newelectronics

28 July 2020

OUR CITIES TRANSFORMED

Could Covid-19 be a 'trigger moment', accelerating the digitalisation of our cities as we look to contain, monitor and suppress the pandemic?

New Electronics' weekly eZine features the latest blogs, news, articles and more. To register for your copy, go to www.newelectronics.co.uk

CONTENTS **VOL 53** NO 13

20

24

12

26

29

MISSION STATEMENT
'New Electronics keeps designers and managers abreast of the latest developments in the world's fastest moving industry'

The end of the saga, or is it?

IS THE BRITISH GOVERNMENT'S DECISION TO BAN HUAWEI FROM THE UK'S 5G NETWORK GOING TO BE ITS FINAL WORD ON THE MATTER?

E arlier this month the UK government unveiled a significant u-turn when it announced that Huawei was to be stripped out of Britain's 5G phone network by 2027.

According to Oliver Dowden, the UK culture secretary, no new Huawei 5G kit will be bought after 31 December this year and the UK was now on an "irreversible path" to eliminating "high-risk vendors" by the time of the next general election in 2024.

The government had said that Huawei would be able to supply 35% of the UK's 5G equipment now, due to new US sanctions forbidding the sale of US-produced components to Huawei, the Chinese company is going to have to source components from elsewhere. The uncertainty around this new supply chain has meant that the UK can no longer be confident it will be able to guarantee the security of future Huawei 5G equipment – hence its decision.

Dowden admitted that these changes would mean, "a cumulative delay to 5G roll out of two to three years and cost up to £2bn", as well as putting pay to Boris Johnson's manifesto commitment to supply superfast broadband to every home and business by 2025.

While both BT and Vodafone have warned about the costs of banning Huawei from the UK's network, they may not be as significant as they would have us believe. Costs have not jumped, or investment fallen, in Denmark or Norway where operators have chosen to replace Huawei with Ericsson.

In truth, the decision has been determined by the geopolitical tensions between the US and China. President Trump has even taken credit for the decision while US secretary of state, Mike Pompeo, has praised the UK government's decision.

But has this actually drawn a line under this saga?

According to various sources, the British government has privately told Huawei that while geopolitics had played a part in its decision, it appears to have given the company the impression that it was possible that the decision could be revisited in the future, especially if Trump is defeated in the upcoming US Presidential elections and Washington then eases back on its anti-China rhetoric.

Huawei executives have said that they are hopeful that the British government will rethink its decision, apparently encouraged by these back-channel contacts.

While China has certainly changed for the worst in the past few years in terms of human rights and its recent actions in Hong Kong have raised concerns, talk of our relationship with this economic giant being 'irrevocably changed' is a little wide of the mark.

China remains a key driver of economic growth, and while security should be our number one priority, any decision taken for geopolitical reasons and one that doesn't consider the broader economic costs to the UK, is one that could end up being reversed.

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

> "While both BT and Vodafone have warned about the costs of banning Huawei from the UK's network, they may not be as significant as they would have us believe."

MediaTek unveils 5G SoC

THE COMPANY'S LATEST 5G SOC, THE DIMENSITY 720, WILL PROVIDE MID-TIER SMARTPHONES WITH A 5G EXPERIENCE. **NEIL TYLER** REPORTS

MediaTek has launched the Dimensity 720, a 5G SoC designed to give consumers access to premium 5G experiences but on mid-tier smartphones.

The Dimensity 720 is part of MediaTek's 5G chipset family that includes a range of chipsets from the Dimensity 1000 for flagship 5G smartphones to the Dimensity 800 and 700 series for more accessible 5G mid-tier devices.

"The Dimensity 720 sets a new standard, delivering feature-packed 5G experiences and technology to devices that are more accessible to mass market consumers," said Dr. Yenchi Lee, Deputy General Manager, Wireless Communications Business Unit, MediaTek.

"This chip is highly power-efficient, has impressive performance and advanced display and imaging technologies. All of that combined will help brands usher in differentiated 5G devices for consumers around the globe."

The 7nm Dimensity 720 SoC has been integrated with the most power-efficient 5G modem in its class and uses MediaTek's 5G UltraSave technology, which uses both network and content awareness intelligence, to manage the modem's operating mode in real-time so as to extend battery life. The chipset also integrates multimedia, connectivity and imaging features for an improved user experience.

The Dimensity 720 provides devices with the power needed to run the latest AI applications while two Arm Cortex-A76 big cores operating at 2GHz in the octa-core CPU, means that the chipset is able to improve the responsiveness of applications. The Dimensity 720 also includes an Arm Mali G57 class GPU, fast LPDDR4X memory and universal flash storage (UFS) 2.2 for fast read/write speeds.

The chipset supports the latest connectivity technologies including two carrier aggregation (2CC CA), Voice over New Radio (VoNR) and 5G and 4G dual SIM, dual standby (DSDS) to provide users with the best possible connection.

The chipset also supports both standalone (SA) and non-standalone (NSA) sub-6GHz networks and has been designed for global sub-6GHz 5G networks in Asia, North America and Europe.

Complex challenges face **5G smartphone manufacturers**

Teardowns, conducted on behalf of ABI Research, have found that manufacturers of the latest 5G smartphones are moving to a full level integrated modem-RF system design.

"The 5G smartphone market is set to rapidly expand, with many mobile vendors looking to quickly develop their 5G portfolios. However, a host of extremely complex challenges lie ahead for smartphone vendors," said David McQueen, Research Director at ABI Research.

The move to 5G requires an integration of the entire 5G cellular system design into OEMs' devices, from modem-to-antenna, addressing all aspects of end-to-end performance. This complexity includes the integration and deployment of new 5G modem and RFFE components, features, and functionalities, leading to substantial changes in the design of mobile devices.

"Smartphone OEMs are finding this change particularly challenging, as it makes their RFFE component procurement process and system design far more complex than ever. Unless adequately addressed, OEMs could face lengthy product development cycles, more expensive devices, and huge constraints on device industrial designs," McQueen explained.

In order to address demand OEMs will have to rationalise modem-RF system procurement to a handful of suppliers, and will need to select the 'right partner'.

The teardowns have shown that several OEMs are moving away from RF component assembly and adopting 5G design from modem-to-antenna.

"Qualcomm is currently the only company supplying products with end-to-end performance in fully integrated system designs," said McQueen. "However, third party modem-RF system design will become a mainstream approach, and this will influence decision-making across all technologies. Qualcomm is likely to be joined by others IF they can offer such turnkey solutions."

'Smallest' Point of Load DC-DC converter solutions

Dialog Semiconductor, working in collaboration with TDK, has brought together its GreenPAK technology with TDK's latest µPOL power solutions to create what it claims is the world's first single-integrated system power sequencing solution.

By combining Dialog's scalable, flexible GreenPAK technology with TDK's high-density power module solution it's been possible to reduce the number of required components creating a more compact, reliable, robust solution for powering advanced industrial applications.

With Dialog's GreenPAK technology it's possible to reduce production lead times expediting the development of complex system boards. The µPOL solution leverages advanced technology packaging techniques to enable cohesive 3D system integration in a smaller size and lower profile.

This integration allows TDK to deliver higher power density and ease of use at a lower total system cost compared to what is currently available today.

"By working alongside TDK, we combined the flexibility, programmability and scalability of our GreenPAK technology with the industry's most compact and highest power density point-of-load solutions from TDK into a single chipset," said Davin Lee SVP & General Manager, Advanced Mixed-Signal Business Group at Dialog Semiconductor. "The result is a fully integrated, reliable system that is more cost- and power-efficient than current market offerings for power sequencing."

Phase change material breakthrough

SCIENTISTS DEMONSTRATE A NEW MATERIAL FAMILY THAT COULD REVOLUTIONISE OPTICAL CIRCUITS. **NEIL TYLER** REPORTS

University of Southampton researchers have demonstrated a new material family that is expected to help revolutionise the development of optical circuits, replacing parts of traditional electronic hardware.

The materials that have been developed to allow rapid reversible switching between two states, known as phase change, has previously been limited to electronic circuits because standard commercially available materials tend to suffer from large optical losses.

Scientists from the university's Quantum, Light and Matter group and Optoelectronics Research Centre (ORC) have designed the phase change materials to exhibit no loss of light at telecommunication wavelengths and can be switched with very low power.

The technology is compatible with existing silicon photonic circuits and opens the door for more advanced applications.

Dr Matthew Delaney and Dr Ioannis Zeimpekis pinpointed the material structure and composition to enable high transparency while exhibiting low power modulation of light and found that the new composition has 100 times less loss than the current state-of-the-art optical materials.

Their material was deposited on top of optical chips, where a short laser pulse was used to crystalize the material and change the phase of the guided light. Importantly, the material remembers its last state without any applied signals, leading to large potential power savings.

Professor Otto Muskens, Head of the Integrated Nanophotonics group, said, "This new technology will simplify and enable newly emerging applications such as solid-state LiDAR, quantum and neuromorphic computing that are currently limited by the performance of the existing materials.

"Neuromorphic and programmable photonics are set to revolutionise the industry as they offer new paradigms for data processing going far beyond existing hardware. Quantum optical circuits are on the horizon and ultralow loss components are needed to make the next step in controlling and routing quantum information."

Professor Dan Hewak, ORC co-author said, "This is a significant breakthrough for optoelectronics. Our team has now demonstrated a material which bridges the gap between electronics and photonics and we expect to see further advances resulting from their discovery."

Synaptics to acquire DisplayLink

Coming fast on the heels of its acquisition of Broadcom's Wi-Fi and Bluetooth technology, Synaptics has announced that it is to acquire DisplayLink, a specialist in high-performance video compression technology, for $305 million.

DisplayLink's high performance software compression technology enables universal docking and casting of high bandwidth video from any device to any display using any transport medium such as USB, Ethernet or Wi-Fi. For the Enterprise IT market, the solution supports multi-OS environments including Windows, MacOS, ChromeOS and Ubuntu Linux enabling a myriad of devices to seamlessly dock to multiple high resolution (4K, 8K) displays.

"Several market trends such as work from home (WFH), bring your own device (BYOD) and office hoteling coupled with the growing need for multiple, high resolution displays in enterprises are driving demand for universal docking and casting solutions," said Michael Hurlston, President and CEO of Synaptics.

The DisplayLink acquisition will help to accelerate Synaptics' long-term IoT diversification strategy, delivering solutions that drive up to four 4K displays, adds support for emerging 8K/10K displays and the upcoming USB4 standard, and uniquely enables high-performance, dynamic wireless video docking and casting.

Commenting Graham O'Keeffe, CEO of DisplayLink said, "Our video compression technology is the perfect complement to Synaptics' current product portfolio, and the combination of our engineering teams will be able to address both existing opportunities and exciting new use cases."

Faraday unveils Ariel SoC Platform

FARADAY TECHNOLOGY LAUNCHES THE ARIEL IOT SOC DEVELOPMENT PLATFORM. **NEIL TYLER** REPORTS

Faraday Technology, an ASIC design service and IP provider, has launched Ariel, its next generation IoT SoC development platform.

Built on UMC's 40uLP logic process and combined with Infineon's SONOS eFlash technology the platform, when compared with its predecessor, the 55nm Uranus+ platform, demonstrates a 35% reduction in operating power, cutting power consumption levels in SoC designs for use in AIoT, IIoT, smart grid, wearable, and portable devices.

The Ariel platform features a Cortex-M4 core, 1MB embedded flash, USB OTG, 12-bit ADC, 10-bit DAC, built-in security, and comprehensive SDK support. In addition, DVFS management is implemented for the trade-off between low power and high performance; low-power IP solutions have also been adopted to achieve the ultra-low-power requirements of embedded system applications.

By leveraging the advantages of Infineon's SONOS eFlash, both wafer cost and manufacturing cycle times will benefit from far fewer additional mask layers when compared to other eFlash solutions.

"We are pleased to work with Faraday and offer our SONOS eFlash for its Ariel SoC platform," said Sam Geha, Head of Infineon Technologies LLC Memory Solutions. "The 40uLP SONOS process has already delivered abundant mass-production projects. We believe it will also facilitate Faraday's customers to develop a wide range of IoT and MCU related products with superior processing performance and faster time-to-market benefits."

"Infineon's SONOS provides an easy approach for embedded flash memory with cost-effective advantages," said Flash Lin, chief operating officer of Faraday. "Our customers will benefit from an advanced solution to achieve ultra-low-power and high-performance needs for their next-generation IoT SoC designs."

Mouser partners with Central Research Laboratory

Mouser Electronics has entered into a partnership agreement with the Central Research Laboratory (CRL) that is intended to accelerate the growth and learning of product makers and start-ups in the United Kingdom.

Based in Hayes, northwest London, CRL is the UK's first purpose-built hardware accelerator programme and is currently working with its 7th cohort of members. Applicants who are accepted into the programme are based at the CRL for an intensive, hands-on, six month programme focused on product development, commercial strategy and investor readiness.

Mouser will provide the start-ups with design tools and resources, enabling them to access the latest technology, and connecting them with an extensive network of supplier technical experts. Additionally, Mouser will also provide specific technological insights through open events and workshops, including CRL's Demo Day in November, which provides an opportunity for applicants in each cohort to pitch and demonstrate their inventions to potential investors and partners.

CRL supports entrepreneurs from concept development through to prototyping and first batch production and scaling up for commercial orders.

"Many of our start-ups rely on Mouser for components as they develop their prototypes and products, and we're thrilled to be working with them in this new partnership to bring even more support to the innovators and inventors we support," said Toby Kress, Managing Director of the CRL.

Mentor streamlines IC circuit verification

Mentor, a Siemens business, has announced the extension of its powerful Calibre Recon technology to the Calibre nmLVS circuit verification platform.

Introduced last year as an extension to Mentor's Calibre nmDRC suite, the Calibre Recon technology enables customers to rapidly, automatically and accurately analyse IC designs for errors during early-stage verification design iterations, enabling significantly shortened design cycles and faster time to market.

The Calibre nmLVS-Recon solution speeds overall circuit verification turnaround time by helping system-on-chip (SoC) engineers, circuit designers, and IC circuit verification teams identify and resolve selected systemic errors early in the development phase.

These types of violations can consume valuable compute resources and potentially generate millions of error results, many of which are due solely to the incomplete status of the design.

Early adopter customers leveraging the Calibre nmLVS-Recon solution are said to have realised more than 10x runtime improvements and 3x less memory requirements when analysing early-stage designs.

The Calibre nmLVS-Recon technology is based on a flexible configuration framework that enables multiple use models, allowing design teams to select and analyse specific classes of circuit verification issues.

The tool features automated, intelligent execution heuristics engineered to help users seamlessly navigate between a complete Calibre nmLVS signoff flow and Calibre Recon selected circuit verification checks.

With advanced options for data partitioning, design breakdown, data reuse, task distribution, and error management, the Calibre nmLVS-Recon flow can be used with any foundry/integrated device manufacturer's (IDM) Calibre sign-off design kit "as is", and on any process technology node.

The Calibre nmLVS-Recon initial offering will be available to the market with the Calibre family release in summer 2020, with planned additional capabilities in later releases.

Managing the supply chain post-Brexit

COULD THE IOT HELP COMPANIES BETTER PREPARE FOR THE CHALLENGES ASSOCIATED WITH BREXIT? **TOM HOLLAND** TALKS TO NEW ELECTRONICS.

With the launch of the UK government's information campaign urging businesses to prepare for the Brexit transition next year, significant changes and opportunities can be expected.

One key issue in a post-Brexit world, will be the risks of border crossing delays between the United Kingdom and the EU. Businesses, according to Tom Holland, Territory Sales Manager, UK and Ireland at Sigfox, need to act now to prepare and to strengthen supply chain visibility.

On 1 January 2021, the UK will have a new relationship with the EU and with the clock running down, the most likely outcome is that the UK will not enter into a new free trade arrangement with the EU.

"The UK is already behind in its preparations and this is where greater visibility of the supply chain is a must to ensure a smoother transition," explains Holland.

Critics of the UK government suggest that it has been showing 'wilful ignorance' and is ill-prepared to operate a functioning customs border.

"We didn't have enough time to put in place the infrastructure, people, and systems we needed before COVID-19 [and] we certainly don't now," said one.

So new trade barriers are likely and for businesses this will present a number of new challenges.

"Those barriers could take many forms, such as divergence of regulations, introduction of tariffs, or goods quotas. What is clear is that with the introduction of new trade barriers, the risk of delays in moving goods across the border in either direction increases significantly," says Holland.

The impact of border crossing delays will vary from industry to industry. Industries that utilise just-in-time manufacturing processes, and industries that trade in perishable goods such as food and medicine, are likely to feel the effects of border crossing delays more than most.

> "The disruption to cross border supply chains that Brexit may bring, means that businesses will need to be on-board, and up-to-speed in order to maintain competitive advantage."
>
> Tom Holland

The options available to businesses will depend on the type of cross-border trade, according to Holland. "How can they prepare for those delays? Invest in new facilities to stockpile? Plan alternative supply routes if primary routes become congested? Identify possible local supply alternatives? Renegotiate contracts to make special provisions for border delays? Build contingencies into to the supply chain?"

What cuts through all of those options is a need for greater visibility and greater access to data. To mitigate border crossing delays, businesses need real time visibility of those delays to inform their contingency plans.

"Lack of end-to-end visibility of the supply chain is not just a Brexit issue though; it is arguably the greatest challenge facing enterprise supply chains in 2020," says Holland. "We need to move to an efficient and optimised, data-driven approach, when it comes to trade."

Can the IoT help?

The Internet of Things (IoT) has the unique ability to capture vast amounts of extremely valuable data, helping businesses better understand the behaviour of people, environments and assets to give a real-time holistic view of the entire supply network says Holland.

"By implementing connected devices across the supply chain, businesses could gain a vast array of data that not only can give them real-time data on border crossing delays and the impact to the supply chain, but could fulfil regulatory requirements, and offer granular insights into the efficiency and real time operation of their networks.

"The possibilities with regards to the data that IoT can extract are vast; businesses can gain additional data and insight of routes travelled, warehouse delays, monitoring of goods in transit, and even the ability to expedite customs requirements by verifying the provenance and authenticity of goods, or by confirming that a container hasn't been opened or modified from the time it was packed."

According to Holland, customers are already reaping the benefits of the IoT and the connectivity provided by platforms like Sigfox.

"For example, real-time alerts about delays and transport conditions has enabled Michelin to reduce transit stock by 10%, increase Estimated Time of Arrival (ETA) by 40% and reduce Out of Stock (OOS) situations due to exceptional circumstances by a quarter.

"We are seeing increasing interest across geographical locations, including the UK, via our secure sensor network operator, WND UK. We are also seeing an upsurge of demand across Europe, especially among those nations trading with the UK."

This tide of innovation is beginning to deliver measurable results, suggests Holland.

"Deutsche Post DHL Group has outfitted about 250,000 DHL roll cages with Sigfox smart trackers giving it powerful levels of visibility of the essential and valuable roll cages which are used to transport large volumes of parcels."

The IoT is gradually beginning to transform and digitise the global supply chain, providing companies with unprecedented visibility into their own operations.

"The accelerating pace of change, and the uncertainty and potential disruption to cross border supply chains that Brexit may bring, means that businesses will increasingly need to be on-board, and up-to-speed in order to maintain competitive advantage," says Holland.

"Just a few years ago, full supply chain visibility was just a pipedream – now it is a rapidly approaching business fact."

OUR CITIES TRANSFORMED

A ccording to research conducted by Grand View Research two years ago, the global market size of smart cities was expected to reach $2.6tn by 2025.

Today, the disruption caused by Covid-19 is expected, albeit temporarily, to have slowed or curtailed many smart city development plans, but in the longer term growth is expected to return and accelerate. In many respects, the pandemic has seen the use of technology grow as cities have sought to contain, monitor and suppress the pandemic with a myriad of new applications and solutions.

Covid-19 is driving the need for greater urban resilience and is seen as having actually boosted digital transformation strategy agendas, despite much of what has been done being improvised and decisions having to be taken 'on-the-fly'.

According to Dominique Bonte, vice president, end markets, at ABI Research, this has resulted in a rich "laboratory type learning experience," as smart technologies have been deployed across cities.

According to Bonte, we can

Could Covid-19 be a 'trigger moment', accelerating the digitalisation of our cities as we look to contain, monitor and suppress the pandemic? By **Neil Tyler**

expect to see drones being used for communication and enforcement of social distancing rules, as well as for the delivery of supplies; the appearance of new and different forms of surveillance; the growing use of autonomous freight as well as the deployment of real-time dashboards and data sharing to deliver tracking solutions.

The pandemic has triggered a massive uptake in e-government services, e-health, remote working, online education, and e-commerce, all of which will have an impact on how cities operate and how we, as individuals, engage with them.

Normally bustling cosmopolitan hubs, cities have been hit hard by Covid-19 and many urban planners now think that there will need to be a major rethink on how cities operate.

Many believe that the pandemic will help to transform how technology is used in smart cities and accelerate

"It's no secret that organisations across all industries have changed their working practices in response to Covid-19. The one factor that connects them all is the rapid acceleration of digital transformation."
Jamie Hayes

current trends.

"It's no secret that organisations across all industries have changed their working practices in response to Covid-19. We've witnessed companies being inventive in a variety of ways, but one factor that connects them all is the rapid acceleration of digital transformation," suggests Jamie Hayes, Mobile Network Operators Director at BT Wholesale.

"If you take the NHS, for example, it has undergone years of transformation in the space of a few months. City councils that are ultimately in charge of seeing the delivery of the smart city vision have been exposed to this increase in digital transformation too – they will have been connecting, for example, with co-workers with new remote working tools. Therefore, it wouldn't be surprising if we see smart city timelines bought forward because we know how quickly we can embrace

new technology."

Smart cities have also been actively helping to control the pandemic, according to Hayes, and in places like Seattle and Hong Kong, thermal imaging, body scanners, and infra-red CCTV have all been added to control population risks and to help local governments contain further outbreaks.

"What the world needs is more insight," suggests Alistair Fulton, General Manager, Wireless (LoRa) & Sensing Business at Semtech."We need to better understand what's going on for a number of different reasons. We need to improve the efficiency of processes and there's a need to drive more efficient consumption.

"What that boils down to is how to get more from less, whether the less is energy, chemicals, water or whatever. Investment is often triggered by adversity."

Another trigger, according to Fulton is social or societal needs. "By any measure Covid-19 has been a unique experience with a host of consequences," he argues. "We will need more data and information about how people behave and where they are and how they're interacting with one another. Because if we don't have that information, then we can't help people do what we know works i.e. social distancing."

Many see parallels with the 2008 global financial crisis, which helped to propel the first global wave of smart city projects.

"Then an economic crash and government budget shortfalls created an impetus for cities to collaborate with technology firms to address urban problems and generate new sources of revenue," says Fulton. "Covid-19 will prove, like the financial crisis of ten years ago, to be a trigger moment. The next stage of the pandemic will be a massive economic shock that will, in turn, force companies and organisations to engage and embrace technology."

Collective intelligence

Damien Stephens, Associate Vice President, Mobility & IoT, Tata Communications agrees. "The pandemic has given a much required boost to connected technologies. Along with collaboration solutions that enable remote operations, sensors and IoT-enabled devices are playing a critical role in ensuring minimal human-touch during current times."

He suggests that Covid-19 has had, and will continue to have, a significant short-term negative impact on the development of some shared mobility services.

"Smart services such as ride-hailing solutions have been impacted by the lockdowns imposed in most countries. But there are moves to change this impact. Digital technologies have already begun creating solutions to the challenges that public transport faces due to Covid-19. For instance, with smart technologies public transport providers will be able to monitor how crowded services are, and suggest alternate routes for commuters looking to avoid busy services. IoT and connectivity will play a crucial role in reassuring citizens that public transport is safe to use."

The ability to monitor, maintain, and update equipment remotely has also become more important, as in some cases companies do not want to deploy their engineers to attend remote sites.

"The move to a remote service model, to reduce human-human contact, will most likely also be seen in the key use cases of public safety and emergency response, traffic management, smart lighting, parking, and waste management along with preventive and remote health and smart utility," he suggests.

"A truly smart city gives you a constant stream of information, meaning councils can make more effective, data-driven decisions. It helps you monitor resources, therefore saving time and money

"The 2008 economic crash and government budget shortfalls created an impetus for cities to collaborate with technology firms to address urban problems and generate new sources of revenue."
Alistair Fulton

in the long run," says Hayes. "The benefit of a smart city is that you can address the needs of each individual place efficiently, whether it be forecasting and planning for population expansion or identifying high-risk areas where there needs to be a greater police presence, for example."

At the heart of a smart city's management infrastructure is a control centre connected to digital data sources such as video cameras, personal healthcare monitors, traffic flow sensors, fire and intruder alarms, flood and pollution sensors and the like

"This allows people running the city to make swift, intelligence-based decisions, helping them respond to what's going on and to anticipate events before they happen," explains Hayes.

He suggests that surveillance infrastructure is the foundation of a smart environment, with the camera, as the smartest sensor, at its core.

"5G technologies will help make smart cities a reality, providing greater coverage and meeting public demands for higher speeds and greater bandwidth. Small Cells will play a key part in supplying high bandwidth and low latency connectivity for smart city deployment, especially in the 5G era which we are now entering.

"To provide seamless coverage and installation of Small Cells, operators and telecom equipment providers will need to cooperate with each other in an efficient way. Harmonised management and governance with each other will need to be in place to ensure the smooth rollout of network operations."

Collective intelligence will also enable better collaboration between cities and it's likely we will see networks of 'intelligent cities' pooling knowledge and resources going forward, especially when it comes to delivering effective real-time pandemic responses.

Critical to that type of response will be location data, such as 'Track & Trace', particularly from mobile devices, and that can be achieved in one of three ways: mobile network location using Cell ID and signal strength (with the help of the mobile network operator); satellite positioning; and known Wi-Fi access points.

Proximity device identification can then be achieved using the detection of identifiers of other devices close by via Bluetooth ID or Wi-Fi ID media access control address (MAC address), for example.

"Technologies like Apple AirDrop – which use device identification and local area network scanning – could be employed to discover neighbouring devices, showing other devices connected to the same Wi-Fi access point as an example," explains Dr Janko Mrsic-Flogel, CEO of Private Planet and Planet Computers.

"A typical 'Track and Trace' scenario would involve a device passing location information, timestamp, and its device identifiers to a centralised service continuously. This would, however, equate to a vast amount of information about nearly everyone in the world; everyone's locations and patterns of movement throughout the day, weeks and months would be collated. As a result, privacy is a big concern," adds the doctor.

Hayes, however, argues that all new 'paradigm shifts' generate barriers to entry.

"Security is just one barrier. The fact is smart cities are just an extension of the use of data that we freely share today. In most use cases, this data is stored and federated, but not integrated into a business eco system. It's not necessarily about what data is collected, but how it is used. Privacy has to be respected and it will be up to local governments to work closely with providers to make sure that happens."

Data collection

'Track & Trace' forms just a part of the data that will also be collected through thousands of touchpoints that citizens will come into contact with every day in the smart city, whether through smart parking meters or office space management.

Each IoT device that's integrated into a smart city will collect data which will inform usage and help optimise services for citizens.

"If analysed regularly and accurately, data could offer insights on a city's strengths and weaknesses helping to inform decision making that can help create a balanced city system," explains Stephens.

When it comes to delivering data greater connectivity will be required and one of the biggest barriers that many cities face, especially in the west, is that many services are comprised of a mixture of old and modern infrastructure.

"Most cities already have significant communications network access capability, so the challenge is how to marry the existing infrastructure with applications and devices to help monitor and manage the core concepts of smart cities," explains Stephens.

"Cellular technology should work in conjunction with other connectivity options, including LP-WAN and Wi-Fi, to deliver the multi-bearer connectivity requirements needed to manage

"Cellular technology should work in conjunction with other connectivity options, including LP-WAN and Wi-Fi, to deliver the multi-bearer connectivity requirements needed to manage smart city projects."
Damien Stephens

smart city projects."

The key question is whether the various parties involved operate in silos or whether a tighter form of integration and orchestration is required.

So how do we integrate solutions, especially at a time when we are seeing a vast array of uncoordinated, localised and improvised collective intelligence responses emerging at the city level?

"In terms of the way that smart city applications and device connectivity is provided, whether via cellular, LP-WAN, or Wi-Fi, the need is for more integration and the use of devices that are capable of multi bearer connectivity," suggests Stephens.

"Going forward designs and design engineers must focus more on embedded connectivity, enabled by eSIM and iSIM developments in the case of cellular technology."

Looking to the future, it's quite possible that Covid-19 could provide a once-in-a-lifetime opportunity for speeding up the introduction of the digital technologies necessary in delivering smarter cities and better lives.

A growing number of smart city experts believe that public concerns about data collection have actually become less pronounced following the current health crisis, which could provide more scope to experiment with innovative smart city models.

Ready for Tomorrow

Farnell®
AN AVNET COMPANY

A global distributor that provides a high quality service to make sure you are Ready for Tomorrow!

- Same day despatch, fast delivery
- 2,000 leading manufacturers
- 950,000+ products available online
- Excellent and available customer service – we will pick up your call in 3 rings*!

*95.34 % calls in September 2019

Our best ever range

Inventory increased by 25%

ready4tomorrow.farnell.com

TE connectivity — AUTHORIZED DISTRIBUTOR | NXP | STMicroelectronics life.augmented | Microchip | molex® | ON | Renesas | FLUKE® | KEYSIGHT TECHNOLOGIES | maxim integrated™

XP Power | Raspberry Pi | Panasonic | VISHAY | Amphenol® | TDK EPCOS | multicomp PRO The Engineer's Choice | Tektronix® | XILINX | Infineon

---

LET US HELP WITH YOUR EMBEDDED PROJECT

- **SYSTEMS INTEGRATION**
- **BSPS & DRIVERS**
- **TESTING**
- **MULTI CORE & HYPERVISORS**
- **BARE METAL**
- **REAL TIME OS**
- **EMBEDDED AI & MACHINE VISION**
- **SECURITY**

WORLD-CLASS SOFTWARE DEVELOPMENT SERVICES AND CONSULTANCY FOR OVER 20 YEARS.

Feel free to contact us to discuss your requirements for your next Real Time System or Embedded Project

See more on
our website

harmonicss.co.uk

01403 784500   **sales@harmonicss.co.uk**

HARMONIC SOFTWARE SYSTEMS

Managing social distancing effectively

Flow management and social distancing are critical when it comes to crowd control.
An AI-powered LiDAR solution from Quanergy is attracting real interest. By **Neil Tyler**

Founded in 2012 Quanergy, based in Sunnyvale, California has developed a high performance AI-powered LiDAR (Light Detection and Ranging) platform that is capable of anonymously tracking human traffic.

"When we were founded in 2012 our intention was to focus on the autonomous vehicles space," concedes Enzo Signore, chief marketing officer. "But the timeline for autonomous vehicles has changed. When we realised that they aren't really going to start to appear until the second half of this decade, it made sense for us to target other market segments that could deploy and use this technology. When combined with perception software we can interpret the data derived from LiDAR and apply it to a broad range of security and smart space use cases."

A good example of how Quanergy's LiDAR solutions are being used can be found at airports including the likes of Miami International, McCarron in Las Vegas, Singapore, Vienna, and San Jose International.

These airports are using the company's LiDAR solution to count and manage queues in real-time and control passenger numbers. With the advent of the COVID-19 pandemic Quanergy's platform is now being used to apply and enforce social distancing in public spaces.

"The great advantage of using our technology is that it's possible to track human traffic without compromising the privacy of the individual," explains Signore. "As a result we don't have an issue with civil liberties because we don't collect personal data or use facial recognition to monitor their activity.

"Security check points tend to be the biggest pain point at airports, with very long lines. Our technology can speed up the processing of passengers and enhance security management. LiDAR makes it possible to better understand the geometry of an area and when deployed with perception software, it is possible to not only count the number of people but calculate wait times. That data can then be taken by third parties and acted on.

"If out platform 'sees' people are gathering too closely together, or too many people are grouped in one space, it can alert airport security, who can then quickly respond and disperse the crowd. It can also be used by passengers to identify and locate queues and avoid them."

Even before COVID-19 the demand for solutions capable of flow management had become a key growth market for the company.

"It's proved a significant opportunity for the technology and we reasoned that a pivot away from autonomous vehicles which, don't get me wrong, remains an important market for Quanergy, would provide us with more commercial opportunities. In practice we found that with flow management the adoption of our technology was much faster."

LiDAR is a time-of-flight sensing technology that uses low-power eye safe lasers to measure the time it takes for the laser to make a round trip between the sensor and its target.

Quanergy has taken this technology and combined it with its Qortex perception software which, powered by machine learning, is capable of providing accurate centimetre level information about numbers of objects, their spatial location, direction and speed.

"By aggregating the data we collect we are able to generate a 3D point cloud image that enables us to provide both spatial location and depth information in order to identify and track moving objects," says Signore.

"A point cloud is a large data set composed of 3D point data which can be transformed by software to create LiDAR-based 3D imagery of a given area."

LiDAR device families

Quanergy has developed two LiDAR device families comprising of Mechanical LiDAR sensors, its M-Series, and Solid State LiDAR sensors (S Series).

"The M series has been designed to provide a 360 degree view and is suitable for mapping, security and smart space applications. It offers long range coverage and real-time 3D perception," explains Signore. "The S series, based on Optical Phased Array technology, is capable of providing electronic beam steering. Based on a scalable CMOS silicon process they are both cost effective and suitable for mass production."

As Signore explains, the M series is intended for longer distances, particularly outside of buildings, and can offer much higher levels of accuracy, when combined with perception software, than would be the case by simply using cameras.

Enzo Signore, chief marketing officer, Quanergy

The company's Flow Management Platform provides real-time analysis for people counting, object detection and tracking. Comprising of the M series with QORTEX DTC (Detect, Track, Classify) software which uses a combination of advanced object detection, tracking, and classification capabilities to reduce false alarms, and the company's S3-2 People Counter, the platform is being used across a range of different end markets from airports to sport stadia and industrial facilities.

"This platform is being used to not only count people, but despatch services based on actual use, reduce crowding, and monitor crowding on public transport.

"Smart cities have proved an important, and growing, market for this type of technology and we have seen over 25 implementations around the world," according to Signore.

"Our platform can also be used in the industrial space to detect and profile stock. Think of grain or coal, for example. By using LiDAR it is possible to sweep across the surface of what's being stored and create a 3D image of the pile to calculate volumes."

The efficacy of LiDAR is determined by lighting and surface conditions but, according to Signore, the company's solution can perform effectively in all lighting and atmospheric conditions, so it can operate 24/7.

"The concept of 'reflectivity' defines how much an object will reflect light - whether that's a vehicle, object or a person - and there is a trade-off between reflectivity and range," he admits.

Quanergy continues to grow from strength to strength and recently announced its first commercial integration of its 3D AI-powered LiDAR solutions with the Genetec, Security Center unified security platform.

"This integrated solution will provide advanced people flow and occupancy management in smart spaces as well as enhanced threat detection and surveillance in high-security environments," explains Signore. "Our 3D LiDAR and sensor data flow, combined with Genetec's Security Center will provide real-time accuracy for a wide variety of industrial applications including public facing businesses such as banking and retail."

When it comes to smart cities the flow of people is critical, so rather than monitoring individuals it's about the overall numbers; privacy is also of critical importance and Quanergy's solution is well placed to address both.

"Flow management is driving demand for our solutions and we have seen a significant uptick in demand for our technology in light of the COVID-19 pandemic. There's certainly been a high level of interest and not just in addressing the current crisis but in planning for the longer term and helping people, cities and businesses to return to normal."

"Experience has shown that cameras can be too sensitive and numerous events can trigger false alarms," Signore suggests. "The weather or animals can trigger false alarms. That's both disruptive and expensive in that these false alerts will need to be investigated.

"According to our own research, customers have seen an 84 per cent reduction in false alarms when using LiDAR combined with cameras.

"LiDAR offers much greater accuracy and not only can it locate people it can then track them too – not only reducing false alarms but improving security as well."

Converters for photovoltaic panels

In recent years, we have witnessed a growing interest in "green energy". Numerous applications are offered that make it possible to obtain energy from freely available sources, among which photovoltaic panel installations are the most popular ones. Their prices have become so affordable that they are oftentimes installed even in small summer houses. When building such systems, it is important to understand the specific nature of the energy source – a photovoltaic panel or a turbine. One should also bear in mind the challenges faced by the manufacturers of devices powered from such sources.

A photovoltaic panel used as an energy source is very capricious, because the power of the electric current obtained from the panel will depend on the intensity of the incident light. Additionally, the load current also remains an important factor. Users of this energy source in most cases are not able to obtain constant lighting or a constant load. Usually, the panels are fixed in one spot and they are rarely placed on revolving supports that follow the sun. As a result, sunlight falls on the panel surface at different angles. In addition, the sun can be obscured by clouds. The load is not constant, but it usually varies according to the needs of the users. Under such conditions, the voltage on the panel terminals will also undergo significant changes.

Usually, users of the power network expect stable voltage, as they do not want to worry about its fluctuations. If, for example, it is 12 V DC, then changes are expected to be rather small, 2-3% of the nominal value at the most. As we have mentioned before, freely available energy sources are rarely capable of providing such power supply conditions. Therefore, properly constructed voltage converters are used as the intermediary between these sources and the user.

Unlike "standard" DC/DC converters for power supply – and depending on the target application – converters working with renewable energy sources must offer the right parameters to match the "caprices" of the source. The most important of these are a wide range of input voltages, suitable input resistance and high breakthrough voltage between input and output, usually at least several hundred volts.

The demand for "green energy" has resulted in devices and products designed for its acquisition being produced by many competing companies. An average user of a panel will be interested mainly in ready-made plug&play modules attached to the panels, but, on the other hand, electronic engineers may be searching for converter modules

AM5W-60005S-NZ-ST AIMTEC
Converter: DC/DC; 5W; Uin:
100÷1000V; 5VDC; Iout: 1A;
3"x2"; 150g

designed to be integrated into user's own devices. The target applications may include illuminated traffic signs, monitoring devices or systems operating within IoT networks. Among the products for such applications, those manufactured by Canadian company Aimtec are worthy of mention, since they are appreciated by engineers all over the world.

Aimtec is a global company that develops and manufactures modular AC/DC and DC/DC power systems, including LED power supplies. The company is headquartered in Montreal, but also has numerous offices in Europe and Asia. Products by Aimtec are valued mainly for their unique features and the quality/price ratio.

Converters for photovoltaic panels

Converters for photovoltaic panels manufactured by Aimtec will be of particular interest to the constructors of DC devices powered by 5V to 48V DC. Of course, a battery can also be charged with this voltage, from which another converter will obtain 230V AC, but this would be at the expense of a significant loss of efficiency of the power supply.

As the voltage at the terminals of photovoltaic panels and wind power generators has similar parameters, the company recommends its series of products to be used with both types of energy sources. This is the AM5W...AM200W family, where the number following the "AM" prefix

AM40W-80012S-NZ AIMTEC
Converter: DC/DC; 40W; Uin: 200÷1500V; 12VDC;
Iout: 3.33A; 5"x3

AM40W-80024S-NZ-ST AIMTEC
Converter: DC/DC; 40W; Uin: 200÷1500V; 24VDC;
Iout: 1.67A; 610g

Table 1. Basic parameters of Aimtec converters for photovoltaic panels and turbines

Series	Output power [W]	Nominal input voltage [V DC]	Output voltage [V DC]	Protection options
AM5W-NZ	5	100…1000	5	CSP1), OCP2), OVP3), RPP4)
AM10W-NZ	10	100…1000 200…1500	5, 9, 24	
AM10WM-NZ	10	200…1500	5	
AM15W-NZ	15	100…1000 200…1500	12, 15, 24	
AM15WM-NZ	15	200…1500	12, 15, 24	
AM40W-NZ	40	100…1000 200…1500	12, 15, 24	
AM45W-NST	45	150…1500	2×15	
AM200W-NZ	200	300…1500	24, 48	

1) CSP – Continous Shortcircuit Protection 2) OCP – Over Current Protection 3) OVP – Over Voltage Protection
4) RPP – Reverse Polarity Protection

indicates the maximum continuous output power available. Then, according to the manufacturer's nomenclature, the nominal input voltage, output voltage and housing type are specified. Thus, for example, the symbol AM15W-60015S-NZ stands for a converter with a power of 15W, output voltage of 15V DC, nominal input voltage of up to 600V DC, contained in a housing designed to be soldered into a PCB. In addition to this type of housing, there are also modules with screw terminals, an external fuse and an EMC filter (-ST), for

mounting on a TH/TS35 bus with a fuse and an EMC filter (-STD, -STS) or without a fuse (-STF). For more details, please refer to the data sheets available on the website of the manufacturer or distributor, TME.

The most popular among OEM users are 5W to 40W converters, in a 70mm×48mm×23.5mm housing, designed to be soldered into a PCB. What is very important, the converters offered within this family of products are enclosed in housings of the same dimensions and are compatible in terms of the layout of outputs, which allows

for easy extension of the power source functionality without changing the printed circuit board. The higher power converters, i.e. 45W and 200W, have an open frame casing and are connected to the associated circuits using screw terminals, which will surely be appreciated by installers and service technicians. It is worth mentioning that also lower power converters (as mentioned earlier) are offered in a variant for mounting off the PCB, with a fuse, with an EMC filter, with screw terminals.

Nominal input voltage depends on the type of the device, it spans from 200V to 1500V DC, and its range is very wide, because it amounts to 10:1. The output voltage is constant, set by the manufacturer at the production stage. The largest selection of variants is available within the series of converters with the power of up to 40W. These include converters with an output voltage of 5, 9, 12, 15 or 24 V DC. The 45W converter has two 15-volt outputs, while the 200-watt converter provides 24V DC or 48V DC. All of them can be used at ambient temperatures from -40°C to +70°C without any deterioration in performance. The highest energy efficiency is about 80%, which translates into low power losses and no need for forced cooling.

All these products meet the strict requirements of the safety standards for devices working with photovoltaic panels. They have CSA (CSA-C22.2 No.107.1-01), UL (1741), and CE marking granted in accordance with European standards (a detailed list is available in the data sheet of each converter). Standard protection options include protection against overvoltage and short-circuit at the output, overheating, reverse polarity of the supply voltage.

The converter does not require a minimum load to start up, and the start-up of the converter in no-load condition occurs in less than 1 second. Typical breakthrough voltage between input and output for most converters is 4 kV.

The basic parameters of the converters in this series are listed in table 1. For detailed parameter descriptions, please refer to the catalogue data sheets

THE MISSION CRITICAL EDGE

The transformational power of high performance and edge computing on mission critical applications is profound, as **Ian Ferguson** explains

UAVs and flying taxis (that bring controlled democratisation of access to airspace), affordable satellite technology (low-cost satellite vehicles and launchers), industrial digital transformation, and self-driving vehicles, are among today's most exciting trends.
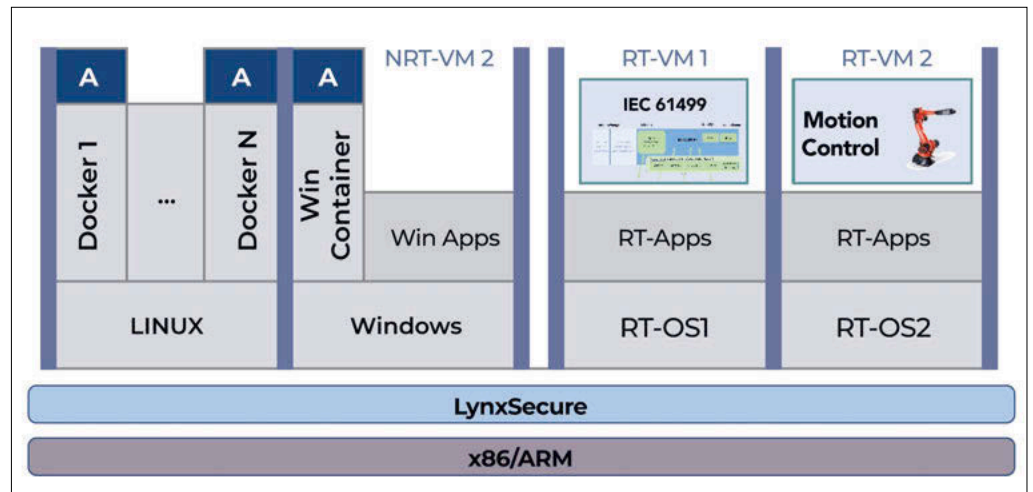
These technologies are typically predicated on intensive sensing and are extensively connected to other, similar assets and high-level management applications.

Carrying their own intelligence on-board, while connected to large numbers of sensors on the one hand and the cloud on the other, these are edge computing applications with a difference. Being dependent on deterministic real-time responses to sensor information and robust cyber-protection, both to meet system performance demands and maintain safety and security, they define a category that we at Lynx refer to as the mission critical edge. It's a $16 billion software opportunity that imposes exacting requirements.

These are use cases that demand a combination of high-performance embedded capabilities as well as attributes associated with edge computing, such as intelligence, management and automation, security and monitoring, and sensor fusion.

There must be scope to run big operating systems like Linux and Windows, as well as bare-metal software, and RTOS to ensure the real-time determinism of specific elements of the platform, typically guaranteeing latency of less than one microsecond.

In addition, applications must be compartmentalised to ensure that certain applications cannot cause other elements of the system to fail. There is a need for multi-level security and, of course, applicable safety certifications must be satisfied.

Figure 1: Lynx's unique separation kernel technology isolates applications and guarantees real-time system behaviour

Fusing mission critical and edge computing

Some of the challenges currently encountered in industrial robotics, for example, include how to implement suitable processing adjacent to where the data is created for improved privacy, latency, and uptime.

There is also a demand to consolidate system workloads into one or two subsystems to reduce cost, power and footprint.

In addition, compatibility with legacy and future communications protocols, safety requirements, and other equipment on the factory floor must be maintained.

As a consequence, developers need help to establish a future-proof architecture for real-time and regular applications, as well as support to manage multiple robots within a cell and to deploy data collection, analytic and insights at the robot and cell level.

A different set of challenges apply when developing UAVs or small satellites. Operators face the need to run constellations comprising large numbers of individual satellites, for example, and must coordinate management and operations for all units while also separating mission control from the management of third-party payloads. Satellites, necessarily, must be able to operate for long periods autonomously, with minimal intervention, and require secure connection for access to ground-based compute facilities.

The challenges are intensified by factors such as increasing application complexity, with approaching 50 million lines of source code in some UAV systems and typically over 500 million lines in SAE Level-4 autonomous vehicles.

At the same time, safety certification costs and timelines are increasing, and rising engineering costs are driving longer deployment cycles that demand flexibility to respond to changes such as evolving communication protocols.

A software framework that can cater to all these requirements can include:

- **Multicore and multi-OS:** Support for RTOS, bare-metal, Linux and Windows workloads over non-homogeneous multi-cores
- **Mixed criticality:** Precise mapping and scheduling of hardware resources enables real-time and non real-time workloads
- **Multi-level security:** immutable partitioning, tamper-proof, non-bypassable partitions, no helper, root or master OS
- **Safety certification:** Reduced certification costs by minimising high DAL source line counts. Traceability of low-level hardware allocations to system specifications
- **Flexibility:** System functionality can be distributed across one or multiple guest operating systems
- **Communication:** Built in mechanisms for secure, efficient communication across partitions
- **Pre-validated components:** certified RTOS like LynxOS-178, alternative RTOS such as FreeRTOS, Buildroot Linux, virtual device server, configuration tools.

Software framework

To meet all the disparate demands on performance and cost, Lynx has taken the approach of leveraging the Lynx MOSA.ic framework, which is already proven through important military programs to support the real-time determinism and safe separation of applications.

MOSA.ic contains features that are valuable for mission critical applications, such as Lynx's separation kernel technology that isolates applications and guarantees real-time system behaviour, and FAA certified (reusable) software building blocks. To address the challenges developers are encountering in the UAV/satellite, avionics, and industrial automation sectors, we have expanded the variety of software types can run on Lynx MOSA.ic.

One example is FreeRTOS, for which we announced support earlier this year as an alternative OS to the LynxOS DO-178 RTOS. This has made it possible to create domain-optimised bundles that contain common features of the MOSA.ic framework with additional software that meets the demands of a specific domain.

Two of these bundles, Lynx MOSA.ic for Avionics and Lynx MOSA.ic for UAVs/Satellites both support Arm and x86 processor architectures and include LynxOS-178, LynxSecure safety software, the separation kernel hypervisor, Linux, a rich set of tools, and support for the SR-IOV extension to the PCIe specification.

On the other hand, the initial alpha release of Lynx MOSA.ic for Industrial removes Lynx's RTOS but adds Azure IoT Edge and Windows 10 support for x86 platforms, as well as providing Virtual PLC functionality

Figure 2: Lynx has created domain-optimised bundles that contain common features of the MOSA.ic framework with additional software that meet the demands of a specific domain
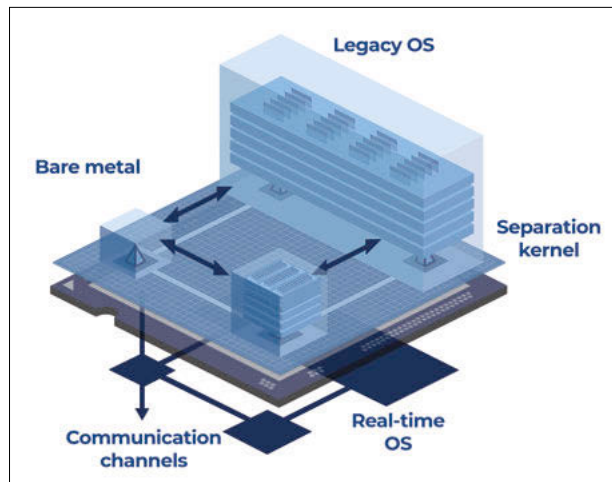
to let manufacturing organisations quickly scale, reconfigure, and update software-driven capacity.

Each of these bundles is conceived to address developers' needs serving rapidly evolving markets that demand higher intelligence at the edge and the ability to manage sensor fusion platforms, blending rich operating systems, bare metal code and real-time determinism. At the same time, this framework-based approach to developing mission critical robustness

Author details:
Ian Ferguson is Vice President, Marketing and Strategic Alliances Lynx Software Technologies

in edge computing applications supports modularity to support software and hardware upgrades for deployed platforms.

This way, developers can take advantage of those aspects of edge computing that enhance flexibility, intelligence, and control, such as easily establishing cloud connectivity to extend public and private cloud services to the mission critical edge without compromising performance.

There are also facilities for data collection, distribution, analysis and optimisation, which ensure support for "systems of systems" configurations and secure communication of mission critical data between nodes, such as individual satellites in a constellation.

In addition, security and health monitoring leverages patented methods to identify, monitor and mitigate threats to hardware and software, while lifecycle management makes it possible to add APIs for manageability and orchestration to integrate into hyper-converged infrastructure solutions.

Conclusion

Edge computing, although an industry buzzword that has earned its place on the infamous Gartner Hype Cycle, delivers important advantages such as flexibility, intelligence, and lifecycle management for today's connected applications.

With the integration of software tools and systems that are already proven to support safety, security and real-time determinism, applications that are mission critical can benefit from these attributes while meeting stringent demands that in the past have called for inflexible, locked-down embedded implementations.

Bringing mission critical and edge computing together can help reduce development costs and risk while enabling the resulting applications to deliver greater performance, safety, security, and flexibility for operators and end users.

Raising core-infrastructure **performance**

The AI data-centric era demands more efficient, pervasive compute that scales far beyond the reach of CPU and GPU technologies, as **Mike Thompson** explains

Managing and analysing data is at the heart of everything, and our digital lifestyles and the emerging IoT are inextricably connected with the rapid growth in computing and data services in the cloud. 5G New Radio (NR) is also set to place intense pressure on the capacity and performance of backhaul, metro and core networks.

There is strong demand for increased data bandwidth and compute throughput across cloud data centres and in telecom and cellular-backhaul networks, and in building new and higher performing equipment to meet these demands. However, next-generation equipment is going to have to deliver significantly increased performance within existing physical, electrical, and thermal boundaries.

Design work also needs to begin using the latest protocols and standards before the final specifications are agreed. Waiting for specifications to mature is not an option for equipment providers, so flexibility to adapt at a hardware level as the project progresses will be required.

Programmable logic devices such as high-density FPGAs and programmable System-on-Chip ICs (MPSoCs) have become the accelerator of choice for workloads that cannot be executed quickly enough in conventional CPU or GPU architectures or do not satisfy power constraints. Offering a high degree of parallelism to offload specific compute challenges these also provide inherent

Figure 1: Versal Premium ACAP with 112Gb/s PAM4, 600G Ethernet, 600G Interlaken, and 400G HSC
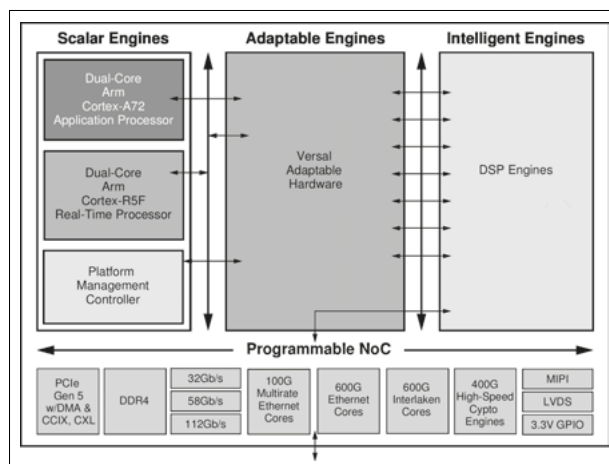
adaptability as programmable devices.

Now, to satisfy more recent and more demanding performance levels a new class of programmable devices called Adaptive Compute Acceleration Platform (ACAP) has emerged.
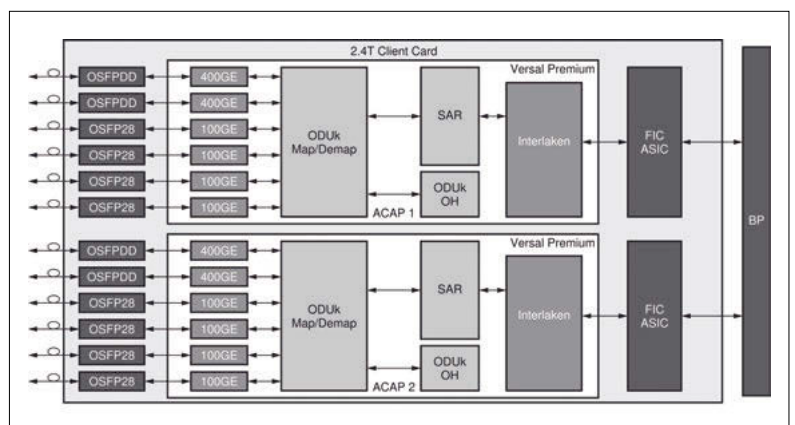
The Xilinx Versal ACAP contains an array of intelligent AI and DSP compute engines, adaptable engines equivalent to FPGA logic fabric, and application-processing and real-time scalar engines, closely coupled through a programmable Network on Chip (NoC) interconnect.

Software-controlled platform management and state-of-the-art interfaces including DDR4, 100G Ethernet, PCIe Gen 5, and multi-gigabit optical interfaces are also integrated.

The Versal DSP

engines feature improved DSP blocks with native support for operands such as INT8, 32-bit floating point, and others, to increase the speed and efficiency of applications that include not only digital signal processing but also wide dynamic bus shifters, memory address generators, wide bus multiplexers, and memory-mapped I/O registers. The scalar engines comprise a dual-core Arm Cortex-A72 application processor and dual-core Arm Cortex-R5F real-time processing unit.

The ACAP's heterogeneous engines can be reprogrammed to adapt to workloads that change over time, or as algorithmic implementations or neural-network models evolve.

These high-bandwidth devices combine high compute density with additional dedicated high-speed cryptographic (HSC) engines and state-of-the-art network interfaces.

The intensive network connectivity includes scalable optical transceivers up to 9Tb/s total bi-directional bandwidth supporting the latest Ethernet and Interlaken rates and protocols, 112Gb/s PAM4 transceivers, and cryptographic processing with up to 400Gb/s high-speed crypto engines, and adaptable hardware, (See Figure 1).

Compared to existing 58Gb/s PAM4 technology, using 112G PAM4 transceivers allows a doubling of bandwidth density per port, easing pressure on front-panel rack space and allowing a doubling of bandwidth

Figure 2: 2.4Tb/s client interface card

per unit volume in applications.

The latency for transmitting a given payload of data is 50% lower, which enables applications to be more responsive and helps mitigate latency impacts when interconnecting geographically distributed data centres.

The resources integrated on-chip provide up to three-times the bandwidth and double the compute density of Xilinx's 16nm Virtex UltraScale+ FPGAs while, when compared to a dedicated application-specific OTN (optical transport network) processor, application-throughput capability is up to five times greater.

Increased compute density

To meet the demands of hyperscale cloud service providers, the Versal ACAP architecture combines high on-chip memory bandwidth tightly coupled to high performance heterogeneous compute engines with flexible workload provisioning through Dynamic Function eXchange (DFX).

With the ability to swap kernels eight times faster than in preceding FPGAs, DFX permits dynamic provisioning of accelerators to make the most efficient use of device resources for changing workloads.

With multiple types of distributed RAM on-chip, up to 1Gb of tightly coupled memory is available, they have an equivalent on-chip memory bandwidth of up to 123TByte/s. This enables high-speed interactions between the various processing engines and memory and, in addition, the programmable NoC interconnect supports high-speed interaction with off-chip DDR4 memory.

A 1RU system or a single card can be built to provide 3.2Tb/s capacity with support for a wide variety of standardised and emerging protocols and optics.

A single Versal Premium ACAP can implement multiple channels of 100G FlexE Ethernet with 4x25G NRZ connections to optics on the
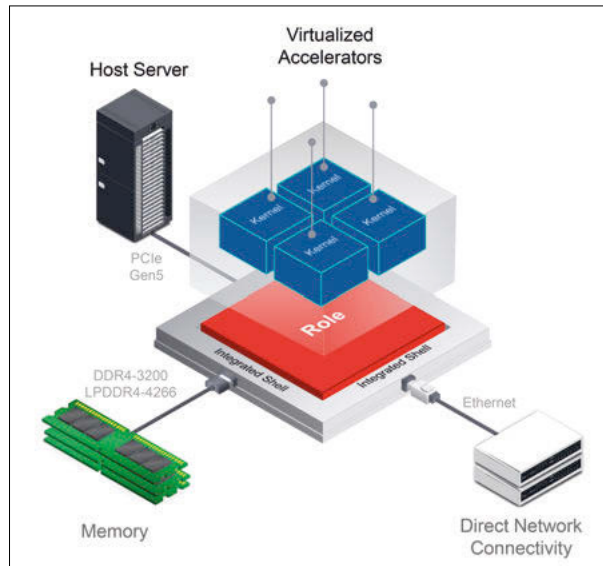
server side, 400G Ethernet channels on the line side implemented with 4x112G PAM4 connections, AES256 encryption at 1.6Tb/s line rate, and control and port-management functions.

These devices are intended for high-speed client interface cards (Figure 2), and leveraging Versal to bridge and encapsulate digital traffic and services into industry-standard OTN wrappers. The integrated channelized Ethernet, Interlaken, and 112G and 58G PAM4 GTM transceivers and 32.75G GTYP transceivers provide multi-terabit/s capacity. These resources, being integrated as dedicated hard IP, enable ASIC-class power efficiency while leaving the ACAP logic fabric free for mapping, overhead, and SAR functions.

Future-proof AI acceleration

The attributes mean that Versal can deliver a significant performance boost over GPUs when handling tough workloads.

Another interesting feature of the ACAP that simplifies accelerator development, compared to FPGA and MPSoC architectures, is the pre-built shell that provides hard connections to off-chip interfaces such as Ethernet, PCIe Gen 5, DDR4, and optical interfaces. This efficient

Figure 3: Pre-built shell infrastructure simplifies cloud connectivity and boosts speed and efficiency

Author details:
Mike Thompson, Sr. Product Line Manager, Virtex UltraScale+ FPGA and Versal Premium ACAP at Xilinx

infrastructure for cloud connectivity delivers several advantages including allowing CPU host and system memory communication to be available at device start-up, as well as simplifying kernel placement and timing closure and simplifying accelerator virtualization.

The shell allows designers to utilise more of the device's internal logic fabric for custom functions, which would otherwise be required to implement necessary infrastructure such as memory and DMA controllers.

With Versal Premium ACAP, it is possible to host a video analytics solution on a single platform for identification, extraction, and classification of video metadata.

The shell provides off-the-shelf connectivity and cryptography, while the device's DSP engines and software-programmable compute kernels handle object detection and image classification as well as video encoding, decoding, and scaling.

Up to 1Gb of on-chip SRAM is available immediately adjacent to the compute kernels, providing up to 123TB/s of memory bandwidth for AI acceleration.

By eliminating the memory-bottleneck and batch-size limitations that hinder GPU and CPU-based architectures, an analytics accelerator can operate at up to 13,000 images/sec for Resnet50.

As the world becomes increasingly data centric, and relies on instant service delivery, however complex, compute intensive, and bandwidth sapping, the ACAP is able to provide a combination of efficient, distributed heterogeneous compute engines and high-speed interconnect to meet rapidly increasing performance demands.

By blending hard IP, an innovative pre-built connectivity shell, and programmable logic fabric, and software-configurable resources, these devices not only boost performance but also simplify design and provide future-proof flexibility.

THE PEOPLE PROBLEM

When it comes to running a successful heterogeneous project, what do you need to take into account? By **Colin Funnell**

Today's engineering disciplines are being thrown together into single devices and therein lies one of the biggest challenges facing the industry today - how do you develop and debug an entire system in a single chip?

It seems like natural progression – cramming more into increasingly capable devices. Transistor sizes shrink, silicon becomes more turnkey and you get more device for your buck but what doesn't shrink is the expertise that's required to develop these complex devices.

Systems used to be designed by groups of engineers. Integration and test engineers waited on the developers and toes tended to get trodden on, with hidden code picked apart and untouchable historic designs questioned - all for product development. There was certainly no room for ego!

Today, favourite tools may be replaced by those common to the technologies inside a device. Xilinx Zynq devices have two debug ports to allow individual debugging of the Processor Section or Programmable Logic. On Zynq you can chain these ports into one, so tools that are aware of both worlds deliver greater insight. Other devices may only offer specific insight. Vendors will offer a toolset to work with this, but it may be different to what people are used to. Suddenly, this new wonder-device to solve everyone's design problems is upsetting the engineering apple cart across all engineering disciplines.

One approach is to increase the visibility of some internal sections. Application processors can log more, real-time processors can show events occurring on IO or serial lines, FPGA logic can flag up states and events. With more now handled internally on a heterogeneous device, this frees up what would have been interconnecting busses on the device pins. By making it easier for someone without specialist tools and knowledge to understand when something goes awry, problems can be directed to the appropriate developer.

Can one engineer handle heterogeneous designs? Yes, if they understand the system intention and expected operation. Silicon vendors know this and provide tools to help where possible.

There is a risk as the more a tool automates a task for you, the less is understood. Trying to manually configure and control your system would be a massive task. There is more going on inside these complex devices than your platform needs. Wizards are a great productivity boost, until the point that something goes wrong, and you dig into something you did not create.

Creating a heterogeneous system with minimal people is possible. The trick is good engineering in all areas. Easy to say, hard to do and harder still to explain to a project manager.

Progress will be slow as problems in one area will hold the project up, putting pressure on timescales. Don't expect fanciful and clever designs. Simpler is better. There is a lot to do just getting the basics up and running.

Consult engineers early in the design process. It can't be left to project managers who see a heterogeneous device as a short-cut. Both disciplines spend time writing, developing and testing code. They maintain code repositories, perform simulation/emulation and debugging. As soon as hardware is available, the system can be almost ready.

The same cannot be expected of FPGAs. "Reconfigurable hardware" is not about "sorting this out afterwards." Even worse would be to deliberately plan to have a hardware design with an empty FPGA, assuming that whatever is wanted will fit. It won't!

Managing security

Security can seem to get in the way of the simplest things. The pressure to get life from a new system is huge. There is a temptation to ignore designing in security features from the start. Working within security restrictions feels difficult, but is the correct thing to do. If we circumvent things now, it'll never be put right afterwards.

A downside to heterogeneous devices is their 'attack surface' can be larger with more potential entry points, especially when moving to a complex system rather than squeezing one into a smaller space. With many types

Sikov.adobe.stock.com

of engineering design at play, real collaboration is required rather than meeting specifications. Don't assume inwards-facing interfaces provide security from the outside.

The maker community also has a part to play in this story. Adding a rich OS into a system, isn't the same as bolting a Raspberry Pi with something. This growing community, with systems such as Raspberry Pi and Arduino, along with complimentary kits such as ShieldBuddy, should be welcomed. Hobby electronics was dying as the interesting components are too small to be built with at home so add-on shields have addressed this, enabling a new generation of engineer. Yet it may be glossing over the complexities and subtleties of a real design. Raspbian, the Raspberry Pi operating system, is akin to a desktop computer experience to help people on their way. With a single command line, a complete webserver can be downloaded, installed and started.

Embedded Linux is a different world with many books dedicated to it. As a rule of thumb, if you can't already do everything you want from a command line, it's not for you. Very little is instantly available, and everything gets built from the ground up. Great strides have been made to automate the building of custom embedded Linux distributions with the likes of the Yocto Project. This builds itself and the tools required before building for your target.

Silicon vendors offer a step-up in trying to build Linux for their device, and may offer a pre-built image to boot from. This will need modifying for your needs. It's amazing how many common command-line tools don't show up by default. Don't be fooled into thinking moving from a Raspberry Pi to another platform will be straightforward.

Even the world of classic embedded microcontrollers and embedded Linux are poles apart. Tools and techniques are available for each, but they differ. The GNU/Linux world evolves as software packages go in and out of fashion. Keeping up with this is a full-time job in itself.

There are tasks engineers cannot do. Specifically, they are not product designers. Enter the artists – graphic designers, musicians, animators… With high expectations on user experience, these people are crucial to your product image.

Engineering and artistry

Normally engineering and artistry are kept apart, with the occasional curious crossover. If product presentation is key, then a good multimedia framework is essential, along with the tools to bridge art and code. Qt is one such framework with tools that can import from Adobe Photoshop.

One project I worked on needed graphical display, webserver over Ethernet, local filesystem and real-time capabilities. One option was a single powerful Cortex-M microcontroller: lean and compact with a low BoM cost

Author details:
Colin Funnell is a Development Engineer, Hitex (UK) Ltd

plus an RTOS and Keil middleware blocks. The graphical application was developed by the customer. But it was becoming restrictive. They would either have to rebuild the entire system each time, have their application in a mini filesystem, or divide up flash memory.

A heterogeneous alternative of Cortex-M for real-time operations and Cortex-A for Linux together was preferable. The top-level application was developed separately on a desktop PC and graphics were easily changed and uploaded, giving the web developers a familiar working environment. With both Cortex-A and -M being available in a single device, the PCB size was kept to a minimum.

Heterogeneous devices can be wasteful with features, but deliver greater flexibility in development, architecture and costs. It is rare to utilise every section of a complicated chip, and you shouldn't try.

So what makes for a successful heterogeneous project? You need to:
• Get a good group of people together, not just good engineers.
• Create a functional platform along with any key multimedia elements. New features and shiny bells and whistles can be added later.
• Avoid specification creep. As soon as Linux or FPGA is mentioned, people start dreaming!
• Constrain it to 'your' platform. Planning too many future options will never deliver a good platform for the essentials.
• A dedicated technical project leader will steer the project in a clear direction.
• Use tools able to handle the different sections as a whole. For a mix of Cortex-A and Cortex-M work, Arm Developer Studio is ideal.

Heterogeneous devices are here to stay. At the end of the day, it's critical that hardware, software, project managers, senior developers, junior engineers, and dare I say it – marketing, all working towards one goal.

Below: Complementary kits, such as the Shieldbuddy TC375, should be welcomed
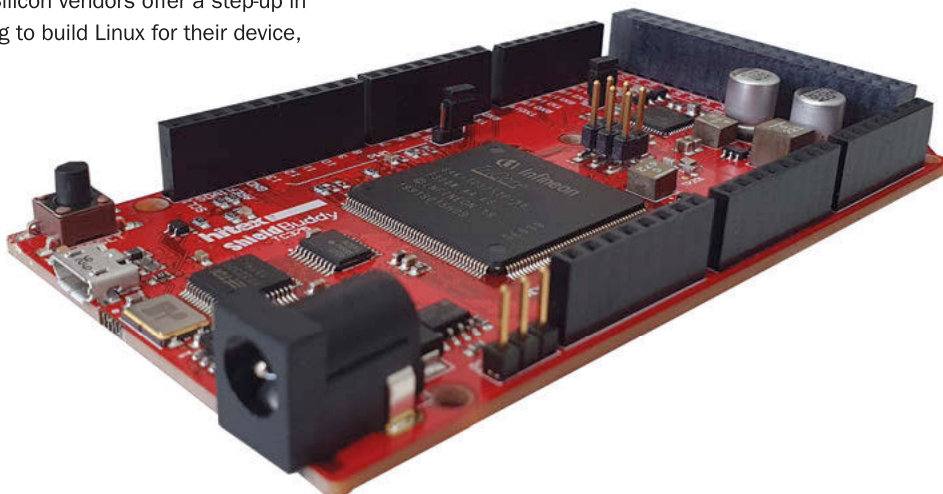
WALKING THE LINE

Effective control of industrial actuators requires precise control. **Bonnie Baker** looks at how using a DAC can deliver an accurate linear actuator
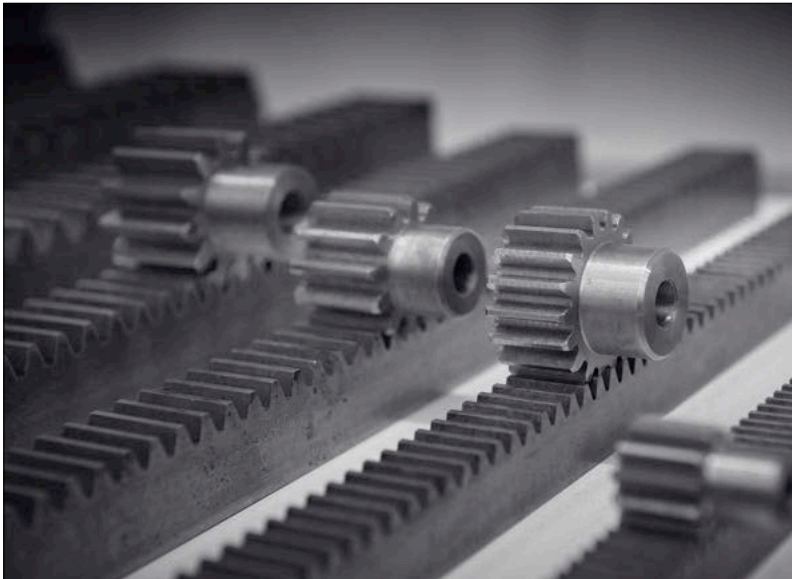
Figure 1: A diagonal view of metal pinion gears on toothed bars with high-precision linear toothed wheels (picture: Mikhail Leonov / Shutterstock)

In contrast to the circular motion of an electric motor, a linear actuator creates movement in a straight line. Machine tools and industrial machinery use linear actuators in computer printers, valves and dampers, and places that require linear motion.

The control of industrial actuators requires precise, repeatable control. Effective linear actuator control has a precision control loop with high resolution, monotonicity, low-settling-time, and low-code-to-code glitch energy.

This design is challenging, as precise actuators require high-precision digital-to-analogue-converters (DACs) that initiate the linear movement. Often linear actuators are too slow for the application and mechanical while discrete actuators are not precise enough.

The solution for high-precision linear actuator control in many applications lies with machine tools.

Industrial machinery must have precise, low-glitch, fast DACs which create a high-precision, control system for computer printers, in valves and dampers, and in some places, in applications that require linear motion.

Linear motion control

Precision motion-control applications utilise high-precision control loops such as linear actuator control. Figure 2 shows a block diagram of a DAC-driven linear actuator circuit.

In Figure 2, the high-speed DAC drives the linear actuator through the driver amplifiers. The precision 16-bit

DAC sends an analogue output voltage that can vary for a full-scale actuator change or for minute increases or decreases in motion.

DAC monotonicity means that an increase (or decrease) in the digital code input will always produce no change or an increase (or decrease) in the analogue output.
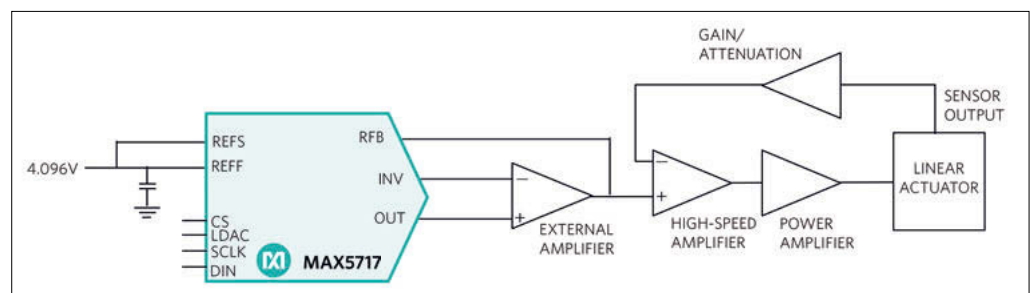
For a linear actuator, a non-monotonic DAC would cause the actuator to shorten with an expected lengthening event. With a feedback loop, this error would cause an oscillation occurrence and the electrics in the actuator will then attempt to correct the error.

If the monotonicity specification is not available in the DAC datasheet, the differential nonlinearity (DNL) specification implies the DAC's monotonicity capability.

The DNL error is the difference between an analogue actual step width and the ideal analogue value of one LSB. For an ideal DAC, in which the DNL is equal to 0 LSB, each digital step equals 1 LSB. 1 LSB equals $V_{FS}/2^N$, where V_{FS} is the DAC's full-scale range and N is the DAC's resolution. If the actual DAC step from code to code is less than one LSB, the DNL is negative.

A DNL error of less than -1 LSB indicates a transition value that is

Figure 2: Precision DAC-driven linear actuator provides precise positions during the actuator action
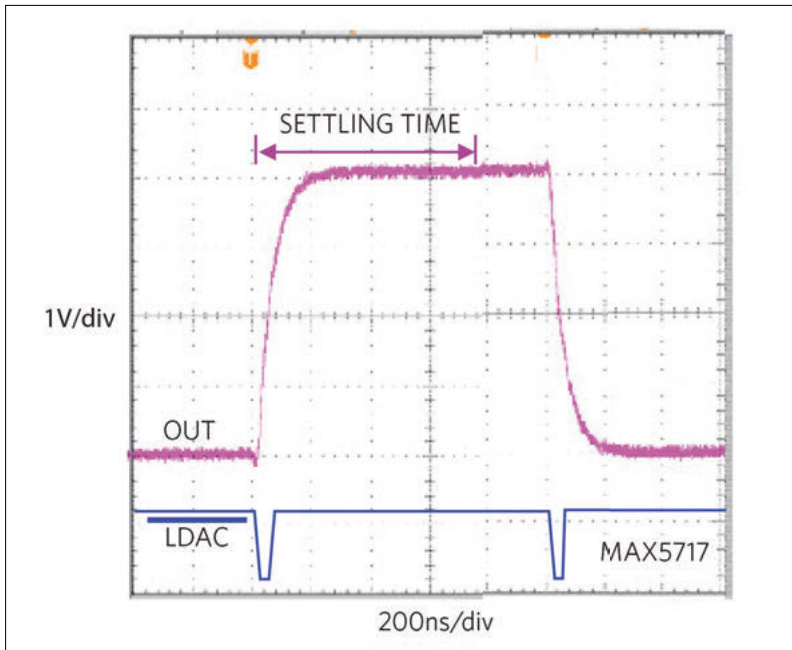
Author details:
Bonnie Baker,
Principal Technical
Writer, Maxim
Integrated

Figure 3: A typical
750ns settling time
of a 16-bit DAC

directly opposite of the expected transition, creating a missing code or an instance where the analogue decreases with an increase in the digital input code. In other words, a DNL error that is less than -1 LSB implies that the DAC is non-monotonic.

A DNL less than -1 LSB signifies a non-monotonic DAC. For this figure, the analogue output increases with increasing digital code, even when the DNL error is -½ LSB.

Settling-time and conversion speed
Output settling time is the maximum amount of time it takes for the output of a DAC to settle to a specified level from a zero output to full-scale. In this circuit, the DAC settling time defines the speed of the actuator.

The settling time measurement starts at the falling edge of LDAC (Figure 3). The figure shows an example of the settling time of an actual DAC. It is useful to note that the characteristics of the analogue output signal as it spans from zero to full scale exhibits a first-order low-pass filter. The 750ns (typical) DAC settling time occurs as the signal is stable within a band of ±1 LSB around the ideal final analogue voltage. Multiplying the settling time by two

determines the DAC's bandwidth – equalling 667kHz.

DAC glitch energy
Ideally DAC outputs move from one value to the next monotonically. Real circuits may have slight undershoots or overshoots. The DAC characteristics of this dynamic specification can disrupt a closed-loop linear actuator system's operation by momentarily outputting erroneous voltages. The over or undershooting that occurs with code-to-code transitions quantifies the glitch impulse specification.

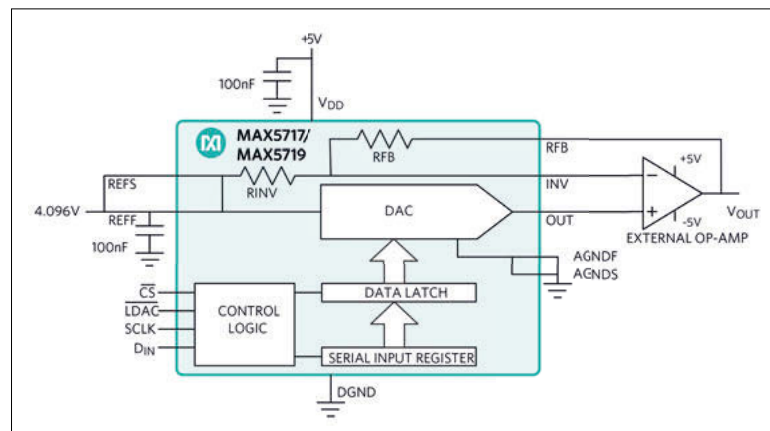Internal DAC switch synchronisation is not always perfect, and this produces an overshoot and/or

Figure 4: A block
diagram of a
16-bit/20-bit DAC
with a 3-wire SPI,
QSPI, MICROWIRE,
and DSP-compatible
serial interface

undershoot signal at the output of the DAC.

Glitch impulses produced by string DACs produce a single-lobe glitch impulse (B). R-2R DACs (C) produce two regions of code transition error. In this situation, subtract the positive glitch impulse (G2) from the negative glitch impulse (G1).

Since glitch impulses are very fast, the units of measure that capture the area contained by the glitch is nanovolts-second (nV-s).

Actuator precision
The MAX5717/MAX5719 16-bit, precision high-speed DACs predetermine the linear actuator's precision performance with monotonic behaviour, 750ns settling time, and ultra-low 0.05nV-s glitch energy.

They are serial-input, unbuffered, 16- and 20-bit voltage-output unipolar DACs with integrated feedback resistors that allow bipolar operation when used with an external op amplifier. In unipolar mode, the DACs reset to zero at power-up. These DACs provide low noise, tight bipolar resistor matching, and high accuracy. Integrated precision-setting resistors make the DACs easy to use.

Conclusion
The need for an accurate linear actuator control does not have to be an afterthought. Simple solutions are often too slow and are mechanical while discrete actuators lack precision.

During the planning process, it is important to consider various specification advantages and apply an integrated solution.

A precision, low-glitch, high-speed DAC provides a simple, effective feedback solution that brings peace of mind to the designer of linear actuator control.

#ENGINEERINGHEROES

Celebrating engineering's role in fighting the Covid-19 pandemic

The way engineering and manufacturing have stepped up during the Covid-19 pandemic to address shortages of medical and protective equipment has been truly inspiring. #EngineeringHeroes celebrates and honours the stories of people, companies and technologies that have made up UK engineering's massive contribution during this time

BACKED BY
newelectronics

If you have a story you would like us to share or you wish to join the leading companies and organisations supporting the campaign please visit our website.

Join the campaign! www.engineeringheroes.co.uk

Keeping production
on track

"One-stop" consultation can keep semiconductor production on track through installation and beyond, as **New Electronics** discovers

For semiconductor manufacturers, compound semiconductor manufacturers, raw wafer material suppliers, and R&D labs, utilising wet process cleaning equipment is critical when it comes to producing extremely reliable products, so partnering with a vendor with deep expertise in all aspects of the process – from equipment selection, design specification, testing, and installation/hook up – can be critical to success.

In such fabrication, "cleaning" refers to the etching process used, which precisely removes thin layers of material. In other applications, cleaning can also refer to the use of agents such as solvents, acids or bases to remove unwanted particulates and other contaminates such as photoresist.

The cleaning process may involve moving product into extremely hot chemical baths of acids, bases, or flammable solvents, so consulting with an expert can improve safety and ergonomics.

It often requires selecting the most appropriate options from a number of technologies that may involve various chemistries, temperature controls, chemical baths/dips, ergonomic designs, as well as cleaning, filtration, ventilation, safety, and disposal technologies.

It may also involve automating/upgrading the cleaning process for high-volume production. If the process takes place in a cleanroom, then the entire system including motors and robotics must be appropriate for that environment.

Avoiding delays
Hitting any snag can cause quality or safety issues and delay production, and can end up costing millions if the equipment has to be prematurely replaced to accommodate automation.

To avoid these "snags", it can be invaluable to partner with an equipment manufacturer with industry expertise that can help to optimise the entire product life cycle from start to finish.

While all aspects of wet process cleaning are important to consider, failing to plan for even the smallest details of cleaning equipment can lead to challenges like not complying with the local fire or building codes or even being able to get it through doors, hallways or elevators into a clean room.

One area that is often overlooked but can be essential to consider is "facilitisation" – meaning the installation, hook up (supplying deionised water, chemistries, drain lines, exhaust system etc.) and safety compliance.

Facilitisation is a major cost when considering new production equipment and changes in the equipment design to accommodate

existing facility constraints can reduce this cost. That is why it is important to work with an equipment supplier that takes those costs into consideration when quoting a project.

"The facilitisation process needs to be thought through because missing important details can cause serious problems that can compromise production and require retrofitting," explains Louise Bertagnolli, president of JST Manufacturing, which designs and manufactures manual and automated cleaning equipment, including proprietary systems with all the features and transfer devices needed for a complete turnkey cleaning process.

As an example, Bertagnolli points to a variety of logistics that must be properly implemented. This can include, for instance, getting the product and chemistries in and out of the tool, and getting the tool into the cleanroom and set up, not to mention meeting safety and exhaust system requirements, etc.

"Because the cleaning equipment can be relatively large, even the size of elevators, doors and hallways must be checked to ensure it fits," she says. "Failing this, one manufacturer had to have a crane lift the equipment through a 6th story window."

So, to prevent mistakes and ensure that wet process cleaning equipment is designed, installed and "facilitisized" in complete compliance with all safety and performance requirements, it is important for the manufacturer to work with an equipment manufacturer with the expertise to provide one-stop guidance. Getting needed expertise up front ensures that the wet process cleaning equipment will perform as required, with no unwelcome surprises.

Planning for Success

Specifying for safety and compliance is critical and many aspects need to

be sorted through to ensure the tool is designed to be integrated with the semiconductor manufacturing plant.

In terms of complying with fire codes, Bertagnolli says that if the semiconductor manufacturer has its own fire system in a clean room, then the cleaning equipment needs to communicate with it. So, if the tool has an emergency situation and needs to shut down due to fire, it must notify the house fire alarm system. Fire suppression lines must also be properly sealed and maintain sufficient pressure. Also, to qualify for fire insurance, factory mutual approved materials must be utilised.

When complying with OSHA, she adds that the manufacturer needs to have a three-foot clearance in front of lockout, tag-out areas when powering down for safety. So, this needs to be planned out as well.

According to Bertagnolli, however, there are a number of areas that are prone to mistakes during facilitisation if expert guidance is not readily available. In these areas, she suggests that it is particularly important to seek help from an industry expert that can provide one-stop guidance as needed.

To avoid unplanned problems that can delay production and may require expensive retrofits or workarounds, for example, Bertagnolli says that it is necessary to plan for the logistics of the install, down to which elevators, hallways, and doors the wet processing tank/equipment must fit through.

She adds that because many clean rooms have sub floors, it is also necessary to ensure there are structural support/leg levellers on the right floor location.

For safety compliance and performance, the manufacturer must also provide sufficient exhaust system air flow velocity, at specific cubic feet per minute rate, designed for the production space.

In addition, facilitisation involves correctly hooking up to deionized

"The facilitisation process needs to be thought through because missing important details can cause serious problems that can compromise production and require retrofitting."
Louise Bertagnolli

water, chemistries, and drain lines without any leaks.

"A common error is failing to provide pump pressure to chemistry lines when these need to be brought in from afar," says Bertagnolli. "And per safety codes, dual containment is required on chemical lines."

The chemical line/tank fill systems, in fact, must be configured correctly, or the chemistries will lack sufficient pressure to properly feed the tool or have other issues such as large amounts of entrapped gas. Facility chemical system's with chemical lines that take too many turns, becoming convoluted, can reduce pressure to the point where the tank fails to fill. So, the chemical lines must be configured in a more direct manner that maintains enough pressure to properly supply the tool/ fill the tank.

"For facilitisation to go off without a hitch, a lot of expertise, planning, and attention to detail has to brought to the project beforehand," Bertagnolli explains.

According to Bertagnolli, thorough facilitisation will even plan for and ease maintenance tasks to avoid unnecessary safety risk or cost.

How a water line runs through the cleanroom should be considered because it can decrease safety and efficiency if it encroaches on the space used to perform maintenance tasks. If planned for, however, the waterline or the cleaning equipment's maintenance space can be located in different, non-conflicting areas.

The bottom line is that for wet process cleaning equipment to be implemented smoothly and correctly, a lot of details need to be expertly determined in order to effectively handle design specification, facilitisation and production.

When well-planned with appropriate one-stop guidance, the whole enterprise can get implemented correctly the first time at minimal cost, with production going smoothly far into the future.

Bluetooth 4.0 / Bluetooth 4.2 & 5.0 module

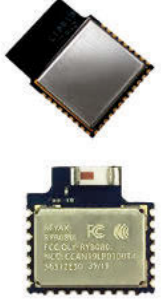**RYB070I** | 2.4GHz Bluetooth 4.0 Low Energy Module with Integrated Antenna, AT command.

RYB080I | 2.4GHz Bluetooth 4.2 & 5.0 Low Energy Module with Integrated Antenna, AT command.

TI CC2640R2FARM Cortex-M3 technical grade core Can connect to two Bluetooth devices at the same time. RYB080I Size is only 115.94mm

https://www.mansky.co.uk/products/wireless-products/wireless/bluetooth/

@: nw@mansky.co.uk
✆: +44 (0)1344 307733

www.mansky.co.uk

How a Zero Flux Current Transducer Works: new video from Danisense

Tutorial discusses how to achieve a measurement accuracy of 1PPM

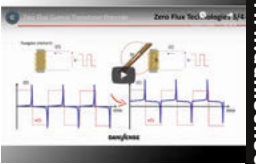InnoSwitch3-AQ achieves Q100; operates efficiently from 30 V to 550 V DC input

Danisense, the leader in high-accuracy current transducers for demanding applications, has produced a new tutorial video which discusses how – using the zero flux principle - current transducers can be produced with a measurement accuracy as accurate as 1ppm for applications such as power analysers in EV production, medical equipment such as MRI scanners and power supplies for particle accelerators.

The video explains zero flux technology, also called 'fluxgate' and how it works, including the use of a closed loop which balances opposing magnetic fields, so eliminating offset and linearity issues. Using this combination of techniques, it is possible to achieve extremely accurate results even in a harsh environment.

Comments Loic Moreau, Sales & Marketing Director, Danisense A/S: "The test and measurement industry has had to be extremely creative to cope with the increasing challenges set by customers who require greater accuracy in tough conditions.

@: lmo@danisense.com
✆: +41 78 704 29 67

www.danisense.com

Lattice Accelerates FPGA-based Processor Design

Lattice Accelerates FPGA-based Processor Design with New IP Ecosystem and Design Environment

Lattice Propel Provides RISC-V Support and a Robust IP Portfolio to Enable Development of Processor-based Systems in Minutes

Lattice Semiconductor Corporation (NASDAQ: LSCC), the low power programmable leader, today announced Lattice Propel™, a new software solution designed to accelerate development of unique applications based on low power, small form factor Lattice FPGAs. The design environment will empower developers of any skill level to quickly and easily design Lattice FPGA-based applications by enabling the easy assembly of components from a robust IP library that includes a RISC-V processor core and numerous peripherals. The Propel design environment automates application development for developers serving the communications, computing, industrial, automotive, and consumer markets.

In order to leverage the parallel processing capabilities of FPGAs in more complex systems, first-time FPGA developers want application design solutions that are flexible, easy-to-use, and integrate all design software and IP required to develop emerging applications without a learning curve. Lattice Propel's correct-by-construction development tools automate much of the design process to simplify overall system development.

@: Bob.Nelson@latticesemi.com
✆: 408-826-6339

www.latticesemi.com

Nexperia announces next generation 650 V Gallium Nitride (GaN) Technology

Next-gen GaN technology targets automotive, 5G and datacenter applications; Devices available packaged in TO-247 and innovative Copper Clip SMD

Nexperia, the expert in essential semiconductors, has announced a new range of GaN FET devices featuring next-gen high-voltage GaN HEMT H2 technology in both TO-247 and the company's proprietary CCPAK surface mount packaging. Devices achieve superior switching FOMs and on-state performance with improved stability, and simplify application designs thanks to their cascode configuration which eliminates the need for complicated drivers and controls.

The new GaN technology employs through-epi vias, reducing defects and shrinking die size by around 24%. RDS(on) is also reduced to just 41 mΩ (max., 35 mΩ typ. at 25 ℃) with the initial release in traditional TO-247, with high threshold voltage and low diode forward voltage. The reduction will further increase, to 39 mΩ (max., 33 mΩ typ. at 25 ℃) with CCPAK surface-mount versions. Because the parts are configured as cascode devices, they are also simple to drive using standard Si MOSFET drivers. Both versions meet the demands of AEC-Q101 for automotive applications.

@: petra.beekmans@nexperia.com
✆: +31 6 137 111 41

www.nexperia.com

OMC's new hermetically-sealed FDE851HLBF infra-red fibre optic emitter

OMC's new hermetically-sealed FDE851HLBF infra-red fibre optic emitter optimises long-term reliability in challenging environments

Specialist 850nm device delivers signal integrity with high intensity beam

OMC, the pioneer in optoelectronics design & manufacture, has released a hermetically-sealed 850nm fibre optic transmitter diode which delivers a high intensity output for coupling into multimode fibres even in challenging environments. Designed for applications where long term reliability is paramount, this device is highly specialised with very few similar products available on the market globally. It suits a wide range of fibre optic applications including datacomms, sensing, encoding, instrumentation and signalling, ensuring speed and integrity of signal over a long operating life.

The FDE851HLBF 850nm emitter features a hermetically-sealed TO-can body with glass optical window that helps protect the device internals from atmospheric conditions.

@: Heathw@omc-uk.com
✆: +44-1209-215424

www.omc-uk.com

Pickering Electronics' miniature HV reed relay at the heart of IC test system

Custom request becomes industry's smallest high voltage reed relay

Pickering Electronics, the reed relay company which has pioneered miniaturization and high performance for over 50 years, has announced that it has developed a miniature high voltage relay for use in a new test rig, designed by globally-renowned chip maker, ON Semiconductor.

In switching systems for test and measurement applications, reed relays are often the best solution thanks to their small size, high isolation resistance, hermetically sealed contacts, fast operate time and long-life expectancy. When developing a new test rig, ON Semiconductor – a long-standing customer of Pickering - identified the need for a reed relay with a stand-off voltage of at least 400VDC, which was also small enough to meet its demanding high switching density requirements.

The internal clearance constraints required by the uprated specs would not fit within the package dimensions of other miniature relays in Pickering's broad portfolio.

@: poppy.moore@pickeringrelay.com
✆: +44 1255 428141

www.pickeringrelay.com

Power Integrations Releases Highly Integrated InnoSwitch3

Power Integrations Releases Highly Integrated InnoSwitch3 Flyback Switcher IC for Automotive BEV and PHEV Applications

InnoSwitch3-AQ achieves Q100; operates efficiently from 30 V to 550 V DC input

Power Integrations (Nasdaq: POWI), the leader in high-voltage integrated circuits for energy-efficient power conversion, today announced the production release of the InnoSwitch™3-AQ, an AEC-Q100-qualified flyback switcher with integrated 750 V MOSFET and secondary-side sensing. The newly qualified device family targets automotive EV applications, such as traction inverter, OBC (on-board charger), EMS (energy management DC/DC bus converters) and BMS (battery management systems).

The InnoSwitch3-AQ uses Power Integrations' high-speed FluxLink™ coupling to achieve ±3% accuracy for combined line and load regulation while eliminating both dedicated isolated transformer sense-windings and optocouplers.

@: nina.hurd@power.com
✆: (408) 414-8785

www.power.com

System-on-Module from Direct Insight

System-on-Module from Direct Insight packs STMicro ST32M1 ARM Cortex-A7 performance in tiny QFN-style package

Solder-down QSMP solves production challenges

Direct Insight, the UK-based, technical systems integrator and reseller of system-on-module (SoM) and other embedded systems, has announced the tiny QSMP Solder-down module with STMicro ST32M1 single/dual core ARM Cortex-A7, manufactured by the company's long-standing partner, Aachen-based Ka-Ro Electronics. The module's ST32M1 family processor provides a single or dual 650MHz ARM Cortex-A7 core as well as a separate ARM Cortex-M4 running at 200MHz. Also featured is up to 512MB of DDR3L RAM, up to 4GB eMMC Flash, and a range of interfaces. As well as very low-power operation, the ST32M157C can offer a powerful 3D GPU, secure boot and an AES/TDES/SHA crypto-engine.

The new QSMP SoM measures 27mm square and just 2.3mm high. It features a solder-down package with a QFN-type pin-out based on a 1mm pitch with 100 edge-located pads. This design aids inspection and simplifies routing, even permitting a two-layer baseboard and a base plane.

@: David.Pashley@directinsight.co.uk
✆: +44 (0) 1295 768 800

www.directinsight.co.uk

ENGINEERING
DESIGN SHOW
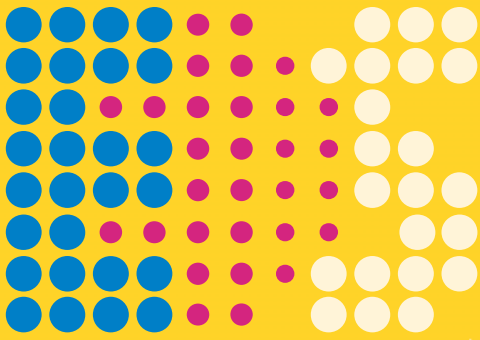
in 𝕏 @EngDesignShow

THE LARGEST UK EVENT DEDICATED TO DESIGN ENGINEERING

31st March – 1st April 2021
Ricoh Arena, Coventry

BOOK YOUR STAND NOW!

**For further information contact
gordon.kirk@markallengroup.com**

WWW.ENGINEERINGDESIGNSHOW.CO.UK