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COMMENT

AIRWAVE ANGST

Over budget and late
ANOTHER PUBLIC-SECTOR PROCUREMENT FIASCO EMERGES.

Being able to provide mission critical communications to the UK’s emergency services is essential and the UK government, back in 2015, decided to replace the existing Airwave Network with a new Emergency Service Network (ESN).

Intended to save money, while providing a vastly improved service for emergency services across England, Scotland and Wales, it has now become apparent that it is facing a significant delay of several years before it’s ready to go live.

Estimates suggested that ESN would generate savings upwards of £200 million a year and it was claimed that it would be more flexible, enabling users to exchange data and images more easily. The new service would see the replacement of, essentially, old-fashioned brick phones with smartphones.

Instead, in what is a long line of botched public-sector procurements, the costs of the project look set to spiral, due to this three-year delay. Rather than 2019, as originally intended, it is now unlikely that the deployment of ESN will take place any sooner than 2022.

That delay is set to cost the UK taxpayer over £1.2 billion and the emergency services are now looking to have to cover additional annual costs of £400 million. Development and set-up costs are expected to add an additional £200 million to that.

Last year the Public Accounts Committee warned that the 2019 operational deadline was unlikely to be achieved, and it now seems that the Home Office has quietly confirmed those worries.

Overly ambitious and far too optimistic? It seems that yet again the pressure to roll out an untried technology, without adequate testing or sensible costings, has back-fired.

Far too few bidders for a very complex technical project and everything being created from new should have raised some concerns but, yet again, warnings were ignored.

One company has benefitted from this though – Motorola. Not only does the company own the Airwave Network but it’s also the lead partner in the ESN project.

A case of tails I win, and heads……I win!

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

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BEEAs winner

THE BRITISH ENGINEERING EXCELLENCE AWARDS NAMES AESSEAL AS ‘BEST OF THE BEST’ AS IT SCOPS GRAND PRIX AWARD. BETHAN GRYLLS REPORTS

Commended for its work in encouraging increased interest in engineering and promoting the uptake in STEM subjects, AESSEAL, specialist in the design and manufacture of mechanical seals and support systems, took home this year’s title of Grand Prix winner at the BEEAs ceremony.

Held at etc. venues in County Hall, London, on October 4, 2018, the day saw a whole host of extraordinary talent, including Design Engineer of the Year, Orla Murphy, and Young Design Engineer of the Year, Brent Brakeboer, both of whom have been deeply involved in outreach activities – an important quality the BEEAs judges look for in its winners.

Luke Webster, Publishing Director of awards organiser MA Business, commented, “Once again, the BEEAs has attracted a host of impressive entries from brilliant British innovators. Through every category, the judges were deeply impressed by the quality of engineering put forward and the talent behind it. I congratulate all those entrants that were shortlisted and, of course, the winners.”

Automotive lighting growth

The automotive lighting market will grow at a CAGR of more than 5% from 2018 till 2024, according to market research and strategy consulting firm, Global Market Insights.

Driving this growth is the increasing demand for advanced LEDs and laser-based light modules to improve the vehicle safety parameters and providing aesthetic looks.

LED lighting technologies are proving popular due to the rising implementation of vehicle lighting systems, adds Global. However, it anticipates that high tariff and trade restrictions in several countries may hamper the market.

These restrictions limit the sales of lighting and other automotive systems to different countries, according to Global. In addition, fluctuations in the raw materials and component prices due to changing supplier conditions will hinder the product development.

Global says commercial vehicles are witnessing steady growth due to the implementation of enhanced lighting products and growth in trade and transportation business, and government infrastructure development projects.

The European automotive lighting market, valued at more than $8billion last year, is also anticipated to rise further due to the presence of major automotive manufacturers.

Several manufacturing standards, set by the European Commission to support sustainable development and energy-efficient products, will also contribute to this industry growth, concludes Global.
**Imagination works with GF**

Imagination Technologies and GLOBALFOUNDRIES (GF) are collaborating to provide ultra-low-power baseband and radio frequency (RF) solutions for Bluetooth Low Energy (BLE) and IEEE 802.15.4 technology. The partnership will involve using Imagination’s Ensigma connectivity IP on GF’s 22nm FD-SOI platform.

The combination of 22FDX technology and Imagination’s Ensigma IP will provide a power and cost-efficient solution that customers will be able to integrate into their System-on-Chip (SoC) designs. Mutual customers will be able to create differentiated connected devices for the IoT using Imagination’s ultra-low-power Ensigma connectivity engines in GF’s 22FDX process.

Imagination has also joined GF’s FDXcelerator Partner Program to provide a set of resources including EDA tools, IP, silicon platforms, among others specific to 22FDX technology.

**Brighton 5G testbed**

A UK 5G testbed has been launched to showcase some of the region’s latest innovation and immersive technology companies.

The hope is that this will allow Brighton-based small businesses to benefit from 5G mobile wireless communications and provide a space to test and explore the potential applications of 5G.

The facility provides an environment where start-ups and scale-ups can access “the most advanced digital technology solutions”, including an Immersive Lab, designed to help these businesses grow faster. Digital Catapult and partners are encouraging local companies to register to take part in using the testbed to develop their ideas.

The testbed should also help to meet the commitment in the Government’s Industrial Strategy for the UK to be a world-leader in 5G technology.

**Safer autonomous driving**

ARM HAS UNVEILED WHAT IT SAYS IS THE FIRST AUTONOMOUS-CLASS PROCESSOR WITH INTEGRATED SAFETY. NEIL TYLER REPORTS

The Cortex-A76AE is a CPU that has been designed specifically for automotive and optimised for 7nm process nodes. AE stands for “Automotive Enhanced” and any Arm IP with that designator will include specific features addressing the requirements of in-vehicle processing. A high level of processing capability is required for autonomous driving, with inherent safety as standard. The Cortex-A76AE is the industry’s first high-performance application processor with Split-Lock capability, combining the processing performance required for autonomous applications and high-integrity safety.

While Split-Lock is not new to the industry, Arm claims to be the first to introduce it to a processor uniquely designed for high performance automotive applications such as autonomous drive.

Split-Lock delivers: flexibility not available in previous lock-step CPU implementations; enables CPU clusters in an a SoC to be configured either in “split mode” for high performance, where two (or four) independent CPUs in the cluster can be used for diverse tasks and applications, or ‘lock mode’ where CPUs are in lock-step, creating one (or two) pairs of locked CPUs in a cluster, for higher safety integrity applications.

The Cortex-A76AE also offers improved power efficiency and enables a more energy-efficient use of vehicle battery power combined with thermal efficiency. To complement the Cortex-A76AE, Arm is introducing a new Automotive Enhanced system IP for designing a comprehensive autonomous-class SoC.

**PC TAM growth ups pressure**

Intel CFO and Interim CEO, Bob Swan, has pointed to a “continued explosion of data” and “the need to process, store, analyse and share”, as a key driver for industry innovation which has resulted in a demand for “compute performance in the cloud, the network and the enterprise”.

Intel’s data-centric businesses grew 25 percent through June, and cloud revenue grew 43 percent in the first six months, he said.

Second quarter PC shipments grew globally for the first time in six years, and Intel now expects modest growth in the PC total addressable market (TAM).

With the “surprising return to PC TAM growth” he admitted Intel’s factory network will be under pressure. Consequently, production of Intel Xeon and Intel Core processors are being prioritised, so that collectively it can serve the high-performance segments of the market.

Swan said Intel will be investing $15bn in capital expenditures in 2018. This is an increase of $1bn from the beginning of the year, and will go towards Intel’s 14nm manufacturing sites in Oregon, Arizona, Ireland and Israel.

Swan said Intel was also making progress with 10nm, with yields improving, and still expects to see volume production in 2019.
Xilinx unveils Versal

THE FIRST IN A NEW CATEGORY OF PLATFORMS DELIVERING RAPID INNOVATION AND SCALABLE AI INFERENCE. NEIL TYLER REPORTS

Speaking at the company’s Developers’ Forum in San Jose, Xilinx CEO Victor Peng unveiled Versal – the industry’s first adaptive compute acceleration platform (ACAP).

Versal ACAPs combine Scalar Processing Engines, Adaptable Hardware Engines, and Intelligent Engines, with memory and interfacing technologies to deliver powerful heterogeneous acceleration for any application.

The platform’s hardware and software can be programmed and optimised by using a host of tools, software, libraries, IP, middleware, and frameworks that enable industry-standard design flows.

Built on TSMC’s 7-nanometer FinFET process technology, the portfolio is the first platform to combine software programmability with domain-specific hardware acceleration and includes six series of devices architected to deliver scalability and AI inference capabilities for a host of applications across different markets.

“With the explosion of AI and big data and the decline of Moore’s Law, the industry has reached a critical inflection point. Silicon design cycles can no longer keep up with the pace of innovation,” said Peng. “Four years in development, Versal is the industry’s first ACAP. It’s been designed to enable all types of developers to accelerate their whole application with optimised hardware and software and to instantly adapt both to keep pace with rapidly evolving technology. It is exactly what the industry needs at the exact moment it needs it.”

Breakthrough performance

Xilinx has launched a portfolio of accelerator cards designed to increase performance in industry-standard servers across cloud and on-premise data centres.

Customers can expect performance improvements at low latency when running key data centre applications like real-time machine learning inference as well as video processing, genomics, and data analytics, among others, Xilinx says.

The Alveo U200 and U250 are powered by the Xilinx UltraScale+ FPGA and allow customers to reconfigure the hardware, without incurring replacement costs.

For machine learning, the Alveo U250 is said to increase real-time inference throughput by 20X versus high-end CPUs, and more than 4X for sub-two-millisecond low-latency applications versus fixed-function accelerators like high-end GPUs. The accelerator cards also reduce latency by 3X versus GPUs, according to Xilinx.

Arm and Xilinx join forces

A partnership between Arm and Xilinx is looking to bring the benefits of Arm Cortex-M processors to FPGAs through the Arm DesignStart programme.

According to Arm, this collaboration will mean it will now be possible to gain fast, completely no cost access to proven, soft processor IP, easy design integration with Xilinx tools and comprehensive software development solutions to accelerate the development of FPGAs.

Arm’s Cortex-M processors give embedded developers the opportunity to benefit from simplified software development and superior code density. In addition, they will now have the support of a broad technology ecosystem of software, tools and services providing a valuable and accessible path on which to scale products.

Developers can choose from a number of options by considering factors such as design requirements, budget, resource availability and time-to-market, all critical in an increasingly connected world with a vast range of applications and needs.

Options include SBCs, off-the-shelf chips, FPGAs and custom silicon.
Speaking at Qualcomm’s recent ‘State of Play’ 5G briefing in London last month, Ben Timmons, Senior Director of Business Development at Qualcomm Europe, suggested that while there was considerable PR swirling around 5G, there was a real possibility that we would see the commercial launch of 5G devices as early as Q1 2019.

As recently as June the idea of devices appearing next year and the very ‘idea’ of 5G, “seemed distant,” he said. However, pointing to ‘real’ activity on the device side and to significant new developments around the issue of interoperability, Timmons now believes that the prospects for the next generation technology were far more “tangible” than had been the case, hitherto.

Timmons said that in order for 5G to become a reality it was crucial that interoperability between technologies, such as Qualcomm’s Snapdragon X50 5G modem and the infrastructure network platforms of vendors, was proven and seen to work.

Qualcomm demonstrated the interoperability of its technology earlier this year at Mobile World Congress. Working with Ericsson and Nokia it had shown, “that the technology we are developing – that was actually going to end up in the device – worked, and would interwork with other infrastructure vendors”.

In June, the wireless networks community had an enormous box ticked with the completion of the 5G new radio (NR) standard. 5G will use different kinds of antennas, operate on different radio spectrum frequencies, connect many more devices to the internet, minimise delays, and deliver ultra-fast speeds, so these latest standard specifications will present some significant challenges for the designers of 5G systems.

The Gizmo parking app, appears to be costing considerably more to develop than anticipated.

Absolutely. Green for free parking and red or charged.

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Trouble is I forgot our test driver was colour blind!

According to Timmons, while the device is certainly large, although considerably smaller than competitors’ test devices, he hastened to add, it was actually being used by engineers, infrastructure vendors and operators “to test 5G is actually working”.

The test device, along with its X50 chip and the next Snapdragon processor, due to be unveiled shortly, suggest that Qualcomm is on “route to commercialisation”, according to Timmons.

So, when are devices likely to be in the hands of consumers?

“The end of Q1 next year, or the beginning of Q2,” says Timmons. However, he warned that while there may be phones, “It may be there is no network there and operators don’t have launch plans in those timeframes. But in terms of the process that we are going through, in terms of doing interoperability testing with the infrastructure vendors and developing a commercial smartphone, we are on track.”

That will come as a relief to those telecoms companies who are investing in spectrum for 5G.

Financial concerns are palpable. In Italy, after a fiercely fought auction, the Italian government was able to raise €6.5bn from selling the country’s 5G frequencies. The auction winners, Telecom Italia and Vodafone, each committed to pay about €2.4bn for the largest blocks of spectrum.

“We might not be there yet,” Timmons concluded, “but devices are in factories, being tested and they are working.”
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Teach them to fish

Cybercrime is on-going, but many breaches could be prevented according to Niroshan Rajadurai. Bethan Grylls finds out why business know-how is the key

Last year was dubbed the “worst ever” by the Online Trust Alliance for data breaches and cyber incidents around the world. Interestingly, it revealed that 93% of the breaches recorded in 2017 could have been prevented. And with cybercrime continuing to make the headlines, this year hasn’t seen much improvement. Niroshan Rajadurai, director of sales and field engineering EMEA at Semmle, software specialists, believes that industry is going wrong and failing to address the problems of cybercrime correctly.

“Software is ‘eating’ the world” Rajadurai explains. “Right now, we’re in the Software Age. Digitalisation is being embraced by more businesses all the time; companies are taking traditional processes and integrating Internet of Things (IoT) capabilities into them.”

Although software proliferation is opening up a range of possibilities for businesses and customers, Rajadurai suggests that it is also one of the biggest challenges for software developers, because it’s opening doors for hackers too.

“If you go to your friend’s house, you can leave your mobile on the table and know if you came back in a few hours, it should still be there,” Rajadurai says. “If you did the same at a shopping centre, there’s no guarantee your mobile will still be there when you returned.

“It’s the same concept,” he suggests, “a company has written a piece of software with the expectation it will be in a self-contained, safe environment. For businesses to keep up with the velocity of digitisation we’re seeing today, they’re using the same software but it’s entering a non-self-contained area.”

He continues, “The issue is that these older processes weren’t designed to be connected and as such, are vulnerable to attacks. Just one weak link in a system can expose you to cybercriminals.”

So why not simply discard the old technology if it isn’t up to par? “To simply throw away technology is a non-starter, for one thing that would be extremely expensive,” Rajadurai explains. “Companies are left with no choice but to keep the technology they have and find a quick way to scale it to better address the changing requirements of their markets.”

Rajadurai believes the explosion of software has been, in part, driven by online retailers like Amazon.

“Businesses are having to “transition”, moving from a manual process, where it oversees applications and web servers, to an automated method of service,” he says. “This is pushing the need for software which is required to deliver this automation.” The concern, however, is that this demand is pressurising companies to deliver automated services too quickly and, as a result, security is not being properly addressed.

The skills gap isn’t helping the problem either, stresses Rajadurai. “The number of software engineers isn’t growing at the same pace as the volume of software, and this poses a big challenge with regards to building software efficiently and reliability.”

In an effort to strengthen business cybersecurity, Semmle offers businesses consultancy services which aim to help them reduce the time, effort and cost of verifying and validating systems.

“Traditionally, businesses have had to rely on vendors to provide updates – that is ‘bug fixes’ - with no control over when this would be delivered. I strongly believe in giving people the power to control their own destiny.

“Our approach is to put ‘helpful’ technology in front of these companies and teach them the skills they need in order to deploy and manage their systems securely. This means they can protect themselves without relying on specific individuals or a third party for support.”

Variant attacks

One particular issue Rajadurai highlights is ‘variant attacks’ – a tactic where hackers use public bug updates as a means to finding vulnerabilities in other areas of a company’s technology.

“If a company makes a fix and pushes it out there, they’ve immediately told the world ‘we’ve got an issue’,” Rajadurai explains.

To avoid such attacks, some businesses have started to go through what Rajadurai calls a ‘diagnosis fix cycle’. This involves carrying out an analysis on the architecture to see if the same problem is occurring elsewhere, talking to developers, and doing a manual code review. “This approach is, however, very time-consuming”, he notes, and it’s a problem with a double-edge sword.

“Fix the one identified problem quickly and tell hackers there may be a way to get into the system,” Rajadurai says. “Don’t fix the problem and the process goes from taking a day to weeks or even months.”

Rajadurai thinks Semmle’s ‘variant analysis’ could hold the key. “We automate the process,” he says. “We take a company’s source code and convert it into a database where questions can be asked.

“Once a vulnerability is discovered in your source code, either reported by externals (bug bounty), through internal review or through root cause analysis after an incident or breach, it’s essential to detect and eliminate all semantically similar - but often syntactically very different - vulnerabilities that exist across the application portfolio. Failure to do so exposes the organisation to additional risk from malicious attackers.”
Niroshan Rajadurai has more than 18 years of embedded systems experience in the design and development of safety-critical and fault-tolerant systems. He has held a number of engineering roles within the military avionics and communications industry working for companies like Lockheed Martin, BAE Systems and NEC Telecommunications.

After the vulnerability is identified, a ‘query’ can be constructed. QL, a type of declarative, object-oriented query language, ships with extensive libraries and abstraction features that enable you to write advanced queries without having to worry about low-level language concepts and compiler specifics. “Instead,” Rajadurai says, “you can focus on investigating and interrogating your own codebases.”

The QL finds logical variants of the same error elsewhere in the code. The code is then ‘captured’ before it gets merged, preventing similar vulnerabilities from being introduced in future and “giving businesses results in days rather than weeks or months”.

He continues, “Software isn’t going to slow down. We need to keep developing tools and keep up with the speed in which it’s is being built.

“Cybersecurity has given a new meaning to quality. It doesn’t just affect the brand now, but it opens doors to more serious issues.

“Quality deficiencies have become a way of attacking businesses and stealing and exploiting data. It is no longer simply about whether a device or service can deliver its solution to a high standard, but also whether it can deliver it without opening itself or its customer to additional risks.

“These companies know they have a problem,” he clarifies, “but they don’t know how to manage that problem. The answer is teaching them the best way to address it.”
As the amount of data soars and computational power accelerates, data centres are set to have a bigger carbon footprint than the aviation industry. What can be done to address this?

By Neil Tyler

Devices and ‘things’ are being connected to the Internet at a rate that was unimaginable a few years ago. Today, businesses and institutions have become data dependent; and in our daily lives, most of us are rarely separated from a connected device.

All this ‘connectivity’ is helping to create a ‘digital universe’ that looks to extract value from data.

According to Daniel Eaton, Senior Manager Strategic Market Development at Xilinx, “Traditional databases are no longer able to handle the sheer volume of data or the diversity of data types, and the complex ways being used to combine and manipulate data in order to gain insights.”

Businesses and scientific users are becoming increasingly aware of the value contained within the vast quantities of data now collected from the physical and virtual worlds.

As Eaton explains, “The exploding volume of data and the complexity of the workloads are outstripping the performance of established data centre compute platforms.

“Customers are demanding the insights generated by analytics applications quickly, sometimes even in real-time for business or financial purposes, and traditional architectures cannot keep pace.”
The demand for data analytics is typically proportional to the amount of data being generated and as the quantity of data expands exponentially, so the need for data analytics grows.

Contemporary hardware and software architectures cannot be leveraged cost-effectively to meet the data generation, storage, and analytics needs of today’s users.

Data centres

Located in Loudoun County, Virginia, in the US, it is possible to find what is believed to be the world’s largest concentration of computing power.

An estimated 3,000 technology companies use the many data centres that have sprung up across the county. So many in fact, that it is quite possible that every one of us in the UK communicates with them every day, at some point.

It is reckoned that the district handles around 70% of the world’s online data each working day.

The growth in data centres in this region is due to a combination of factors, primarily the area’s low risk to natural disasters and, crucially, the competitive electricity prices that are available in the region.

The last factor is the most interesting and challenging because all these data centres need power and that power is supplied by a company, called Dominion.

According to Greenpeace, in a report published last year, only 1% of the company’s total electricity was generated from renewable sources, the rest came from coal, gas and nuclear power.

Dominion is also said to be looking at developing a pipeline that will carry fracked gas to its power plants. A move, it claims, that is being driven by the needs of data centres for ever more electricity.

It’s that insatiable demand for power which is raising concerns, and some believe that the call for digital services will begin to outstrip the world’s ability to supply enough electricity to power them.

There’s one interesting fact that puts the electricity demands of the data centre into some perspective and that is that they, are, within the next few years, set to have a bigger carbon footprint than the entire aviation industry.

Consider the anger generated by the decision to expand Heathrow; is there a similar response when yet another data centre is commissioned?

According to the British author, James Bridle, in a recently published book called, the ‘New Dark Age’: “In response to vast increases in data storage and computational capacity in the last decade, the amount of energy used by data centres has doubled every four years and is expected to triple in the next 10 years.”

Research conducted by W Booth School’s Lofhi Belkhir, an Associate Professor of Entrepreneurship and Innovation, suggests that data centres and smartphones will become the most damaging information and communications technologies to the environment by 2040.

According to his research on the global emissions footprint of information and communications technology (ICT), which was published in the 2018 Journal of Cleaner Production, Belkhir found that ICT has a far greater impact on emissions than previously thought.

“The ICT industry as a whole has been growing incrementally,” Belkhir says, “but if trends continue, it will account for as much as 14% of the total global emissions footprint by 2040.”

If that proves accurate, then it will equate to half of the emissions of the entire transportation sector worldwide.

Telecommunications networks and data centres consume vast amounts of energy and most are powered by electricity that is generated by fossil fuels.

When it comes to designing and building a data centre there are numerous concerns that need to be addressed, including temperature control, humidity control, static electricity control, fire suppression and physical security systems.

Heat and humidity are chief among those issues that data centres work hard to combat, but as they get bigger so it becomes harder to maintain temperatures and keep humidity under control, both consume vast amounts of power.

The demand for more processing capacity is being driven by the rise of the Internet of Things, with billions of devices expected to be transmitting and receiving data in a few years’ time. The advent of 5G will enable even more data to be transmitted and is seen as crucial in driving the deployment of new technologies from virtual reality to driverless cars – but all this energy-intensive communication will only add to the demands being placed on data centres.

Some of the world’s biggest users of data centres are certainly aware of the problem and have been working to reduce the environmental impact of their operations.

Companies, especially those in Silicon Valley, talk of having an environmental conscience and among their number the most important, including Facebook and Google, are looking to power their operations solely by using clean and renewable energy.

Facebook talks of using “100% clean and renewable energy”, to power its operations, while Google says that it has already achieved that goal.

Apple also claims that it is entirely dependent on renewable power.

While companies use these sources of power many use carbon offsetting, to offset their use of fossil fuels, but that’s not solving the fundamental environmental issues around growing data centre usage.
Even among the big technology companies their commitment to the environment has been questioned. Amazon and its cloud-computing division, Amazon Web Services (AWS) provides few details on its electricity consumption and it talks little about its ‘carbon footprint’.

And while we may be focused on Silicon Valley, the rise of the technology sector in China raises questions as to what other leading technology companies are doing when it comes to electricity use.

According to Greenpeace, “Among emerging Chinese internet giants such as Baidu, Tencent and Alibaba, the silence on energy performance still remains. Neither the public nor customers are able to obtain any information about their electricity use and CO2 target.”

**Technological solutions**

Despite the efforts of some leading technology companies to be more transparent about their energy consumption, what can be done to make data centres more energy efficient, especially when data centre construction continues unabated, and less reliant on fossil fuels?

In the face of criticism about their ecological footprint, more providers are looking to renewables.

Solar energy is increasingly being viewed as a sustainable energy source, as costs of solar technology continue to fall – the International Energy Agency predicts that solar could be one of the world’s main sources of energy within the next five years.

One company that has sought to embrace a fossil-free future is Iron Mountain, a specialist in delivering data and management services.

The company has recently announced that its data centres across Belgium, the Netherlands, and the UK are now utilising all of their electricity from renewable sources rather than coal and natural gas, as had been the case.

Iron Mountain recently pledged to make the transition to green after joining the RE100 initiative, a collaborative, global initiative that brings together more than 100 businesses all of whom are committed to 100% renewable electricity.

Commenting, Steve Kowalkoski, senior VP for Iron Mountain UK & Ireland, said, “We are aware we have an obligation to operate responsibly in the environments where we live and work, despite growth in our business. Looking across our operations, including the recent data centre acquisitions, they saw an opportunity and solved this environmental challenge in a way that’s good for our business and our customers while also ensuring we are prepared for future business and footprint growth.”

Aside from going green, companies like Xilinx and Intel are helping to drive high-performance computing, with the development of new platforms that leverage hardware acceleration within heterogeneous architectures that are supported by flexible combinations of conventional CPUs, Graphics Processing Units (GPU) and Field-Programmable Gate Arrays (FPGA).

A new generation of compute accelerators is now emerging, which takes advantage of the individual strengths of each type of processor to deliver significant improvements in performance, space efficiency and, crucially, power.

MIT’s Computer Science and Artificial Intelligence Laboratory has developed a new system for data centre caching that uses flash memory.

This could prove important as data centres, those used by the likes of Google or Facebook, might use up to 1000 servers that are dedicated to caching – they’re expensive to run and use vast amounts of power. The MIT solution replaces RAM with flash, consuming just 5% as much energy and is significantly cheaper.

Flash also has 100 times the storage density of RAM which could mean smaller data centres and far fewer cache servers.

The drawback to flash is that it’s much slower than RAM but, according to MIT, flash access is still much faster than human reactions to new sensory stimuli.

The data centres of the future will develop an exponentially smaller footprint, but with far greater utility. They will be modular, which will mean that they can be deployed more quickly and cheaply, and scale on demand, while their requirements for cooling, humidity and airflow will certainly become more efficient.

Flexenclosure, a Sweden-based designer and manufacturer of prefabricated data centre buildings has, for example, developed the eCentre, a state-of-the art, custom-designed, prefabricated and pre-integrated data centre building that is fast to deploy, energy efficient and fully future proofed.

Yet, despite the efforts of so many enlightened, and not so enlightened companies, to reduce energy consumption or to switch to alternative forms of renewable energy, there are those who are talking about the possibility of having to ration Internet use.

Fear mongering or not, could unlimited digital consumption simply be unsustainable in the long run?
AMOLED Displays

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With the rapid increase being seen in the electrical content in today’s automobiles, there is a growing requirement for what many call a revolution in analogue integrated circuit (IC) design methodology.

Why? Well, when compared to designing for consumer electronics, designing for mission-critical applications, such as industrial, medical, space, and automotive, a very different approach to reliability analysis is required.

So, in what way does reliability analysis need to change in order to meet the needs of mission-critical designs?

Some of the key changes include better modelling of device degradation and accelerating electrical aging with additional phenomena that contribute to shifts in device characteristics.

One of the main challenges for mission-critical design is the need to reduce the failure rate across the product lifetime. Traditionally, the failure rate has been expressed as the bathtub curve.

The bathtub curve has three regions: early life, useful operating lifetime, and end of life. It describes the general types of failures that occur after these devices reach consumers. Early failures are primarily due to test escapes (defective devices that are not identified during test).

During the useful operating lifetime, the challenge of the source of failures is to assure that the device is constrained to operate within the operating range used for reliability analysis; in particular, design to prevent thermal overstress is critical. At the end of life, failures occur due to the fact that devices wear-out – that is, changes of device characteristics due to electrical stress.

While engineers may think in terms of the bathtub curve, customers, – automotive customers in particular – will often have a different view. They want the failure rate for an IC to start out low: ideally, zero defective parts per million (dppm) and stay at zero dppm until beyond the useful lifetime of the product.

Consider the effect of a 1dppm failure rate for ICs on an automobile. If a typical mid-class car has 80 electronic control units (ECUs), and each ECU contains several ICs, then for every million cars produced, about 1.5%, or 15,000 cars, of the vehicles will have a defect.

Design for automotive applications also place high expectations on reliability; the lifetime of ICs compared to the traditional requirements of consumer applications. Typical operating lifetimes for consumer products are from one to three years, by contrast automotive applications require up to 15 years of lifetime.

Reliability analysis
It has long been recognised by designers that they need to be able to analyse the reliability of ICs. One early tool for analysing device degradation was the Berkeley Reliability Tools (BERT). The technology is available in the Virtuoso RelXpert Reliability
Reliability solution

The Legato Reliability Solution, developed by Cadence, is intended to help extend reliability analysis for mission-critical applications. It includes several enhancements to the Virtuoso RelXpert Reliability Simulator simulation flow.

The first enhancement is improvements to the models for device degradation. The AgeMOS model is a more advanced version of the lucky electron model (LEM) model that is predictive for planar CMOS transistors down to 28nm. The LEM model is not sufficient for modelling device degradation of advanced node, FinFET, transistors. The three-dimensional (3D) structure of a FinFET results in changes in how stresses affect device degradation. So, a new aging model for FinFETs has been developed and demonstrated.

Figure 3 shows simulation results for bias temperature recovery for the new aging model. It provides better prediction of degradation and recovery across operating conditions, such as varying overdrive and recovery levels and duty cycle.

The next enhancement we will look at is how the calculation of device degradation can be improved. In the Virtuoso RelXpert Reliability Simulator simulation flow, the focus is on device degradation due to electrical stress. Other factors that can accelerate device degradation, such as temperature or process variation, are considered globally. The Legato solution has been enhanced to consider the interaction of these factors instead of decoupling these phenomena.

Figure 4 shows an example of analysing process variation and device degradation together. To improve the accuracy of reliability analysis, the reliability analysis must account for the phenomena that contribute to device degradation: electrical stress, temperature, and process variation.

Conclusion

In this article, we have looked at some new approaches to performing reliability analysis. These new approaches to reliability analysis include better modelling of device degradation and a more holistic approach for calculating device degradation.

The device degradation analysis can be improved by considering all the phenomena that result in device degradation.

The other approach to improving reliability is to better describe how the device will be used, which better models the stress the device experiences.

Reliability analysis for mission-critical applications is driving the need to provide better prediction of product lifetime.
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Clearing the air

Addressing the efficiency and sound-quality challenges of next-generation car audio, by Klaus Neuenhüskes

The automotive industry is undergoing a raft of changes, covering everything from the powertrain to assisted and autonomous driving. Regardless of when and to what extent these changes occur, in-car entertainment will remain an important item on the list of requirements for car buyers.

Modern infotainment systems are key to the driver and passenger experience, providing guidance, playing media, and even becoming the single human-machine interface in some vehicles. Central to this is high quality audio that ensures that the music played is truly represented, and telephone calls and navigation guidance are as clear as possible to minimise driver distraction.

Once an almost purely mechanical system, with few electrical items, the modern car is becoming more reliant on a range of electronic systems. Mechanical functions are migrating to electromechanical solutions to save weight and improve efficiency. Car audio is also expected to contribute to these goals while continuing to enrich the driving experience.

Surrounded by a wide range of consumer devices, such as smartphones that can be freely customised through apps, consumers are expecting a similar experience from the multimedia system in their cars. With the possibility of driving assistance systems taking over some of the stress of driving, a consumer survey by Accenture showed significant interest in being able to surf the Internet, read and dictate emails, and stream music while driving.

In fact, the survey goes as far as indicating that it is in-vehicle technologies, such as the multimedia system, that are influencing purchases more than the vehicle’s performance.

**Lifetime quality**

Key to any audio amplifier is its ability to faithfully reproduce the input signal provided. However, the amplifier is not an isolated component within the vehicle. It is a fully integrated element of a high-value solution. It is therefore imperative that it is suitably protected against potential damage. The vehicle’s owner should not require interaction with the dealership due to failure of the audio system.

The demands on semiconductor vendors are therefore extremely high, requiring audio amplifier solutions to withstand and detect a range of potential faults. For example, capacitor degradation can, over time, result in a DC offset appearing on the amplifier’s output. This can destroy the installed speakers. Modern audio amplifiers include a DC offset detector to compensate for such aging.

Size and weight are also continuously under review, as is overall cost. The Bill-of-Materials (BoM) needs to be considered carefully to ensure the price-point can be met and manufacturability is as simple as possible.

The move to new powertrains and concepts for fuel-consumption improvement are also a cause for concern. Start-stop systems can result in significant variation in power supply voltage, and the electric drives of EVs and HEVs are a potential...
additional source of EMI. On top of this, there are a range of consumer devices, such as smartphones and tablets, that can also contribute to this issue.

**New topologies**
In their search for faithfulness of reproduction, increase in power output, and improvement in efficiency, a wide range of amplifier topologies have been developed over the years. Class AB and high-efficiency Class AB are an evolution of analogue Class A and Class B topologies. These are still found in some low-end infotainment systems.

Class AB designs overcome efficiency limitations of Class A amplifiers while reducing the crossover distortion inherent in a Class B design. However, since this topology operates the transistors in their linear region, there is a limit to the efficiency that can be achieved.

Class D topologies use digital pulse-width-modulated (PWM) signals to replicate the desired analogue output. This results in a much higher efficiency since the output stage is not required to operate in its linear region. The output is fed through an LC filter, passing the low-frequency audio signal to the speakers and excluding the high-frequency elements of the digital PWM pulses.

**Attaining more efficiency**
Such amplifier designs can achieve greater than 90% efficiency at loads more than 25%, and better than 50% for light loads.

However, developers are continuously looking for ways to ensure that more of the available energy goes into the speakers and less is emitted as heat. The new Class TB (Tied BTL) amplifier from Toshiba, for example, matches the high efficiency level of Class D at low power levels while delivering an 80% power reduction when compared to Class AB. This results in an infotainment system that runs much cooler than previous generations of amplifier.

Savings are also to be found in the BoM. Class TB designs require a similar number of components to high-efficiency Class AB designs while requiring just half the BoM of the more complex Class D solution. This is in part due to the lack of need for the LC filter, allowing linear sounds of in excess of 120 kHz to be reproduced, where a Class D amplifier starts to roll off at around 20 kHz.

**Audio power amplifier**
The benefits of the Class TB topology can be realised through the implementation of an audio amplifier design using the TCB701FNG from Toshiba. The device provides four channels of audio, delivering 49W of efficient, high-quality audio (THD = 0.02%) and a range of diagnostic functions built-in. Its inherent robustness against EMI also reduces the number of external components required, as does the lack of need for an LC filter.

The risk of speaker burn-out is prevented by a significant DC offset voltage protection system that functions in conjunction with the host microcontroller. Power-related protection, such as thermal shutdown, over-voltage, short to VCC and GND, and output-to-output shorts are also implemented. Cross connection detection is also implemented in the output circuitry.

Further functionality is provided via an I2C interface. Functions such as muting, entering of standby mode, and front/rear gain adjustment can be easily integrated into the infotainment software and HMI. The interface also provides access to output offsets, clip detection and integration diagnostics features.

The device supports a supply range of 6 – 18 V DC, making it suitable for vehicles with engine idle reduction implementations. In order to simplify evaluation, a development board that works with the commonly available Raspberry Pi single-board computer is also available.

With increasingly sophisticated infotainment systems being integrated into modern vehicles, audio quality plays a significant role in the purchasing decisions made by consumers. A clean audio experience, free from EMI interference delivering a powerful output, is a key differentiator for automotive OEMs.

Through implementation of a Class TB amplifier configuration, the TCB701FNG delivers a compact, BoM-optimised solution with minimal heat generation that meets the needs of suppliers, while simultaneously fulfilling the aural requirements of increasingly demanding consumers.
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It’s a given that designers of electronic products are under pressure to develop new, or look to the evolution of, products. But whatever their approach they have to address key trends such as the need for higher densities, greater speeds, expanded connectivity and improved power management.

These pressures are just as acute for those involved in the development of industrial connectors. Engineers find themselves under pressure to provide solutions that ensure that data is delivered more quickly and securely, or have to deliver more power, while at the same time ensuring connectors take up less space.

The impact of Industry 4.0 digitalisation processes on existing production plant environments, as companies look to use technology to raise productivity levels and reduce costs, is proving challenging.

“Industry 4.0 has led to more complex set-ups. Large quantities of low latency data, acquired from sensing or monitoring devices, has to be distributed throughout the system and, of course, the factory floor presents an extremely challenging environment for any form of electronic component that is incorporated into the equipment being utilised - including connectors,” says Wendy Jane Preston, Technical Marketing Engineer, at Harwin.

“A direct consequence of this approach is that we are seeing a more modular approach to production platforms,” explains Howard Forryan, a product marketing specialist at Harting. “This can involve either the application of new modular machines into a production line or the retrofitting of existing installed equipment, to support a more modular and decentralised interconnected control system solution.”

It’s an approach being used in even the harshest environmental plant conditions, for example where there are very high operating temperatures.

“Connectivity in industrial applications is a critical element and so the components providing this aspect need to be rugged enough to function accordingly. In this context there is the potential for not only ongoing exposure to elevated temperatures, but heavy shocks or strong vibrational forces,” says Preston.

“In the past, limitations in the operating performance of a connector have often meant that equipment has had to be hard-wired in such situations,” Forryan explains. “However, new types of connectors are able to support greater flexibility in such conditions. As a result, reduced wiring complexity means that such an installation can be optimised and maintenance costs reduced.”

Harting has developed a range of special connectors to provide reliable solutions for such high-temperature environments. In the case of a bulkhead-side connector, seals must not melt or adhere to other integrated component parts over the full operating temperature range.

Many hood and housing coatings and lacquers, that are currently available on the market, are not suitable for long-term use at high temperatures as they can cause melting which can, in turn, lead to mated parts sticking together.

“In response Harting has developed a special surface treatment of the aluminium die-cast hoods and housings, meaning that we have been able to dispense with any potentially detrimental additional protective coating finish,” Forryan explains.

Insulating body and contacts must be able to withstand the high ambient conditions of the location and the additional heat generated inside the housing when under mated load. Harting uses a high-temperature-resistant copper alloy contacts that maintain constant electrical properties when heated. In addition, high-temperature LCP plastic insulators ensure long service life.

Higher density an issue

“With ever more sophisticated systems to deploy, but less and less room in which to deploy them, higher density arrangements need to be utilised,” suggests Preston.

“Not only will the constituent components have to fit into the confined space available, but they should also not create an obstacle that impinges on the system’s thermal management activities (by obstructing the airflow passing over the boards on which they are situated).

“Though 2mm pitch connectors were quite acceptable a few years back, now lower profile connectors with much narrower pitches are being mandated.”

Speed, density and connectivity

Just how are connector companies looking to address the demanding requirements of the industrial sector?

By Neil Tyler
A durable plastic construction is also normally recommended, explains Preston, in order to maximise mechanical robustness.

“It also, almost, goes without saying that a wide working temperature range will be considered obligatory,” she adds.

In response to the changing needs of the industrial space, Harwin has come up with the Archer Kontrol series.

“Suited to a broad array of heavy industrial tasks, these 1.27mm pitch interconnect solutions exhibit a high degree of mechanical robustness, while at the same time delivering substantial flexibility.

“They have a current rating of 1.2A per contact, and a choice of 12, 16, 20, 26, 40, 50, 68 or 80 pin versions for edge-to-edge, parallel board-to-board or right-angle mother-to-daughterboard orientations,” explains Preston. “An extensive variety of different stacking heights are available for design flexibility, so that boards can be stacked together at spacings that are suitable for the rest of the equipment layout.”

With a fully shrouded design, these connectors have strong resilience to vibration and other mechanical forces, while polarisation of the shroud and lead-in chamfers facilitate blind mating procedures.

“They support 500 mating/unmating cycles, possess an insulation resistance of 1000MΩ (minimum), can deal with 500V AC and have a working temperature range that spans from -55°C to +125°C,” says Preston.

**Configurator**

In a move designed to aid and speed up the selection of heavy-duty industrial connectors Harting has created what it calls the Han Configurator, an interactive tool that helps in the selection of heavy-duty industrial connectors.

It allows engineers to access all the necessary information and relevant data on the individual interface components prior to producing a design that can be viewed as a 3D model in real time. It helps generate solutions from an extensive portfolio, without the user having to be or become a component specialist himself.

The designer starts by selecting three inputs (contacts, voltage and current) to generate the first possible solution. At each stage of the process the user can receive suggestions for alternative interfaces and via the “smart assistant” feature the configurator will only allow valid configurations to be implemented, saving valuable design time.

Despite increasingly complex requirements and a high level of product diversification, the smart configurator makes the connector selection process much more manageable.

An “expert” mode, enables users who already know the product numbers or names they are looking to set up their interfaces in the configurator, making them easily manageable for subsequent processing. The choice of housing (top/bottom) or insert (pin/socket) is all that is necessary to begin the configuration process.

An on-screen 3D visualisation of the configuration, allows the design to be viewed from a range of angles. Each configuration is assigned its own number, allowing it to be saved for revision at a later date.

Challenging as the industrial space can be, solutions and tools are on hand to aid engineers in their designs.
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New 1.27mm pitch Archer Kontrol connectors in horizontal and vertical layouts with 12-80 pin combinations.

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Technical cleanliness isn’t new, but as vehicle autonomy becomes a reality, the necessity for clean components becomes a crucial practice for the automotive sector. By Bethan Grylls

Once regarded as a purely mechanical industry, the automotive sector has entered an electronic era as a result of increasing demand for electric vehicles, infotainment systems and driver assistance features. But, it’s the rise of autonomy that has presented the most interesting challenge, according to Mark Chadwick, Global Market Manager Automotive Electronics at PennEngineering, which specialises in thin sheet fastening. As a result, a previously overlooked part of the manufacturing process has pushed into the limelight.

“Today, around 30% of the cost of a new vehicle is electronics based,” says Chadwick. “That’s anticipated to rise to 50% by 2030. Consequently, the demand for quality control of these components and technical cleanliness testing has risen steadily, so much so that clean manufacturing is now one of the main issues in the automotive industry.”

But cleanliness is not a “new” manufacturing concept, Chadwick admits, but rather a new(ish) consideration for the automotive industry. Electricity is being moved around the vehicle from multiple power sources, mostly transmitted through copper. The copper wires and busbars are attached and connected, typically by some form of fastener. However, these fasteners can contain small shreds of metal and particulates that can break off and dislodge causing major problems, such as electrical short circuits. Both functionality and the lifetime of products are linked directly to the extent of particulate contamination.

“It’s no longer a case of if the electrics fails your radio stops working. Now, if it fails there are lives at risk,” Chadwick says.

### Standards

To address these problems, there are two standards to which automotive companies are striving to adhere – ISO16232 and in Europe VDA 19 parts one and two.

VDA 19 part one states the requirements for determining particulate contamination on components. The inspection is based on a particle extraction method where the maximum amount of particulate is removed from the components, typically using a liquid to extract the particles for inspection. The standard also lays out the rules for documenting cleanliness specifications for components. The goal is for there to be no particles greater than 400µm in size after additional cleaning operations.

“This is about half the thickness of a credit or identification card,” Chadwick explains.

The second part of VDA 19 focuses on fixed particles, which can be small bits of metal/swarf that are still attached to the fasteners but can become loose when the fastener is being attached or during operation.

“For example, when the assembly is screwed into place in the vehicle, the particles can be dislodged, fall out and cause problems,” according to Chadwick. He continues, “This means care must be taken in the assembly areas. Part two also assumes that the components used already meet part one of the standard.”

VDA 19 part two provides a guide to help eliminate particle sources in assembly processes where the required degree of cleanliness cannot be met purely by implementing part one. It guides assembly manufacturers on principles to prevent or remove particles at the point of generation.

“Until recently,” Chadwick says, “the automotive manufacturing process had remained unchanged for decades. Many car makers and their tier-one suppliers have struggled to meet these requirements for cleanliness and are now having to design new ways to assemble and...
manufacture products, alongside hiring the expertise they need to achieve compliance."

Costs of compliance
The main challenge for the automotive industry is the cost of the process. “It’s known for trying to reduce costs,” Chadwick says. “So, cleaning is a balance between necessity and requirement.

“When you’re manufacturing millions of components, it’s impossible to economically visually inspect everything, especially when the parts and particles are so small,” he contends. “You can clean them and inspect them again and again, but it’s gets to the stage where the cleaning process becomes as expensive as the components themselves.”

When it comes to VDA 19 part one, Chadwick says PennEngineering already meets the standards (when specified). To identify a risk, the company uses failure modes and effects analysis.

“We look at the manufacturing process and determine whether there are any opportunities for dirt to sneak in. This allows us to find ways to either reduce introducing the risk in the first place, or to devise an alternative method for cleaning.”

PennEngineering also cleans and examines products to ensure that loose particles greater than 400µm are not present when the products are packaged.

“To accommodate to VDA 19 part two”, Chadwick adds, “PennEngineering has designed a range of products in such a way that it reduces the risk of fixed particles becoming detached during the assembly process.

“Swarf particles and debris from the traditional cutting process can remain attached even after washing and tumbling the fasteners,” he explains. “These fixed particles may break loose when a nut and bolt are screwed together, so PennEngineering offers the alternative of the blind nut and standoff range. These fasteners are sealed at one end so that any particles that do become loose will remain trapped within in the assembly as long as the mating screw is not removed.”

But, this option is not always possible. As a result, the company has its stud range for use usually in busbar assemblies. The normal method of producing such stud fasteners is to cut the thread, Chadwick says. He describes this as an “aggressive approach” because it produces a lot of shavings and torn surface is noted for creating high numbers of fixed particles.

“Traditional cutting processes for threads tear the base metal and will always have a risk of particle contamination,” he explains.

“PennEngineering’s cold forming process creates a thread using high pressure and specialised tooling to mould the thread on to the stud fastener. This leads to cleaner parts without the problem of swarf contamination.

“Due to the cold forming process deforming and squeezing the metal into the new shape, it preserves the internal structure of the metal and its properties such as strength, unlike machine cutting which can create weakness at the root of the thread.”

The cleaning process takes place in a ‘clean room’ to prevent containments from entering the environment in the first place, Chadwick explains. These rooms will usually have sealed doors and ventilation systems, and a cleaning process for the equipment, with a “clean down” every few hours. Employees will also be required to wear protective gear that will be stored in a clean area and washed on a frequent basis.

Cleaning before installation can sometimes present issues however, Chadwick continues. “Someone can pay for a cleaning service, but by the end of the assembly process the part is dirty again.” To overcome this dilemma, PennEngineering assesses where in the process is best to clean the part. “If cleaning earlier on will have no impact on the final product, we recommend customers install it and then have it cleaned after the assembly.”

Chadwick says it’s a continuous work in progress, with the company constantly looking to improve the cleaning process. He notes that innovation in cleaning is of particular importance as autonomous vehicles become more of reality.

Vision systems for example, will be relied on to assess hazardous situations – one only has to consider the autonomous Uber that knocked down and killed a woman in Arizona to understand why faults aren’t an option.

And with such high stakes, Chadwick says discussions to tighten the existing standards are suggesting 400µm may not be good enough. “We’re probably going to start looking at 200µm or maybe even 100µm.

“As vehicles are manufactured in much higher volumes and are more cost impacted,” he says, “the challenge is going to be not just keeping up to pace with this advancing technology, but also finding an affordable and efficient solution.”
At a time when the pressure on Britain’s roads and transport systems has never been more intense, with congestion at an all-time high, a US business is bringing a new parking platform to the UK in a bid to improve traffic management.

The company, Passport, is a world leader in mobile payments for the transportation industry and provides services for parking, mobile ticketing, cashless tolling, digital permits and parking enforcement.

According to Adam Warnes, Vice President of Passport’s UK Operations, “We are effectively providing a connected platform that allows citizens to interact and carry out transactions with a city’s authorities. It allows the city to collect and store data and the platform is able to support a number of products from mobile ticketing to parking enforcement.”

Passport describes its platform as making ‘parking painless’ and to coincide with its launch in the UK, it commissioned a survey that threw up some interesting findings.

According to the survey, the issue of mobility in UK cities is a serious concern.

It found that 83% of drivers said that parking machines don’t work when they needed them and over half of the drivers questioned said that there were problem areas with parking in their cities. Almost a third reported an increase in illegal parking; and more than a quarter of city councils (27%) said the rise of new modes of transport (such as rideshares and dock-less cycles) were causing problems; while 37% of councils said there was inadequate funding for parking and public transportation programmes in their cities.

“Passport has been around for 6 years,” says Devin Patel, VP Business Development. “Set up in Charlotte, in North Carolina, we’ve grown rapidly and now operate in 27 of the top 50 cities in the US, where we run our parking platform.

“Our goal is to transform the way cities manage their operations and we’ve now been adopted by more than 450 cities, universities, and private operators around the world including cities such as Chicago, Toronto, and Miami.

“Passport enables organisations in the public and private sectors to streamline their operations, enhance customer service, and make better data-driven decisions.

“Crucially, it provides dynamic charging that can relate to levels of congestion and provides a platform that can deliver information in real time. Should I take a car into town, for example, when a big match is on, or should I take public transport? It looks to address both traffic and safety concerns.”

According to Patel as the population of cities has grown, traffic management within urban environments has become fraught and needs better management.

“We want to equip those responsible for planning, managing and enforcing parking and public transportation with a scalable platform that meets the needs of commuters, while improving back office efficiencies for councils,” explains Warnes.

“By injecting data into the platform we are able to encourage better use of finite space, which then provides
time savings for consumers. We are better able to manage the curb space.”

“The platform provides massive cost savings,” suggests Patel. “From the operators’ perspective, because it is an application they can take out the physical infrastructure, for example, the need for parking meters.

“When these are low hanging value-adds, as an app, we can be integrated into other services and are currently engaging with Ford and Uber as we seek to address issues around better curb side management.

“The platform is reliable and intuitive, which creates a simple and seamless user experience, and it is flexible and innovative. We can actively update and reshape our products in the light of client feedback and we are able to offer cross-functional features that can help to solve problems across various operations.”

“It’s that ability that has proven the platform’s worth, according to Patel. “We’re seeing new modes of shared transportation, whether that is ridesharing or dock-less scooters, but whatever the means of transportation, new tools and systems are required to manage them more effectively.”

Passport’s expansion into the UK follows a successful mobile, cashless payment programme with Westminster City Council last year.

Passport worked with the council to develop and launch ParkRight, a tailored parking app that includes a vehicle-based pricing structure that targeted diesel operated vehicles.

According to the council, within the first two weeks from launch, ParkRight surpassed the council’s legacy app’s utilisation through its improved user experience, on-boarding and easy payment.

According to Vicky Nock, Head of Parking for Westminster City Council: “If we want to ensure a safe and clean environment for our citizens, we must engage directly with them to meet their needs and address their questions. Effective transport and traffic management is an essential part to champion air quality, relieve congestion and ensure a frictionless driving and parking experience.

“Passport offered an intuitive application that supports a vehicle-based pricing structure for parking, and that has helped us support our clean air initiative and deliver quicker and easier parking.”

Passport is able to provide an end-to-end mobility platform, which despite its global presence, has yet to be seen in the UK market.

“We’re making a large-scale push into both the UK and Irish markets,” says Warnes.

“The chief benefits of the system are the cost savings. Chicago, for example, cut the costs of parking management by over 70 per cent. It’s a mobile only service and from the consumer’s perspective, the service is frictionless. It can also be integrated into other services.”

The fact that the platform can be integrated brings significant cost savings to the city authorities, but it also means that rather than having to work with multiple suppliers, with different complex backend systems, the Passport platform is able to simplify the entire process.

“We are able to handle all the different services provided by local authorities and can bring all that data to one place, making it much easier to take smarter decisions.”

“We can easily add new suppliers to the platform,” Patel explains. “Suppliers will need the correct accreditations, both financial and technical, but more importantly the take up of the platform will be dependent on the appetite of the council or city authority to embrace the technology.”

Among cities London is a unique proposition for the kind of platform that Passport has developed.

According to Warnes, “Unlike in the US, European cities are not only concerned with reducing costs but with the environmental issues that arise from congestion.

“For many cities our platform provides a quick and relatively simple platform to help them come into the digital age.” He continues, “London’s size and complexity is a challenge for the platform. There are 33 distinct councils as well as the office of the Mayor of London and Transport for London (TFL). They each have different objectives and even within councils different departments will have distinct policies and objectives.”

However, according to Warnes, London’s boroughs are becoming more joined up in their thinking.

“We are seeing councils coming together.” He points to the West London Alliance, for example, which brings various authorities together to develop joint procurement programmes.

“Complexity forces a conversation between different departments and they are starting to recognise that if they want to solve problems they will have to start working together. Passport provides them with a platform to do just that, whether that is reducing congestion, attaining specific revenue goals or improving the environment.”

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