and investment is shifting towards scaling and managing large deployments, including remote systems management, software configuration management and data management.

5G is expected to dramatically disrupt test processes, according to the report.

New wireless capabilities will require companies specialising in semiconductor, network infrastructure, cloud, software, manufacturing and test technologies to design, develop, test and deliver solutions capable of taking advantage of these wireless capabilities, the report says.

‘5G requires innovative new architectures and the standards required are far more complex than those that have gone before.’

The report says that industry must ‘transform the way these systems are designed, developed and tested.’

According to NI test and measurement solutions have a key role to play in the commercialisation of 5G. Not only will it be necessary to test changing parameters of multiantenna technologies but delivering effective over the air tests which will have to become standard and, while bandwidth is a familiar test challenge, when it comes to 5G the tested bandwidth is expected to increase 50x over a standard LTE channel.

The report goes on to warn that while wireless researchers have embraced a platform design approach, test solution providers will have to do the same.

According to the report while the vehicle of the future looks more like an electrical microgrid with a common power bus connecting a growing list of sources and sinks of power, each managed by an independent control system, the move towards vehicle electrification will require significant investment and growth in infrastructure as well as a need for much smarter control systems.

As a result, there will be a greater reliance on real time test, production test and an ecosystem supplying tools that are able to operate within more open platforms.

Machine learning has delivered many benefits to specific niches the report suggests but businesses are now looking to engineers, platforms and the next wave of machine learning to help improve yields, increase uptime and lift efficiency.

All of this is underpinned by continued improvement in semiconductors but if we are witnessing the end of Moore’s Law, the report suggests that it could offer a chance to branch out in different directions. “To really shake things up,” according to Dr Peter Lee, corporate vice president of Microsoft Research.

The focus on stacking chips and transistors to increase density raises interesting design and test challenges but the continuous scaling in terms of processing capability and I/O bandwidth, will provide opportunities for new architectural innovations.

National Instruments will be hosting its annual NIDays Conference and Exhibition at Sandown Park Racecourse, Esher on Tuesday 28 November 2017.

To register and for more details, visit: uk.ni.com/nidays
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**Info & Free Samples**

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www.linear.com/LTC2500-32
Innovative technology can make a difference; not only on individuals, but also globally – and innovation in lighting technology is an example.

While most LED light manufacturers use gallium nitride (GaN) for the LED, it is generally mounted on a sapphire substrate because it is cheaper than using GaN on silicon carbide. But GaN on sapphire has performance issues; when scaled up to meet the needs of floodlighting and similar applications, light absorption increases and efficiency drops. Sapphire also has low thermal conductivity, with heatsinks increasing product size and cost.

Looking to address these issues, Plessey Semiconductor has developed GaN on Si technology. According to the company, GaN on Si LEDs not only emit more lumens per unit area, but also dissipate heat more quickly. The result is smaller, more reliable LEDs.

Silicon is a good substrate choice; it brings economies of scale and GaN on Si devices are said to be easier to make, bringing better yields. While manufacturing GaN on Si wafers is not without its challenges, Plessey can now make 6in GaN on Si wafers, bringing a range of performance and commercial advantages.

It has deployed this technology in its LUCIAN PLW7070 LED, in which a single die GaN on Si LED produces 30% more light than comparable devices at half the cost.

What the judges said:
“It looks like Plessey has created the right product for the right market at the right time. In particular … the judges are heartened to see innovation from a UK semiconductor company.”

Consultancy of the Year
Sponsored by Rutland Plastics
Car makers continue to look for transmission systems for traditional vehicles which save weight and feature less noise, vibration and harshness. But that concern has expanded recently to include electric and hybrid vehicles.

These requirements have seen the appearance of a number of specialised consultancies, including Drive System Design (DSD), which specialises in the design and integration of electric drive units for main traction, as well as bespoke actuator applications, DSD’s current focuses include efficient transmission design optimisation, eMachine design and control, and electric vehicle/hybrid architecture specification.

Recently, a DSD project team took a design from a simulation model to prototype installation within six months. It has also created a communications interface between EV control systems in a bus electrification project.

What the judges said
“It’s interesting to see the growth in its turnover during the last five years, as well as its investment in control and transmission technology for the electric vehicle market beginning to paying off.”

Highly Commended: Penso Group
Start Up of the Year
Sponsored by Cambridge Consultants
One of the questions posed by the judges is how a start up believes it can succeed in its chosen market. Open Bionics points out there are more than 2 million upper limb amputees around the world and more than 11 million amputees. The market for robotic devices to assist victims of strokes is even larger.

Open Bionics is developing affordable robotic systems, with early customers including hand amputees, as well as parents of children with limb-differences. Devices will be sold directly to customers, as well as being available through private and public health care clinics. And with young people in mind, Open Bionics has signed what it says is a ‘one of a kind’ licensing deal with The Walt Disney Company, allowing it to sell bionic limbs featuring Disney characters.

What the judges said
“With interest from investors, clinical trials in progress and plans to start manufacture in the near future, Open Bionics is poised to make a major impact.”

Design Team of the Year
Sponsored by Altium UK
Looking to exploit an opportunity for a mid-range, flexible and compact, integrated cartoning system, Kliklok set a project in motion with a hard deadline – launching the new system at Interpack Germany in May 2017.

The project team comprised four people from Kliklok and four from Bosch. There were two groups, two countries, two languages and eight opinions. These problems were overcome with daily video calls, weekly project workshops and site visits.

‘Quality gate’ milestones monitored progress in the various stages and team work was paramount. According to Kliklok, efficient communication, mutual trust, respect for each other’s expertise and sheer determination allowed the objectives to be met and the system to be launched on time.

What the judges said
“... good, honest and practical engineering, delivering an impressive output from a multinational project ...”

Highly Commended: PRaVDA/University of Lincoln

Electronic Product of the Year
Sponsored by New Electronics
Since the launch of the Apple iPhone, users of all kinds of technology have been accustomed to touch interfaces, with capacitive touch dominating.

Yet capacitive touch technology has issues; for example, it only operates in the X and Y dimensions, with capacitive touch dominating.

Peratech’s 3D Multi-Touch Matrix Sensor is a passive array of force touch sensors based on its QTC technology. The array not only determines position in the X and Y axes, but also adds a third dimension of pressure, opening a new world of control options.

Humax has recently integrated a QTC multi-touch matrix sensor into its AwareTV platform, while several mobile phone OEMs and display manufacturers are evaluating the technology for integration into mobile handsets.

What the judges said:
“Peratech’s matrix sensor adds another dimension to interface technology and the judges were impressed by the range of potential applications.”
Young Engineer of the Year
Sponsored by RS Components
Since graduating from the University of Glasgow with an MEng in Product Design Engineering in 2013, Rob Hanson hasn’t looked back. Working for Designability – a national charity developing life-changing assistive technologies – Rob’s recent work has included the design of a wheelchair baby carrier, dynamic seating for young children with dystonic cerebral palsy, and the development of Wizzybug, a powered wheelchair for children younger than five years old.

Designability says Rob is a talented engineer whose drive to develop himself and his good natured enthusiasm are a rare combination.

What the judges said:
“... an unsung hero, exhibiting excellent use of engineering skills in a difficult arena. He has delivered great designs and is a shining example to other engineers.”

Design Engineer of the Year
Sponsored by maxon motor
Lontra’s flagship product is Blade Compressor, described as the first ‘clean sheet’ compressor for more than 80 years. While the first version of Blade Compressor was available when Jake Wallis joined Lontra in 2012, the company admits there was ‘considerable scope’ for its improvement – and Jake contributed in a number of ways, including the fundamental geometry of the compressor rotor where it interacts with mating parts.

Now Lontra’s principal engineer, Jake has responsibility for providing leadership and inspiration. He has changed the design process so engineers work more closely to create more sophisticated and commercially appropriate products, with designs created more quickly.

What the judges said:
“Although still a young engineer, Jake has led the design of a flagship product from a clean sheet, while reformatting the company’s infrastructure ...”

Aerospace Product of the Year
Sponsored by Minitec
Looking for a missing person in a remote location can be challenging. But Artemis, from Smith Myers, uses the missing person’s mobile phone as a location beacon.

The initial concept required a bulky direction finding antenna, but Smith Myers refined this approach so that two standard omni antennas could be used.

Artemis works with any phone and doesn’t require an app. The system determines the missing person’s location and displays it on a map, with directional information. It also supports voice and text communication with the mobile phone – even when there is no cellular network.

What the judges said:
“Searching for a missing person in a large area is a challenge, so anything which helps has to be welcomed.”

Engineering Ambassador of the Year
Iulia Motoc has been involved in more than 30 local and national outreach activities during the past year. She is an Academic Ambassador for the University of Kent, a STEM Ambassador and has recently been appointed an Ambassador for the Queen Elizabeth Prize for Engineering.

According to Iulia, she received an invitation a year ago to visit a primary school in Kent to demonstrate robotics. After spending a day at the school working with pupils of all ages, giving them tasks to complete and the opportunity to interact with robots, Iulia realised she wanted to give more students the opportunity to see what engineering is.

What the judges said:
“Iulia has thrown herself into everything in order to ensure as many young people as possible are exposed to ... engineering and technology.”

Highly Commended:
TDK-Lambda UK

Materials Application of the Year
Sponsored by Goodfellow (Cambridge)
Most LED light sources are made from gallium nitride (GaN) on a sapphire substrate, but an alternative approach is to create LEDs using GaN on silicon. Winner Plessey Semiconductors says this allows more lumens per die area, while the thermal conductivity of the silicon substrate means heat can be dissipated more quickly.

But a GaN emitter mounted onto a silicon substrate is exposed to thermal strain. To resolve this problem, Plessey developed a technique which uses a buffer layer between the GaN and silicon layers.

What the judges said:
“Designing a better LED is the latter day equivalent of designing the better mousetrap.”

Mechanical Product of the Year
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Some of the most exciting applications of MEMs technology can be found in the healthcare sector, as Mark Patrick explains.
family has a standard noise level of 500μg/√Hz, which can be further reduced to 175μg/√Hz through a lower noise mode.

As shown in Figure 1, the ADXL362 also integrates antialiasing filters and a temperature sensor, as well as an A/D converter, SPI interface and digital logic.

Taking sensor integration to a higher level (see figure 2) is the ICM-20948 from TDK InvenSense, a nine-axis motion tracking device which integrates a three axis gyroscope, three axis accelerometer and three axis magnetometer with a digital motion processor in a multi-chip module measuring just 3 x 3 x 1mm. Each sensor features a self-test mode, while the integrated motion processor handles calibration as well as the motion processing algorithms, reducing the workload on the host processor.

Under pressure

One of the biggest applications for MEMS in medical applications is pressure sensors. They can be used in ventilators to monitor respiration rates, in dialysis equipment to measure the inlet and outlet blood pressure for flow regulation, and even in eye surgery. MEMS pressure sensors can be used for the detection of oxygen, carbon dioxide, calcium, potassium and glucose in blood, as well as drug infusion pumps. They are also instrumental in continuous positive airway pressure devices for treating sleep apnea, and in negative pressure wound therapy.

Non-invasive blood pressure monitoring is used to measure a patient’s systolic and diastolic blood pressure via the largely familiar inflating arm cuff. Pressure is applied to the arm until the artery is occluded, at which point the blood stops flowing. Pressure is released until blood starts flowing (normally detected audibly), giving the systolic pressure. As the cuff’s pressure reduces the medical professional will no longer be able to detect audibly the flow of blood in the artery; the diastolic pressure. Using MEMS-based sensors, non-invasive blood pressure monitoring can be largely automated and it is one of the biggest applications by volume for MEMS pressure sensors.

MEMS has the potential to transform many aspects of medical care; the concept of a lab-on-a-chip will lead to fast and low cost diagnosis in remote locations and developing countries becoming a reality.

The technologies used to manufacture MEMS devices are also employed in the development of nanotechnology and the two are closely related. This will see the sciences of microfluidics further merging with microelectronics, while the introduction of new materials such as carbon nanotubes and graphene offers even greater potential.

The substantial miniaturisation combined with high fidelity sensing made possible by MEMS already has incredible medical uses today, but currently we are just at the beginning.

There is a veritable smorgasbord of MEMS technology emerging that will be of value here. In future, this will be utilised to improve the quality of patients’ lives and the effectiveness of the diagnosis process.
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Smart factories are the next big change to affect manufacturing companies, but brings with it some significant challenges. By Neil Tyler

For companies looking to maximise the immense opportunities associated with Industry 4.0, there are also many different challenges associated with delivering this digital transformation.

As complex networks are created the convergence of enterprise IT and operational technology (OT) will accelerate as new IoT devices and greater automation technologies are introduced.

While standardised interfaces and state-of-the-art information technology will permit highly flexible, automated ‘plug and produce’ manufacturing as each new device is added to the production process, most will bring with them their own set of proprietary interfaces. As a result, facilitating effective interoperability across the entire manufacturing process will be no easy task.

Earlier this year the consultant Capgemini announced the findings of its ‘Smart Factories’ report for 2017. It found that manufacturers were expecting their investments in smart factories to drive a 27% increase in manufacturing efficiency, which could be worth an additional $500 billion to the world’s economy over the next five years.

As defined by Capgemini, the term ‘smart factory’ looks to cover technologies such as artificial intelligence (AI), advanced robotics, IoT and big data analytics. The smart factory looks set to include collaborative robots, augmented reality and predictive maintenance.

Among those sectors leading in the adoption of these technologies are aerospace, defence, industrial manufacturing and automotive, and in the UK the survey found that 70% of manufacturers were looking to use smart factories. According to the survey, 27% of UK manufacturers said that they were looking to produce their products in smart factories within the next five years, while 48% said they were looking to establish a network of smart factories.

Peter Hannon, UK managing director, Harting, suggests that the ultimate goal for manufacturers adopting, or looking to adopt, Industry 4.0 or smart factory solutions is to be able to deliver customisable products, as well as increasing quality and reducing manufacturing costs.

“These goals can only be achieved by creating a digital system that is able to gather data and then reports back information on manufacturing processes such as workflow, energy use and faults,” Hannon explains.

“This raw data will be analysed and transformed to provide meaningful insights about the manufacturing process, or a particular piece of machinery, with a view to organising maintenance schedules, implementing automation, managing energy use and contributing to future improvements and savings.”

Increased visibility at all stages
of the production process will enable manufacturers to take a proactive view of activities such as maintenance and production flow, while the inclusion of real-time data means that decisions can be based on the current “live” situation.

“Industry 4.0 solutions will grant manufacturers much greater flexibility with the use of modular systems that are easily customisable. This means that a manufacturing site will be able to react to market demands and adjust its manufacturing processes and capabilities,” he contends.

According to Hannon, Industry 4.0 comprises four key elements, “These are digitalisation, modularisation, miniaturisation and customisation.”

Covering both processes and machinery, digitalisation includes the use of embedded industrial computers and intelligent devices such as sensors to provide data on the machines and processes.

The modularisation of products, factories and processes on the production line is at the heart of the smart factory. Each section can be contained and accessed individually, with modular computers allowing data to be saved, evaluated and then processed at the edge.

Miniaturisation, especially where there are high connectivity requirements in areas such as Industrial Ethernet and the Industrial Internet of Things (IIoT), means saving space within the factory infrastructure and the use of next-generation components will enable the faster speeds associated with Industry 4.0.

Finally, customisation across the factory allows the production environment to meet individual users’ requirements and to improve the processes within the factory.

“Customisation enables customers to get the most out of the end-product by tailoring it to their specific needs, along with individually customised reports and remote access to production data,” Hannon says.

“At the core of the smart factory is the communication between machines, which enables interaction and integration across the whole factory,” explains Gavin Stoppel, product manager, Harting.

“Power, signal and data are the three industry ‘lifelines’ on which all manufacturers depend. While links to these specific lifelines can be incorporated directly into the machine, it is also possible to add flexible modular interfaces to transfer data throughout all the levels of the factory.”

Stoppel continues: “Such devices communicate information and data at all levels, allowing modular production systems to be implemented to provide flexible, cost-effective and innovative production solutions.”

While the Internet provides a platform for direct, interactive, dialogue-centred communication, with network structures replacing the previously used linear design, the cost of deploying a fully integrated system remains a barrier to its widespread adoption.

One solution is retrofitting, according to Stoppel.

“Modular computing forms the basis of a new industrial computer system, MICA (for Modular Industry Computing Architecture), which has been designed to provide machinery and systems with intelligence, making it possible to transform existing manufacturing plants into smart integrated factories,” says Stoppel.

“As a result, customers can design their production facilities to be more modular, affordable and less complex. MICA makes it possible to temporarily save, evaluate and process data directly within the machinery and equipment. Based on a modular open platform it can be customised as required, including the hardware, software and interfaces,” he explains.

MICA functions as a small, robust computing unit between physical devices and a higher-level IT system. It provides a cost-effective solution that allows users to run computing power at all levels as well as communicating with central IT systems and the cloud, offering fast data analysis and decision-making at the field level along with storage and data-collection capabilities.

MICA’s open source approach allows users to customise the computer: for example, by choosing the programming language and development environment.

The MICA computer features a powerful 1GHz ARM processor, 1 Gbyte of RAM and 4 Gbyte of eMMC flash memory (plus an additional 32 Gbyte on a micro-SD card).

The unique identification of plant modules and products is required for production processes to run comprehensively. Real-time production can be viewed via the implementation of RFID (radio frequency identification) systems, along with sensor information for production and maintenance processes.

“This can be used to communicate information about each modular section, and record information for maintenance purposes on writable tags. Identification within the smart factory sees full traceability with continual feedback,” Stoppel explains.

Smart factories have benefited from the concepts surrounding ‘big data’ and properly used, big data will allow machinery and systems to learn and adapt their processes.

Similarly, asset management using a networked environment will enable machines to provide information on their condition and productivity. The resultant data makes it possible to forecast their future operational status and optimise processes which, in turn, assists planning for the requirements of production environment changes and future projects such as new product launches, product modifications or quantity changes.

Whether investing in new systems of retrofitting existing systems more manufacturers are seeing the benefits associated with the smart factory.
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It’s not that many years ago that MEMS devices were regarded as something of a novelty, with early applications focused mainly in the automotive industry – airbag deployment, for example.

Fast forward to today and it’s hard to avoid MEMS technology. Mobile phones are an obvious example – housing motion sensors, gyroscopes, microphones and speakers – while automotive MEMS can also be found in braking systems, emissions control and navigation. And opportunities for MEMS devices are appearing in many other applications, such as biomedical sensors and drug delivery systems. It could be argued that wearable devices wouldn’t have taken off without the benefit of MEMS.

MEMS technology has been championed over the last few years by the MEMS Industry Group (MIG), which was recently absorbed into SEMI, the electronics supply chain organisation.

Karen Lightman, previously managing director of MIG and now vice president of SEMI’s MEMS and Sensors Industry Group, told New Electronics in 2012 that she believed innovation in the MEMS market relates to the way the technology is applied, rather than development of the technology itself. “What MEMS is doing,” Lightman noted, “is allowing designers to realise functionality which they have always wanted in their products.”

And the extent to which MEMS technology is pervading all kinds of industry is highlighted by the annual Technology Showcase, being held this year at the beginning of November alongside the MEMS and Sensors Executive Congress.

“This year’s Technology Showcase finalists are as fascinating as they are diverse,” said Frank Shemansky, CTO of SEMI’s MEMS group. “Imagine, for example, a MEMS-based switching element enabling RF switching that is 1000 times faster and lasts 1000 times longer than traditional mechanical switches. That is the kind of MEMS technology that could improve wireless applications dramatically and is just one of the Tech Showcase finalists – and the others are equally compelling.

“The Tech Showcase is always a big draw at the Executive Congress because it gives attendees the chance to interact with the finalists’ demos to decide their vote for the winner – one of whom will be ‘crowned’ at the close of the conference.”

The five finalists this year are: LEIF Technologies, with its eSnowboard; the Maven Co-Pilot by Maven Machines; and Menlo Micro’s Digital Micro Switch (DMS) technology. Also shortlisted are eLichens’ Berries Smart Sensor
Russ Garcia, CEO of Menlo Micro, said the company can trace its heritage back to 2004. “Engineers at General Electric – which was then a power company – wanted to make remotely programmable circuit breakers for energy management applications. They weren’t planning to make MEMS devices; rather, they wanted to source them. The engineers started to look at MEMS failure mechanisms and found one of the major problems was materials fatigue, rather than stiction. They asked what should the material be to get the results they wanted, such as reliability and electrical performance and had to invent new alloys. Having invested $40 million, GE spun out the technology as Menlo Micro.”

Menlo’s switch technology is targeted at high performance RF and power switching applications. Amongst Menlo’s first products is a six channel 25W part with a frequency range of 3GHz. “One of its first applications has been as a replacement for PIN diodes in MRI machines,” Garcia pointed out. “It has reduced cost and overall power consumption by two orders of magnitude.”

At the heart of Menlo’s technology is the DMS unit cell. “You can replicate this cell in just the same way as a transistor is replicated in the semiconductor industry, but not to the same extent.” The DMS cell is fabricated on a glass substrate and, according to Garcia, you can lay down as many switches as you like, then connect them in series or in parallel. Then dice can be linked in parallel for even higher capacity.

Now Menlo is sampling a six channel 100W device and will be unveiling in 2018 a single pole, double throw 25W switch with a frequency range of 3GHz on a glass substrate. Menlo Micro is fabricating a six channel 25W part with a frequency range of 3GHz on a glass substrate. 12GHz range. “The ability to have good linearity over a wide frequency range and switch a lot of power makes the switch a good enabler to modular and tuneable apps in the infrastructure and military radio sectors,” Garcia noted.

He has his eyes on the $5 billion RF switch market. “A good part of this is green field,” he said. “The apps are either using technology which is more than 30 years old or they’re brand new.”

Why Menlo devices? “A lot of companies have produced MEMS devices with good RF performance, but all have had reliability issues. Nobody has tried to do anything at the power levels which Menlo has and this means we can address apps where MEMS couldn’t have been thought about before,” Garcia concluded.

MEMS enables ‘hearables’

Technology showcase finalist Maven Machines is pushing a new device category – hearables. The devices are just like wearables, but provide audio feedback to the user. Craig Campbell, vp of marketing and business development said hearables are like a combination of Twitter and FitBit. “We take input from sensors, like FitBit, then generate lots of messages, like Twitter.”

One of the first markets which Maven has addressed is commercial transport, with the Co-Pilot. Based on a readily available headset, Co-Pilot takes advantage of MEMS technology to provide a safety system for truckers in the US and their employers.

Campbell said the device can detect whether the driver is getting tired before they know it, adding that it also guards against drivers texting while at the wheel. “Co-Pilot is a six degree of freedom device with accelerometers and gyro. We can tell when the driver is looking forward and when they aren’t moving enough – called ‘road hypnosis’. We can detect compound motions, such as the ‘down, up, down, up’ used when reading a text at the wheel. Drivers prefer this technology to cameras as it’s less invasive.”

Sensor data is analysed in the cloud, where machine learning systems provide insight on the data, which can include audio feedback to the driver.

While Co-Pilot needed three chips, Maven has taken advantage of new technology from Bosch to create the Maven Co-Pilot SE. “It put three chips into one, which allowed us to shrink the form factor,” Campbell said. And the SE has been designed by Maven.

But Maven is also looking at other sectors. “We’ve put sensors into injection moulding machines so the users can understand what the vibration means; does the device need maintenance, for example. But it’s not just about putting sensors on machines,” Campbell concluded, “we can also put them on things like screws to tell people what’s happening.”
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Like the technologies which sit upon them, printed circuit boards are getting smaller. While that has a positive outcome in terms of smaller products, there is a negative aspect. Increased component densities mean access to the pins on chips or the balls beneath them has become almost impossible. The ‘good old days’ of being able to attach probes to the pins emerging from a package have long since gone.

For the last few years, this has been more of a concern for those performing manufacturing or prototype test. A solution has been the development of so called boundary scan techniques, developed by the Joint Test Action Group (JTAG) and codified as IEEE1149 in the early 1990s. By creating a scan chain, the performance of many components on a PCB could be verified, as could the quality or otherwise of the solder connections. Inherent in the success of the JTAG scan chain is getting it right at the design stage.

According to Simon Payne, XJTAG’s CEO: “JTAG can do more than just provide test access; it can also be used for processor debug/emulation and programming. “JTAG is implemented in CPUs, programmable devices and the other ICs that typically form the heart of any electronic product; however, its potential is often overlooked. Until now, design tools didn’t include any way to verify the JTAG system at the design stage.”

Yet, despite the fact that JTAG has been around for many years – and XJTAG has been developing boundary scan based test products since 2003 – engineers are still finding problems because they make simple errors in their PCB designs. And XJTAG says these errors are avoidable.

Its solution is the XJTAG DFT Assistant, which it describes as a new tool that enables the early correction of design for test errors in PCB layouts. “For the first time,” Payne said, “engineering can validate proactively the test access to their designs from within their CAD application and before any hardware is produced, preventing costly respins and delays.”

So how was the need for DFT Assistant determined? He pointed out that XJTAG’s team interacts regularly with the design community. “In most situations, we only encounter designs at a point where it is already too late to fix any design problems without the client needing to respin the board.

“Seeing such a wide range of boards with varying quality of JTAG implementation gave insight into the needs of the electronics industry. It became obvious that none of the PCB design tools offered a way for PCB designers to check their JTAG implementation was connected and terminated correctly. This realisation resulted in the proposition of using some of XJTAG’s IP to provide a helpful extension plug in to the design tools, showing at the design stage the available test access to a PCB,” Payne explained.

What’s different about DFT...
“Boundary scan can add value from the beginning of the product lifecycle, and is becoming increasingly important to our customers.”

Jim Martens, product marketing manager with Mentor’s PADS Solutions Group, noted. “We saw the opportunity to enhance PADS Assistant is that has been made available as an extension to PCB design packages from four leading vendors – Altium, Cadence, Mentor Graphics and Zuken. Introduced in 2016, DFT Assistant has been made available free of charge, minimising the barriers to adoption.

“We saw that our customers could benefit from direct integration of JTAG in OrCAD Capture,” said Kishore Karnane, director of product management with Cadence OrCAD Solutions. “XJTAG was the ideal partner to help us achieve this, bringing its specialist knowledge and expertise in testability issues and design.”

The collaboration has resulted in XJTAG DFT Assistant for OrCAD Capture; a two part solution consisting of the XJTAG Chain Checker and the XJTAG Access Viewer. XJTAG Chain Checker is intended to identify common design issues, such as connection errors in the JTAG chain design or incorrect termination of signals at Test Access Ports. XJTAG Access Viewer, meanwhile, is designed to help the testability of designs to be assessed and to identify where coverage could be improved.

The extent of JTAG access is displayed as an overlay on the schematic diagram and a selection tool enables engineers to analyse specific areas of interest by displaying the test access to nets – read, write, power/ground or no access – individually or in groups using checkboxes. Nets are colour coded by JTAG access to aid inspection.

Karnane added: “XJTAG DFT Assistant enables us to deliver greater value for our customers by providing powerful testability analysis.”

Altium also saw the benefits of adding boundary scan chain verification to Altium Designer, its platform that supports the addition of supplemental functionality through approved third party extensions.

“By collaborating with XJTAG, we’ve been able to expand the value of the Altium Designer platform for our customers with the first-ever extension to verify boundary scan chain design and ensure DFT best practices are achieved,” said Daniel Fernsebner, Altium’s corporate director, technology partnerships and business development.

Mentor Graphics is another collaborator. “Boundary scan can add value from the beginning of the product lifecycle, and is becoming increasingly important to our customers,” Jim Martens, product marketing manager with Mentor’s PADS Solutions Group, noted. “We saw the opportunity to enhance PADS

Payne said the aim of releasing XJTAG DFT Assistant was to provide a tool to increase the number of board designs which could be testable, programmable or debuggable using JTAG. “The first objective was to collaborate with all of the leading PCB design tool providers in order to allow as many engineers as possible to benefit from the tool – this has been achieved.

“The second objective,” he added, “was to educate the market about the advantages of designing early for testability and the cost and time savings that can be achieved – this is ongoing.”

“The importance of this product, as the take-up shows, is that JTAG is moving from manufacturing into mainstream design and was a fundamental piece of the jigsaw missing until now. Engineers are not necessarily aware of how to design JTAG to give good signal integrity and this product allows engineers who are not experienced with JTAG to achieve a working design at their first attempt.”

Above: The XJTAG DFT Assistant provides powerful testability analysis.
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There is a tension that lies at the heart of the software defined network (SDN). Telecom and datacom operators have seized on it because the idea of software-based control makes everything more flexible and it is only natural that demand for more responsive communications services should push technology in that direction. But software that runs on general-purpose microprocessors lacks the efficiency of carefully tuned hardware. That is a major problem when the customers’ other demands are for networks simply to deliver data more quickly and cheaply.

George Hervey, principal architect at Marvell, says one of the biggest driving forces for network capacity is within and between data centres. The workloads they run make heavy use of virtual machines that hop from server to server, based on available capacity, and call on specialised accelerators to handle data analysis or machine learning jobs.

“We see a tremendous growth in distributed compute nodes that need to share information with each other through the network,” Hervey says. “People today think of networks being driven by more subscribers. The component of the growth that is usually left out is machine to machine. Distributed workloads are causing the growth. People don’t understand how big this is.

“The network is going to be all about speeds and feeds. The only way to handle this and not be overwhelmed completely is to have smart traffic engineering.”

Traffic engineering involves machines close to the network but not necessarily the switches themselves making high-level decisions about where streams of packets flow. Video from a server may take one route, while control packets take another that offers lower latency, but cannot handle high bandwidths. In many cases, this is achieved by setting up virtual overlay networks using protocols such as VXLAN or tunnels. In response, core network switches become more streamlined and make fewer policy-based decisions. “The networks themselves don’t need [microprocessor-level] intelligence for forwarding,” Hervey contends.

“Network processors just aren’t able to cope with the speeds and feeds. People are willing to give up the traditional value of network processors to offer more bandwidth and connectivity.”

Forwarding engines themselves do more than simple table lookups, Smart network interface cards from companies such as Netronome have converged on an architecture that is, effectively, a smarter network processor

Hervey says. The primary demand is for them to watch what passes through and relay that as telemetry information to the servers that decide how streams of packets should be routed.

“A lot of the applications being deployed in and outside the network are not being deployed in a traditional way. Operators need telemetry to understand how they are being deployed,” Hervey says. “There is a tremendous desire for knowledge and diagnostic ability. People want to know what’s going on in their network.”

Although they are now armed with more telemetry and other information from the network, the processors at the endpoints are struggling with the workload. This is leading to a further change in the balancing act between packet forwarders and processors. At the August 2017 Future:Net conference, organised by virtual machine specialist VMWare, Mellanox’ vice president of software architecture Dror Goldenberg explained the problem. A 200Gbit/s Ethernet switch needs to be able to parse, sort and forward some 16million maximum-sized frames a second. With much smaller 64byte
packets, that number balloons to almost 300m. With the larger packets, a processor in a software-only switch has just 65ns to deal with each one – enough time for five level-three cache accesses or a call to the operating system. “With 64-byte packets, you basically have budget for nothing,” he argues.

With today’s multicore processors, the ability to spread the workload out gives each processor core more time to do its job. But it imposes a heavy burden on servers expected to deal with the workload. Goldenberg says a software packet handler, such as Open vSwitch that runs on processors such as Intel Xeons, can consume half of the 16 cores of a high-end processor handling traffic at 10Gb/s. “When datarates go from 10 to 25 or 40 to 100 Gbit/s, the problem gets exacerbated. You end up losing almost all these cores,” he explains. In a data centre, ‘you’ve lost half of your compute, which is not acceptable’.

The answer being pursued by a number of silicon suppliers is to build smart network interface cards (smart-NICs) that can move workload back off the server processors. Although smart-NICs can be based on dedicated switch chips and FPGAs, suppliers ranging from Broadcom to Netronome have converged on an architecture that is, effectively, a smarter network processor. It has multicore processors that can run Linux, combined with a selection of accelerators for functions such as packet encryption and content-addressable memories to quickly find destination addresses.

“I believe network virtualisation is a killer app for smart-NICs, especially when you go to data rates beyond 10 Gbit/s,” says Sujal Das, chief strategy and marketing officer at Netronome.

The biggest problem facing smart-NIC builders is how they interact with the rest of the server. Only in a few cases will the smart-NIC offload all network processing from the Xeons on the main server blade. Some traffic will pass straight through the smart-NIC, but some packets need to be steered into the server for more extensive processing. This has subtle effects felt throughout the network.

Dejan Leskaroski, senior product manager for network virtualisation software specialist Affirmed Networks, explained at the OPNFV Summit in June that pushing some processing in smart-NICs makes it harder for the high-level services to see billing information. “We don’t see all the flows. And, with firewalls, how can a virtualised network function enforce policies when flows are bypassing it?”

The combination of software and hardware processing in smart-NICs brings problems of standardisation. The first wave of network function virtualisation software, based on projects such as ARM’s OpenDataPlane or Intel’s DPDK, focused on software that would be compiled onto CPUs. Those functions need to be translated into a mixture of microcode and register settings for network accelerators running alongside binaries for a Linux-compatible processor. Although server vendors and users could simply decide to standardise on a single vendor’s product line, this is not a popular option.

Broadcom distinguished engineer Fazil Osman believes: “When we talk to server vendors and ask what would make it easy for them to put in their systems, they want something that looks like a network device or storage device. The application doesn’t see it: it just sees it as an Ethernet device or a block device. The rest is done by an ecosystem of developers.”

The industry is struggling to find a standard that works across all forms of hardware. One possibility is to use a specialised language, such as P4 – a declarative language in the same vein as SQL, but for packet handling. Another is to use LLVM compiler technology to take applications written in a general-purpose language, such as C, and translate them on the target into binaries that can call on programmable hardware accelerators.

Das says: “I call it the Holy Grail of programming. You write code once and you don’t know where it’s running, it just runs in the right place.”

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You have a good idea. You think that with a bit of development work you will have something people will want to buy in large volume. So why not set up a company, do the development and make some money? After all, hasn’t Intel just paid a rumoured $300 million for Movidius and wouldn’t it be nice to get some of that money? As those at the GSA (Global Semiconductor Alliance) Entrepreneurship Conference 2017 learned it isn’t as simple as that, even for Movidius.

What we are looking at is two groups of people, those with ideas (potential entrepreneurs) and those with money (investors). Those with the money provide it to the idea people in the hope of, at some stage, to make a profit on their investment. The idea people are often driven by more complex motives. Making money may be one of them but underlying this is usually the need to “make a difference” by creating a new product or service. Alongside this there is frequently a frustration with the confines of a large company and the desire to show how things can be done better.

The classic model of a funded venture starts with seed funding to provide the money to demonstrate that an idea is feasible. This seed funding may be from an investor – perhaps a business angel. But it may also be from the founder/founders’ own resources, such as savings or family and friends. Once an idea is seen to be feasible, then R&D Capital takes the company forward to creating a product. Another funding round (Go-to-Market Capital) may be needed to get production up and running and after sales begin further Expansion Capital, can help build the company still further. At each funding round the investors will be buying shares, normally at a higher price per share, in the company, so the founders own percentage diminishes but its value may grow. At each stage investors will want re-assurance that the idea is in fact going to be a real product, through evidence such as customer orders, or at least very strong expressions of interest, and market numbers.

At some point the investors will want to see a return. This might be by floating the company on a stock market (an Initial Public Offering or IPO) or, more normally in technology, through acquisition by a large company.

The problem for technology companies, other than pure software companies, is that the amount of capital needed to demonstrate that the idea works is very large, particularly if it involves making a chip at an advanced process node. Investors will not be able to see...
comparative figures since the markets being addressed may not yet really exist. Customers are not going to express measurable interest until first silicon is available, and, even worse, even when you achieve a design win, the customer is going to have to complete the design and build a market before the win translates into volume shipments. Investors have to combine long term horizons and acceptance of high risk. In return, they will want much higher returns.

**Investor categories**

There are three major categories of investor. A business angel, is normally a wealthy individual whose role, as well as bringing very early stage money would normally include advice. Venture capital companies (VCs) are specialists in funding entrepreneurs, normally by managing funds provided to them by third parties. Strategic Investors are a relatively new phenomenon, and are funds from large companies used to invest in start-ups that might provide strategic technologies. Three such funds, from Infineon, Nokia and Bosch presented and they have very different objectives and work differently with their investments.

There is still a difference between US and European VCs, both in the way they think and also in the funds they have available. The differences in financial law means that in the US pension funds and university endowment funds are freer to invest in VC activity and are able to look at longer terms, in excess of ten years, for example.

Finally, here is a collection of advice from the speakers at this year’s GSA (Global Semiconductor Alliance) Entrepreneurship Conference, which included start-ups, VCs and strategic investors. While it is aimed at people building large companies, much of it is relevant if you are thinking of staying relatively small.

- Look to build a solid management team as early as possible. Initially it might be better to use external resources than appoint someone who will not be up to the job when the company gets bigger. Consider Personnel Management, Accounting, Marketing/Sales/Customer support, Operations, Technology, and Investor relations.
  - The founder may not be the best person to be the CEO.
  - Set up a strong board with, as non-executive directors, people who understand your market and technology, and listen to their advice.
  - Within the company, keep thinking lean: use one person where an established company may use four people.
  - Founders will have to work long hours for far longer and for less money than you might expect.
  - External events (such as the 2008 downturn) can have shattering impacts on your plan.
  - While investor bias against semiconductors has lessened, it is still present. The word solution is often overused marketing jargon but providing more than just a chip is increasingly vital for market acceptance.
  - Look carefully at markets, and

“The problem for technology start-ups is that the amount of capital required to demonstrate the idea works is very large.”

- Focus on some strategic targets. Continue to do this and monitor emerging markets. Movidius was saved by a customer working in a market (small non-military drones) which didn’t really exist when the company was founded.
  - Look particularly at markets undergoing disruption which you can leverage to your advantage. Kalray, a French developer of manycore processors (first device with 288 cores) originally saw themselves as serving many markets but currently has focused on data centres where, as solid-state storage is replacing rotating disks, there is a need for very high-performance processing, and autonomous vehicles.
  - Try to stay with initial, non-dilutive, funding (i.e. funding that lets founder retain more shares) for as long as possible. Also make sure that other members of the company will share in the success.
  - When seeking funding, aim to build a strong syndicate of investors who can carry your company forward.
  - The exit horizon of the investors is important – find those who have patience.
  - Strategic investors can be a very valuable resource, but you will want to think carefully about those who invest for longer term acquisition. In an ideal world having two or more strategic investors would be optimal.
  - Look internationally as early as possible. Silicon Valley has both investors and customers and so does, increasingly, China. You have to be there to get to know them.
  - Don’t call yourself an IoT company.

The European investment world is changing and there are investors who understand technology. XMOS has had long term support, and there has been significant funding for companies like Graphcore and Ultrahaptics in the UK.

So maybe you should dust off that great idea, prepare for a number of years hard slog, and make a difference.
Call James Creber on 01322 221144

AEC-Q101 Trench 9 MOSFETs

AEC-Q101 Trench 9 MOSFETs in robust packages from Nexperia save space, deliver high performance and ruggedness

Superjunction MOSFETs in LFPAK56/56E packaging reduce RoS(on) by up to 30% with the world’s largest range of automotive-qualified Power SO8 MOSFETs now wider

Nexperia, the former Standard Products division of NXP, today announces a new series of Trench Power MOSFETs, targeted primarily at the automotive industry, which combine the company’s low voltage superjunction technology with its advanced packaging capability to deliver high performance and ruggedness. Five years ago, the company introduced the world’s largest range of automotive-qualified Power SO8 MOSFETs. Now Nexperia is expanding this portfolio to include ultra-low RoS(on) parts that address the ever-increasing demand for higher power density in many typical automotive applications.

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HDMI/Raspberry Pi TFT Displays

Winstar HDMI Displays

Winstar HDMI Displays are designed to work with Raspberry Pi or an embedded system and single board computers with HDMI output.

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Nexperia extends its leadership

Nexperia extends its leadership with the launch of 80 V Automotive LFPAK56 dual Power SO8 MOSFETs for ultimate space efficiency

Industry’s widest portfolio of devices offered by Nexperia

Nexperia, the former Standard Products division of NXP, today announced a new range of 80 V dual Power SO8 MOSFETs in the popular LFPAK56 package. With the addition of this new 80 V range of MOSFETs Nexperia now offers the industry’s most comprehensive portfolio of devices, ranging from 30 V to 100 V LFPAK56 is fully automotive qualified to AEC-Q101 and has a proven track record for quality and reliability. The LFPAK56 copper clip gallium wing package technology offers exceptional board level reliability in thermally demanding applications such as engine management, transmission control and ABS systems.

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ECP5 FPGA Enables Ximmerse Tracking Platform

Lattice’s Low Power, Small Form Factor ECP5 FPGA Enables Ximmerse VR/AR Tracking Platform

Lattice FPGA Technology Provides Low Latency Visual Computing Needed for Inside-out, Outside-In Tracking for Processing at the Edge

Lattice Semiconductor Corporation (NASDAQ: LSCC), the leading provider of customizable smart connectivity solutions, today announced that Guangdong Virtual Reality Technology Co., Ltd (Ximmerse), a provider of interaction systems for mobile AR/VR applications, has selected Lattice’s ECP5® FPGA to perform stereo vision computing in their AR/VR tracking platform. Lattice’s market-leading ECP5 FPGAs are ideal for flexible connectivity and acceleration at the edge due to their low power, small form factor and low cost, delivering an energy-efficient, low latency solution.

As the market need for AR/VR environments continues to grow, current head mounted display (HMD) based systems witness performance issues running content on mobile applications processors [APs].

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Mouser Electronics

Mouser Electronics Sponsors CLIK Lab Hackathon at Polytechnic University of Turin

Mouser Electronics, the global authorized distributor with the newest semiconductors and electronic components, is sponsoring the Create the Polito Virtual Butler Hackathon Challenge at the 2nd grand opening of the Contamination Lab & Innovation Kitchen (CLIK) Lab at the Politecnico di Torino. The CLIK Lab is designed to help students of the prestigious Italian engineering university realize and accelerate new projects and innovative ideas.

The Politecnico di Torino will inaugurate the new CLIK Lab by hosting a two-day hackathon that tasks participants with creating voice-controlled home automation solutions. Teams will design and produce a virtual lab assistant based on the Raspberry Pi 3 single-board computer provided by Mouser Electronics. The virtual assistant designs will perform actions such as controlling video recording, managing automation in the lab, and any other tasks students can devise. Mouser will select the most impressive projects to exhibit at Maker Faire Rome, Dec. 1 through 3.

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OMC expands into new manufacturing facility

OMC expands into new manufacturing facility to meet increased demand for innovative opto solutions

Fibre optics & backlights pioneer responds to sustained growth

OMC, the pioneer in optoelectronics manufacturing, has completed its move into a new, purpose-built manufacturing facility, reflecting an increase in demand for both its bespoke and off-the-shelf optoelectronic solutions. The company, known for its LED and fibre-optic expertise as “the problem solvers” has seen significant growth in two areas, customer-specific LED backlighting for LCD displays, and fibre optic cable assemblies, transmitters and receivers for use in industrial applications. The move into a state-of-the-art new facility will, they say, enable the company to support this growth and develop new solutions.

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Power Integrations Launches InnoSwitch3

Power Integrations Launches InnoSwitch3, a 94% Efficient Offline Flyback Switcher IC Family

New InnoSwitch™3 integrated switcher ICs cut losses by 25%, deliver constant efficiency over a wide range of load conditions

Power Integrations (Nasdaq: POWH), the leader in high-voltage integrated circuits for energy-efficient power conversion, today announced the release of its InnoSwitch™3 family of offline CV/CC flyback switcher ICs. The new devices achieve up to 94% efficiency across line and load conditions, slashing power supply losses by a further 25% and enabling the development of compact power supplies up to 65 W with heatsinks. InnoSwitch3 devices are ideal for power supplies with challenging energy consumption, footprint or thermal constraints, particularly those targeting mandatory Total Energy Consumption (TEC) specifications.

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TTL Inc. awarded JOSCAR accreditation

TTL Inc. awarded JOSCAR accreditation at DSEI

Participation in industry initiative for aerospace, security and defence sector saves time, costs and resources

TTL Inc., a world leading specialist distributor of electronic components, announces that it has been awarded JOSCAR accreditation and received its formal registration yesterday at DSEI in London, on the opening day of the world’s leading defence and security exhibition. JOSCAR is the new accreditation system for the aerospace, defence and security sectors, and is a cross-industry collaboration initiative that reduces the time, costs, resources and duplication needed when providing information to major customers. JOSCAR holds common supplier data in a central system, and enables information to be accessed by all participating buying organisations.

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