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‘New Electronics keeps designers and managers abreast of the latest developments in the world’s fastest moving industry’
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TESLA

It seems that if you have anything to say tweet it. Elon Musk, the CEO of Tesla, did just that when he announced he was looking to take the company private.

Less spontaneous than it first appeared, the company’s board was aware of the proposal, Tesla’s stock jumped.

Musk isn’t the first CEO to be frustrated at the way investors – in particular short-term investors - obsess about quarterly earnings, and he won’t be the last. But is it feasible for him to do this and is it in the best interests of the company?

Musk has talked about having secured funding from a Saudi sovereign fund, but has provided no evidence to support that claim. At around $70billion the costs of such a buy-out would be huge and analysts doubt the company is capable of funding such a large transaction.

There are several sovereign funds with the wherewithal to fund this, and Apple and Google are flush with cash. It appears that Tesla was also in talks with SoftBank last year about taking a stake in the business.

Most buy-outs involve more mature companies with a solid cash flow. Tesla is not in that position and is burning through cash at an alarming rate. If Tesla has to borrow heavily to fund this move, will the banks be any more forgiving than the short-sellers in the stock market that so irritate Musk?

Musk says he wants to take the company private so that it can, “operate at its best, free from as much distraction and short-term thinking as possible.”

There’s no doubt that Musk has brought real energy and vision to the market for electric cars but, perhaps, what’s needed are a few less tweets, less ‘noises-off’, and a laser-like focus on sorting out the problems with the company’s production lines.

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

A SEVERE BLUETOOTH COMMUNICATION BREACH HAS BEEN DISCOVERED.
BETHAN GRYLLS REPORTS

Previously considered a safe communication channel against breaches, a team of researchers from the Technion-Israel Institute of Technology have successfully deciphered Bluetooth communication.

The encryption key shared by devices allows a third party to eavesdrop or sabotage a conversation. As long as it does not actively participate, the user has no way of knowing that there is a third party listening in, the researchers say.

Bluetooth device coupling uses a mathematical concept called elliptic-curve cryptography (ECC). At the moment of coupling, the Bluetooth device use points on a mathematical structure called an elliptical curve to determine a common secret key on which encryption is based.

The Technion researchers found a point with special properties located outside the curve, which allows them to determine the result of the calculation without being identified as malicious by the device. Using that point, they set the encryption key that will be used by the two coupled components.

The team contacted the CERT Coordination Center at Carnegie Mellon University and Bluetooth SIG and informed them of the breach they discovered, along with major international companies including Intel, Google, Apple, Qualcomm, and Broadcom.

Blockchain business value to soar

Blockchain business value, which refers to the cost savings and efficiencies that could be realised by incorporating blockchain into corporate business strategies, is expected to increase from $2.5billion in 2017 to $2.0trillion in 2030, according to market research specialists, IHS Markit.

“There is barely a day that goes by without a fresh announcement about how banks and financial institutions are seeking to use blockchain technology to transform significant parts of their business,” Don Tait, senior blockchain analyst, IHS Markit, said. “The financial vertical market will be the largest-value market to use blockchain.”

The supply chain and logistics industry is also projected to improve with the introduction of blockchain. The World Trade Organisation estimates that the reduction of barriers throughout the supply chain could increase global gross domestic product by 5 per cent and escalate total trade volume by 15 per cent. According to IHS, business value from blockchain will be especially beneficial for the healthcare sector, where it is projected to reach $134bn by 2030.

Intel says 10nm Xeon server chips arriving in 2020

Intel officials have confirmed that the company’s first 10-nanometer server processor will launch in 2020, with two more 14nm chips set to come to market during the next two years.

According to Navin Shenoy, executive vice president and general manager of Intel’s Data Center Group, the company will be releasing its 14nm Cascade Lake chips later this year, followed by the 14nm Cooper Lake chips in late 2019 and the 10nm Ice Lake processors in 2020.

Each of the generations of Xeon processors will come with a range of enhancements that will drive system performance improvements in traditional data centre applications as well as emerging workloads such as artificial intelligence (AI), machine learning and data analytics, according to Shenoy.

That strategy is a key part of Intel’s efforts at a time when the data centre chip space is becoming increasingly competitive with companies like Advanced Micro Devices, IBM and Arm-based processor makers, working to win bigger market shares.
Technology Push

Samsung Group has announced that it will invest 25trillion won (£17billion) over the next three years in artificial intelligence, 5G mobile technology, electronic components for autos, and in its biopharmaceutical business, Samsung Electronics.

The investment forms part of a much larger package that the company is planning to spend over the next three years to create jobs and secure new growth areas.

The 180trillion won 3-year investment plan will include capital spending as well as research and development in chips and displays, and represents a 6 per cent increase from its spending over the past three years.

Arm acquires Treasure

Arm has acquired data management company, Treasure Data, in a bid to enable a device-to-data Internet of Things (IoT) platform.

IDC has predicted that by 2025, 163 zettabytes of data will be created or copied. To manage these kinds of data volumes, Arm believes that companies need to be able to “seamlessly connect and manage their IoT devices, as well as manage their data flows”. According to Arm, the acquisition has made delivery of a full solution, from device-to-data, possible.

Arm has said it is looking at a platform of technologies from device-to-data: secure harvesting of data from networks of IoT devices, to the convergence of disparate data streams, and the visualisation of that data and the generation of insights leading to actions.

Foundry agreement

Allegro MicroSystems, a supplier of high-performance power and sensing semiconductors, and United Microelectronics (UMC), a semiconductor foundry, have signed a long-term agreement for UMC to continue as Allegro’s primary foundry wafer manufacturer.

The agreement covers technical capacity when compared to a solid block (Ag) electrode. The electrodes also retained their 3D lattice structures after 40 electrochemical cycles, the researchers add. As a result, the batteries have high capacity for the same weight or, for the same capacity, a reduced weight.

With this method, the researchers say they were able to 3D print the battery electrodes by rapidly assembling individual droplets one-by-one into 3D structures.
Updated Embedded C Coding Standard released

INFLUENTIAL STANDARD GETS AN UPDATE AND LOOKS TO HELP ENGINEERS REDUCE DEFECTS IN FIRMWARE. NEIL TYLER REPORTS

Barr Group, the embedded systems consultancy, has released the latest update of the Embedded C Coding Standard. Also known as BARR-C:2018, the latest version of the company’s stylistic coding rules looks to help embedded system designers reduce defects in firmware written in C and C++.

First published over 10 years ago, the Standard has been used by embedded software developers to help reduce the time they spend at the debugging stage of their projects as well as improve the maintainability and portability of their source code.

For the 2018 edition, Barr Group has eliminated the few prior conflicts between its rules and those in the MISRA C:2012 - Guidelines for the Use of the C Language in Critical Systems.

Many firmware developers have chosen to combine bug-killing stylistic rules from the BARR-C standard with safety guidelines from MISRA C.

According to recent industry surveys, BARR-C and MISRA C are the two most widely-followed coding standards, with four out of ten professional embedded system designers applying one or both on their current project.

“The Embedded C Coding Standard’s emphasis on defect-killing stylistic rules has always complemented MISRA C’s style-less focus on a safer language subset,” says Barr Group CTO Michael Barr. “To ensure that developers are able to seamlessly combine rules from these important standards, we have updated our standard and verified that all of our rules are in harmony with the most recent version of MISRA C.”

Commenting, Andrew Banks, Chairman of the MISRA C Working Group, said, “We are pleased that embedded systems engineers are increasingly adopting defect-reducing coding standards such as MISRA C and the Embedded C Coding Standard. Now that the guidelines from MISRA can be more easily coupled with the stylistic rules from BARR-C, we look forward to seeing embedded software designers take even greater steps towards improving the safety, security, and overall code-quality of their products.”

Element Materials enhances radio testing capacity

Element Materials Technology (Element) has made significant investments at its European Radio and Telecommunications Testing Center of Technical Excellence in Hull, as it looks to increase its radio testing capacity by more than one third.

The company specialises in providing a comprehensive range of materials and product qualification testing, inspection and certification services and the investment is intended to meet the growing demand for wireless products that customers are experiencing.

Element in Hull, specialises in electromagnetic compatibility (EMC), radio, safety, telecommunications, and ZigBee testing; and it has facilities have been expanded with an additional radio frequency testing semi-anechoic chamber. The increase in capacity will help to reduce lead and test times for customers.

Commenting, Rick Sluiters, EVP Aerospace, said, “More and more products are being fitted with wireless technology. This investment is in direct response to the bottleneck that the market is experiencing to test wireless functionality.”

Marvell unveils NVMe-oF SSD converter controller

Marvell has announced the industry’s first NVMe over Fabric (NVMe-oF) SSD converter controller, the 88SN2400, for cloud and enterprise data centres.

The 88SN2400 controller has been designed to convert an NVMe SSD into an NVMe-oF SSD, providing what the company calls a ‘revolutionary architecture’ that will increase the utilisation and scalability of SSDs within the data centre and that will help to lower the total cost of ownership (TCO).

By bringing low latency access over the fabric and exposing the entire SSD bandwidth to the network, the controller supports scalable, high-performance disaggregation of storage from compute. The 88SN2400 uses a simple, low-power and compute-less Ethernet fabric instead of a traditional PCIe fabric controlled and managed by an enterprise-class server SoC with integrated 100GE controllers.

Data centres are having to grapple with the issue of increasing power consumption, complexity, and costs associated with the demand for greater storage bandwidth and capacity.

The Marvell SSD converter controller will allow greater flexibility for data centre operators and designers to develop infrastructures to meet evolving workload demands with scalable units of disaggregated flash storage and storage class memory (SCM).

“As cloud and enterprise data centres increase their deployments of flash storage and emerging storage class memories to address growing and diversifying workloads such as AI and analytics, it is paramount they optimise the utilisation, efficiency and scale of these costly resources,” said Nigel Alvares, vice president of SSD and Data Center Storage Solutions at Marvell. “Our converter controller enables disruptive disaggregated NAND and SCM SSD architectures that can be composed, provisioned and assigned in real-time to lower the total cost of ownership.”
It was only a matter of time before Apple became the first public company to be valued at $1 trillion. And following better than expected results, the company, founded just over 40 years ago, achieved that landmark valuation.

Apple’s shares jumped after it reported revenues of $53 billion for the last quarter, having shipped 41 million phones. And while that figure was below expectations, the success of the more expensive iPhone X saw a jump in revenues.

Talk is already about Apple becoming the first $2 trillion company, but where will that growth come from?

Apple’s business is still being driven by consumer demand for the iPhone - it accounts for 60% of the company’s profits – but it’s unlikely that it will retain that predominating position.

Growth is seen as coming from “services” and “other products” such as the App Store, Apple Pay and income from Apple Music. All of these services have been growing rapidly, which is no surprise when you realise that Apple takes a 30% cut on everything in the App Store.

Apple is one of five key tech stocks which, collectively, are known as the “Faangs”. These include Facebook, Amazon, Apple, Netflix, and Alphabet, the owner of Google.

Over the past few months the value of just these five companies has jumped, and they now amount to almost a fifth of total US GDP. The last time five companies were in such a ‘strong’ position in the US was in 1999, just before the tech crash.

What next for the tech giants?

AS APPLE HITS A VALUATION OF $1 TRILLION, WHERE NEXT FOR THE TECH GIANTS OF SILICON VALLEY? NEIL TYLER REPORTS

Each of these five have had numerous problems to contend with, however, and a number of analysts have wondered whether we are seeing a tech bubble in the making.

Each one is investing heavily in new technology, whether that’s developing driverless cars, artificial intelligence or machine learning, but despite that, they are all still generating strong revenues. And when it comes to valuations of their stock, worries of a market correction appear to be overblown – Apple trades at 14 times expected earnings, while in 1999 Cisco was at 117 times earnings.

Some critics have argued that Apple’s hitting the $1 trillion mark has been helped by massive cash reserves, supported by profits repatriated under the Trump Administration’s tax break schemes, to buy back its own stock.

They say that the company has become a one-trick pony, overly reliant on the iPhone and that Apple is failing to innovate in the way it did under Steve Jobs.

It’s certainly true that in a number of areas Apple is following, rather than leading the market.

So what of the other companies on the cusp of joining Apple as one trillion dollar businesses?

A significant number of analysts point to the ongoing success of Amazon and consider it a better longer-term risk than Apple. Not only has it revolutionised the way that people shop, but it has created a dynamic video streaming service and a profitable cloud computing wing.

AWS, the company’s cloud computing division, is making record profits up 1,286% year-on-year, due to the high margins that Amazon makes on selling computing time.

Amazon not only spans the retail space and offers cloud services, it has also invested heavily in voice services such as Echo and Alexa.

Both Apple and Amazon are riding high and the results of the parent company of Google, Alphabet, recently smashed Wall Street expectations.

However, for some of these tech giants, clouds are staring to appear. Facebook’s valuation tumbled by more than $100bn as its growth slowed, in part as a reaction to the on-going scandal around its relationship with Cambridge Analytica, while both market darlings, Twitter and Netflix, disappointed analysts having been hit by either a slowdown in user activity or subscriber numbers.

Interesting times, made more so by the impact of a possible trade war with China. While the tit-for-tat of recent weeks continues to escalate, President Trump is talking of limiting Chinese investments in the US and restricting American technology imports to China. The Chinese may, in turn, decide to target US multinationals directly.
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Despite reservations, the Cloud is helping to revolutionise broadcasting. By Bethan Grylls

The digital revolution in broadcasting continue apace, but while high definition (HD) and 4K (UHD) dominate the headlines, more profound changes can be found in the way production, storage and distribution are evolving. At the heart of those changes is Cloud computing.

Damon Neale, Chief Technology Officer from BASE Media Cloud, a media Software as a Service (SaaS) Cloud provider, describes the Cloud as centralising processing with users accessing broadcast services and tools via web browser-based user interfaces to access remote Cloud hosted workstations.

The Cloud has caused a shift in the way in which a broadcaster stores, edits and delivers content and how users consume product, leading to the rise of Over the Top (OTT) providers, such as Netflix and Amazon Prime. In fact, OTT has grown to such an extent that UK online streaming services have now overtaken ‘pay TV’, in terms of revenues.

“OTT has given the media the ability to distribute directly to consumers and not have to rely on old radio frequency technologies,” explains Jon Morgan, CEO of software provider Object Matrix, a specialist in storage services for the media. “We can now watch what we want, where we want, when we want.”

With the broadcast infrastructure built around technologies that the industry understood, it has been slow to use and implement Cloud technologies. But it’s evident that the Cloud is being adopted as content creators respond to the changing ways in which consumers are now viewing content.

According to a report from Ofcom, the UK communications regulator, the total number of UK subscriptions to the online streaming services – Netflix, Amazon Prime and Now TV – reached 15.4million in Q1 2018.
Traditional broadcast is becoming less popular, especially among younger viewers, with over-54s now accounting for more than half of all broadcast television viewers in the UK.

“Three years ago, broadcasters said they would never use the Cloud, because of worries over security, poor connectivity and cost,” says Neale. However, with the digitalisation of broadcasting, the growing use of distributed production teams, and the rise of on-demand services, the move to the Cloud has started to gather pace.

Production houses have been overwhelmed with archives of tape and vast amounts of footage has been either lost or destroyed, due to the lack of storage space or the unstable chemical properties of traditional reels. The British Film Institute alone has more than 10 acres of archive warehousing.

With the introduction of hard drives, the answer seemed to lie in file-based storage, but, again, the storage capacity to hold such large files has proved very expensive and digitising the video tapes, very time consuming.

The workflow was also a slow process: tapes or hard drives had to be physically transported to various companies involved in content creation, explains Felicity Webster, Marketing Manager at BT Media & Broadcast.

“Companies want to move content around electronically rather than physically,” Webster says, “but the sizes of files are huge – particularly when you’re filming in bandwidth hungry formats like 4K. A 30 second clip can be gigabytes of data.” She explains that having the physical network capacity to transport these files around is an expensive investment and one that requires IT expertise. Cloud providers make financial sense, she says.

For broadcasters, the Cloud offers storage space, better security, can handle the scale of broadcast projects, makes it easier to have backup copies of the data, and provides access to tools suitable for remote editing. It also makes it easier for teams – wherever they are – to engage and work more efficiently together.

“Offices are designed for people, while datacentres (where the information uploaded to the Cloud is stored) are designed for IT equipment,” says Neale. “In a datacentre, equipment can be properly cooled and powered to maintain service uptime and – if deployed correctly – is more secure because of the physical and digital security options available.”

Along with security and efficiency, the way in which data is organised has also changed.

Traditionally, storage relied upon a file system interface which placed upper limits on file numbers. The introduction of ‘Object Storage’, however, recognises files as ‘objects’, assigning a unique ID and metadata to each one.

Unlike normal data files, it doesn’t rely on a file system to manage content. As a result, it can grow without limits. The metadata and ID means that videos and audio can be stored with relevant information attached that can be used to locate that object.

Object storage has also helped with data redundancy. Currently, Neale says that a lot of broadcasters use RAID arrays (for editing) – a system which includes one or more redundant disks to protect against the possibility of disk failures. The problem is that these arrays only give a limited amount of redundancy and only at a single site. They also suffer from performance degradation in the event of a disk failure.

Object storage uses ‘erasure coding’, slicing the files into small chunks which are spread across a greater number of disks (and potentially across multiple datacentres) allowing for increased data protection.

The BBC, for example, is using object storage through its recently built Internet Protocol (IP) Studio – an end-to-end broadcast solution that enables a live studio to operate entirely on IP networks.

According to the BBC, it treats video, audio and data as real-time groups of objects that are sent over the network and assembled as needed. Upon creation, a piece of video, audio or data is given an ID and a timestamp, meaning content can be found and synchronised as required.

The corporation adds that the Cloud has enabled faster transcoding – the process of converting TV
programmes to on-demand content – with a Cloud-based transcoder. What would sometimes take 10 hours, now takes 20 minutes.

BT has also benefitted from the Cloud. To cater to London production houses, it has launched in partnership with BASE Media Cloud, ‘Media Workflow Connect’ – a new high capacity network which provides a flexible, on-demand Cloud service on a private hub and spoke network.

The network is on a ‘pay-as-you-go’ basis, which Webster says is a unique offering; unlike other services, where customers enter into a contract service, paying for a maximum bandwidth for a fixed period of 12-36 months, regardless of use.

The network looks to help production companies upload, assess and edit their data, providing access to Cloud-based tools such as online editing suites provided by BeBop Technologies. It also enables them to share data with other companies involved in the production or team members located off-site. The partnership with BASE Media Cloud provides users with the connectivity they need to access production tools in the Cloud, as well as cross connecting through BASE Media Cloud to other Cloud providers such as AWS, IBM and Azure.

Webster says that the private network allows increased productivity, getting rushes to the Cloud much faster, offering lower latency for remote editing and added security, as it avoids data travelling over the Internet.

The future of storage

It’s evident the industry is seeing a shift to the Cloud and with the likes of the BBC building IP studios and BT offering remote Cloud tools, Morgan’s assumption that “the future is software defined solutions” is starting to appear. “Software has the capability to be built with upgrades. The technology a lot of people are buying today will be obsolete in a few years.”

He also points to DNA as a feasible future storage solution in the next 10 years. “A few grams of DNA can store an exabyte of data and keep it intact for up to 2,000 years.”

In fact, CATALOG, a next-generation storage company, has announced it has raised £9million to fund a commercially viable DNA data storage system.

“We are quickly running out of resources needed to store data. By 2025, there will be 160 zettabytes of data, but we will only be able to store about 12.5% of it,” says a CATALOG spokesperson. “Current datacentres consume enormous amounts of energy and the storage media are susceptible to degradation. Furthermore, it is expensive to transfer massive amounts of data over the Internet.

“DNA storage is more reliable, sustainable and transportable than existing data storage methods, and could fit the world’s data into a coat closet.”

“It will be that we go away from keeping one archive of data to thousands,” Morgan adds.

But Neale argues that, while promising, the idea of DNA storage is currently just ‘hype’. “It might come in the future, but not anytime soon,” he says. “High capacity SSDs of 100TB+ or LTOs of 330TBs+ are more likely to be the interim solution. While the Cloud is mainstream in other industries, broadcasters have taken years to accept it as a viable solution, so even if DNA is used commercially in other industries in the near future, it will take several years for it to be trusted and trickle into usage in the broadcast sector.”

But, Morgan and Neale both agree that Cloud services – at least for now – are here to stay, and concur that the edge will also be around for some time yet too.

“I see a ‘breath in, breath out trend’ with the Cloud,” Neale says, “we started with centralised mainframes and then moved processing to local PCs. Now we see broadcasters moving 100% to the Cloud for HD and 4K, even for remote editing, but it is possible that if connectivity and performance doesn’t keep up, that 8K could bring finishing services back on-premise.”

Despite broadcast playing catch-up with other industries, it seems it may take production companies a while longer to adjust to the complexities of the Cloud. However, SaaS services provided by companies like BASE Media Cloud are helping more production houses and broadcasters to take advantage of the benefits without having to be Cloud experts. Whether or not production companies keep up with other Cloud developments, it’s certainly an exciting watch.
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Managing the pieces

With a new owner and more acquisitions planned, managing an expanding portfolio of products is a tough job, but one that Tim Russell enjoys, as he explains to Neil Tyler.

Perforce is a Minnesota-based developer of software used for application development. Set up 1995 it provides version control software, web-based repository management, developer collaboration, application lifecycle management and Agile planning software.

In January this year, it was acquired by the private equity firm Clearlake Capital from its previous owners, Summit Partners, who had bought the business from its owner and founder, Christopher Seiwald.

Under Summit’s ownership, the company had embarked on an extended period of expansion, both organic and in-organic, and over the past two years had acquired three companies: Seapine Software, a provider of application lifecycle management (ALM) tools, Hansoft, a Swedish based developer Agile planning software and the Finnish repository management services company Deveo.

However, the change in ownership hasn’t changed the company’s acquisition strategy. It recently purchased the UK-based static code analysis firm, PRQA, and Perforce has confirmed that there are plans for further acquisitions.

For Tim Russell, the company’s chief product officer, who has been in post for the past two years, while it may be challenging to bring these disparate businesses and products together, it’s a role he relishes.

“Growth through acquisition is an integral part of Perforce’s business strategy. My role is to ensure that we develop a comprehensive portfolio of enterprise scale software solutions for technology developers and development operations (“DevOps”) teams,” he explains.

“I look to mesh together our expanding portfolio of products, and how that portfolio will aid and support our customers. I ensure that as it expands it has a positive and beneficial impact.

“As we are planning for further acquisitions, I need to ensure that they will add value and bring additional benefits.”

Complexity a given

The fact that hardware and software complexity is growing, is a given, according to Russell. As more customers expand their products lines, so more will be confronted with the challenges associated with bringing innovative products to market.

“It’s a robust and exciting market,” he says. “Even long-term customers are investing in, and expanding, their product lines and development teams. After the acquisitions we have made our portfolio is well aligned to their development requirements.”

According to Russell, foremost among those challenges, is the issue of complexity and its effective management.

“It is, for many, the principle issue they have to contend with, and they are looking for innovative solutions,” he says.

Russell notes the importance the company attaches to further acquisitions, and hints that Perforce is on the look-out for suitable targets.

“Perforce’s recent acquisition of PRQA added Static Code Analyzers that assess software reliability, security, and compliance while reducing development time to the mix,” he explains.

It is the fourth acquisition made by the company in the past two years and, “The first under Clearlake’s ownership,” Russell says.

PRQA solutions are used by organisations who require their products to perform securely and reliably in mission-critical and safety-critical environments, and includes key markets such as automotive, aerospace, medical, and other demanding industries.

“Our aim is to support and enable customers to realise faster time-to-market,” says Russell. “PRQA, for example, can support scale and accuracy in automated inspection of source code for high risk code and non-conformance to standards. It’s becoming critical to be able to detect errors at the source code level before entering into a test environment.

“It also means that organisations are able to focus on the key revenue generating parts of their businesses.”

Russell says that the PRQA acquisition means that the company is now able to offer solutions for enterprise customers but that Perforce can now address the issues of security and quality much earlier on in the software development lifecycle.

“PRQA enables better continuous integration and delivery,” he says. “But beyond the accelerated delivery of technology it enables us to deliver security, and build its delivery into the overall development process.

“The foundation of DevOps is version control which means that you can track changes made by developers. It provides traceability into the built product and supports global distributed development teams.

“From source code to graphics firmware and hardware design, Perforce looks to help simplify the complex nature of teams and product development; our aim is to connect products and make traceability much easier to deliver.”

Business strategy

The company’s strategy of offering more solutions and capabilities that improve the DevOps’ pipeline performance through acquisition, was given a boost with the purchase of the business by Clearlake.

“It’s given us access to additional capital to make further
Russell has extensive experience leading technology teams in high-growth software companies, including NetApp, SafeNet, and Secure Computing. Prior to joining Perforce, he was VP of Product Management at NetApp, where he led the definition and engineering of customer solutions for data center, cloud, and hybrid cloud data management.

Recent senior management changes at Perforce have seen Mark Ties named CEO, succeeding Janet Dryer. Dryer continues with the company, but as Chair of the Board.

Ties had been COO/CFO since January 2016 and during that period had effectively served as CEO.

“On his watch we doubled our revenues,” explains Russell, “and both he and Dryer have worked together, teaming up on over 20 acquisitions. There’s plenty of experience there as we look to take the business forward.”

When it comes to acquisitions Perforce has adopted a model which usually sees back office operations merged, while leaving the customer facing elements of the business unchanged.

“We look for the best ways of sharing best practice across the business. Our aim, and my role, is to develop a portfolio of products, with common functions, that can deliver world class solutions.”

As the nature of software development is changing, technology is being added to almost every business process, so there’s a desire to improve the efficiency of development teams and employ more agile development processes.

“Companies are having to adapt and are looking for tools that will help them boost the release rates of technology, i.e. they want to raise the velocity of product development.

“Our role is to help them test earlier, to build in security, and provide assured quality during the development process.”

According to Russell further acquisitions will cover the entire DevOps spectrum.

“From planning to automated testing, as well as security and test analysis,” he says.

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The fight to ensure cybersecurity is on-going and in mission and safety-critical markets, system protection is critical. By Bethan Grylls

The aerospace and defence sector is flourishing, bringing with it rising profits and new possibilities in terms of travel, exploration and defence. But despite the opportunities it presents, such technology proliferation and success is not without its challenges, and as more devices ‘get connected’, chief among these concerns is the threat to safety in the form of cybersecurity.

“An aerospace system is typically in the field for 15-20 years,” explains Wind River’s Director of Market Development, Alex Wilson. “The kind of technology trying to hack into your system gets better every year, so you have to figure out not only how you’re going to develop a system that is protected against the current types of attacks out there, but also how you’re going to update your system over its lifecycle to keep it protected.”

Wilson points to three main system concerns. The first: products made up from a patchwork of technologies from various suppliers, evaluated at a late stage of development. “For example, if you design the aircraft security without considering the Electronic Flight Bag (EFB), an information management device that can perform basic flight planning calculations and display digital documents such as navigational charts, then a pilot could plug in an unauthorised EFB, or an EFB with unauthorised software into the avionics system.”

The second concern he points to, is lifetime cost. Despite the lower-cost of new generation technologies, Wilson says support and maintenance expense is often overlooked. Maintaining a constant level of security throughout the system lifecycle requires suppliers to be able to modify and adapt systems as new threats are exposed. This means that companies have to budget for lifecycle support and refreshing of systems from a security perspective.

Lastly, with the combination of long development cycles and distributed teams, Wilson says that it’s common for bugs to be discovered late in the testing process. “Often systems and components of systems are designed in isolation and only brought together late in the systems integration phase.”

Wilson suggests following a disciplined systems engineering approach that ‘thinks’ ahead about the systems engineering phase and the interface between components.

Wilson recommends three strategies that can be implemented during development to make it easier to update products, as and when cyberattacks become more sophisticated. These include: hardware refresh; using hardware and software based on open standards; and the use of commercial off-the-shelf components (COTS) to avoid replacing an entire system. “Using COTS components offers a better selection of suppliers, especially if they adhere to open standards, providing more choice and flexibility in who and what you purchase.”

These cyber-based challenges have arisen as the world has become ‘connected’, Wilson explains. “Many of these aerospace systems weren’t designed to be connected to the Internet.”

The question is: how do you ensure a system is secure? Wilson points to an adaptive security approach. “As part of your system design, you can make the assumption that the system is not to be trusted. Rather than trying to prove the system is secure, you look at ways to protect the application and data.”

This security protection could be achieved by expanding the security framework which should have mechanisms to identify, protect, detect, respond, and recover; with the capability to predict security attacks. This allows the security framework to adjust its response and prevent threats based on these predictions.

Wilson also encourages the use of embedded and simulation software, describing it as an essential cog in the development and lifecycle process that can help companies identify bugs much earlier in the cycle.

“Wind River Simics is a simulation tool that allows users to build a digital twin of their system. It mimics the
These costs, Wilson points to resolving the security challenges that the ‘distributed’ architecture present.

A UAS consists of the ground station, the data link, and the aircraft itself, with each part exposed to a different set of security threats. “In a manned aircraft, these are typically contained within the aircraft perimeter and so are more easily protected,” explains Wilson. “In an UAS, where connectivity is required, they are exposed and distributed.

“A lot of these UAS were built on experimental technology that was just proof-of-concept work. These were suddenly accelerated into production and brought into the field without thinking through all of the safety and security implications. There is now a global effort to review these deployed systems and architectures to ensure that safety and security is more formally addressed. This consists of a security risk assessment at the highest level, breaking down the requirements to each component within the UAS system.”

In order to move forwards, Wilson believes that the industry needs to stop building bespoke monolithic systems and start thinking about open architecture systems based on virtualisation. “Our VxWorks 653 product did this for the aviation market by adhering to the open ARINC 653 standard, enabling our customers to support software defined applications,” he says.

“Modern multi-core processors are excellent at supporting these virtualised environments. When combined with COTS software, the full potential of multi-core processors can be realised in avionics systems. Using partitioning capabilities built into VxWorks 653, applications and operating systems can be isolated from each other and the underlying hardware, allowing for future upgrades and greater safety, security, and affordability.”

Forecasts point to further growth, which Wilson believes will be driven by AI. Despite positive application expectations from industry, he warns that with all the benefits, AI may also hand cybercriminals the ultimate hacking tool.
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Europe’s Copernicus environmental programme, which began 20 years ago, manages seven Sentinel satellites that deliver terabytes of data every day. It is the world’s biggest provider of Earth observation data, and that data is offered free to anyone, anywhere.

In fact, Geneviève Fioraso, the former French minister for higher education and research, speaking at Leti Innovation Days in July, said that 54 percent of the data that scientists use to evaluate climate change comes directly from space.

But with extended space missions comes the requirement for flawless performance by on-board equipment over a period of years, in a very harsh environment.

Leti has been designing components and measurement tools, for many years, which have underpinned several European space programmes and provided both emerging and mature technologies for space missions.

Emerging technologies may be born in research-and-teaching (R&T) projects prior to their selection for new missions. For example, the vector mode of magnetometers launched in the Swarm magnetic-field mission were the subject of a PhD theses and R&T programme before they were selected for that mission.

Disruptive performance
These types of projects often involve a long-term partner CNES, the French space research agency, or the European Space Agency (ESA). When it comes to more mature technologies, our task is raising equipment, devices or components to the top of the technology readiness level (TRL) scale. The end result may involve disruptive technology in the sense that the required performance is usually beyond what is currently possible, but it is always based on well-established expertise. For example, current developments in sub-millimetric detectors for missions are a major step toward increased sensitivity and polarisation measurement compared to those that were used in the Photodetecting Array Camera and Spectrometer (PACS) for the Herschel Space Observatory.

Designing and developing new components for specific space projects will often require engineers to expand the applications of existing devices. Leti’s RF MEMS switches, for example, which had been previously studied for land-based operations, have been adapted to the specific requirements of space missions.

More generally, the requirement to reach TRL5 to qualify an instrument for a mission means that one can no longer develop these components only for space applications, which are a niche market.

Developing new instruments or sub-systems, such as the bolometers for the Herschel Space Observatory or the absolute scalar magnetometers for the SWARM mission, gives scientists the opportunity either to carry out completely new studies or to improve an instrument’s accuracy based on its performance in previous applications. Moreover, the demanding requirements of space missions may give rise to technologies that can be adapted to commercial use. The motion-capture applications developed by the Leti-startup Movea, which was acquired by InvenSense in 2014, capitalised on technology that Leti and CNES developed for platform attitude control.

New materials
Continued discovery also depends on new materials such as SOI and GaN
potential revenue once industry is able to manufacture the detectors.

HgCdTe APDs’ use for deep space optical telecommunications will allow space vehicles exploring the far reaches of our solar system to send more data back to earth. The higher the data collection capacities of these explorers, the bigger the data rate they will need.

Another field of application is environmental science, in which the detectors can be used to study our atmosphere from space, to keep an eye on things like the exchange and storage of greenhouse gases.

This will result in a better understanding of the dynamics of greenhouse gases, thereby helping scientists to improve climate models.

A request from industry

While scientists focus on creating new technologies or adapting existing ones to support space programmes, sometimes the industry’s requests are more down to earth.

Speaking at Leti Innovation Days in July, Hervé Gilibert, CTO of ArianeGroup, whose businesses include satellite-launching services, said that he would like to work with technology suppliers to make pre-launch equipment testing and validation more efficient.

“Electronic boards for us are delivering a service onboard the launcher,” Gilibert said. “Of course, we are shaking them a lot and warming them up and down. However, the ideal situation for us would be … to test the functional aspects to make sure it works as a functional chain onboard the launcher, and get rid of having to demonstrate one by one that all the equipment is qualified for the dynamic, radioactive and thermal environment of space.”

In space and on Earth, the challenges and opportunities for the microelectronics industry are far reaching.
The march towards the introduction of 5G services and applications is accelerating and brings with it a need to enable more wireless solutions for applications across a growing number of different industries, all of which are looking to enable reliable connectivity across a growing number of devices.

But as the demand for connectivity continues to grow, so it brings with it the twin challenges of not only providing ultra-low communication link latency but also doing so at gigabit speeds.

5G is set to wirelessly connect millions of Internet of Things (IoT) devices and, in the process, remove cellular network data bottlenecks, by opening up new radio spectrum like millimetre wave (mmWave) bands over 20GHz.

5G mmWave is expected to be used by wireless carriers to initially provide Gbit Fixed Wireless Access for customers, which will then most likely be followed up with the delivery of Gbit mobile services, such as live streaming to smart devices.

As the demand for 5G grows so there will be an impact on devices and on the manufacturers that supply them.

These new products will be expected to support much faster data rates and more data traffic, so manufacturers will have to look at how best to support a more reliable implementation of these services.

According to James Wilson, Senior Marketing Director, Timing Products, Silicon Labs, “At a time when radio access networks are going through a period of radical transformation, as they prepare for 5G, so they are having to provide a far more flexible, scalable way to support the higher bandwidth requirements that 5G requires.

“It’s helping to drive innovation in terms of specialised pre-5G radio access equipment that will be capable of meeting increased network capacity and coverage.

“We are seeing a host of new designs for small cells, distributed antenna systems, massive MIMO, and other pre-5G radios that will have to be able to support LTE and Ethernet connectivity,” he says.

According to Wilson, this is putting a lot of pressure on companies, like Silicon Labs, who supply the timing solutions that are required to support low phase noise LTE clocking, low-jitter Ethernet clocking, and system clocking.

“This is the big trend that we’re seeing in the industry at the moment and it’s impacting many different markets. As a result, Silicon Labs is developing and releasing a lot more products as we look to target new applications. We’ve taken an application centric approach to product development.

“We are seeing a tremendous amount of innovation happening at the physical layer right now, as Ethernet switches/PHYs, FPGAs, and ASICs begin to migrate from 28Gbps non-return-to-zero (NRZ) SerDes to higher-speed 56Gbps and 58Gbps PAM4 phase-amplitude modulation SerDes.”

Because PAM4 packs more bits into the same amount of time on a serial channel - it does this by running four states per cycle - the signal-to-noise ratio (SNR) has to be good enough to ensure the link’s bit-error-rate does not degrade.

“As a result that is driving increased demand for lower jitter clocks and crystal oscillators (XOs) to provide reference timing for 56G PAM4 SerDes,” explains Wilson.

Expanded portfolio

Silicon Labs has responded by expanding its timing portfolio to meet the high-performance clocking requirements of 56G PAM-4 SerDes and emerging 112G serial applications.

“I think we can say that Silicon Labs is the only timing supplier out there right now, that is able to
offer a comprehensive selection of clock generators, jitter attenuating clocks, voltage-controlled crystal oscillators (VCXOs) and XOs for 100/200/400/600G designs that satisfy sub-100 fs reference clock jitter requirements with margin,” Wilson says.

Providing a broader array of timing solutions is becoming critical when so many manufacturers, such as the likes of Broadcom, Inphi, Intel, MACOM, Marvell, MediaTek and Xilinx, are accelerating the migration to 56G PAM-4 SerDes technology to support higher bandwidth and optical networking designs.

According to Wilson looking to meet the stringent requirements of 56G SerDes reference clocks, hardware developers will require clocks with sub-100 fs (typical) RMS phase jitter specifications and, as a result, these designs will typically use a mix of other frequencies for CPU and system clocks.

“Silicon Labs has worked hard to provide fully integrated clock IC solutions for 56G designs that integrate SerDes, CPU and system clocks into a single device - and that trend of integration is another key driver having an impact on the timing market,” Wilson suggests.

In 56G applications, hardware developers tend to seek complete clock tree solutions that can guarantee sub-100 fs RMS phase jitter to ensure sufficient margin and de-risk product development.

But not only does Silicon Labs’ latest clock and oscillator products meet the latest 56G SerDes requirements it also looks to address the needs of the emerging 112G serial SerDes designs that are expected to ramp in data centre and communications applications in the future.

According to Wilson, “Whether our customers are designing synchronous or free-running systems, we offer the right ultra-high-performance timing solutions to meet their 56G SerDes application needs.”

New products
Among the new products that Wilson alludes too is the Si5391.

It is claimed to be the industry’s lowest jitter, any-frequency clock generator and is the only clock generator on the market that can provide all clock frequencies needed in 200/400/600G designs from a single IC while delivering sub-100 fs RMS phase jitter performance for 56G SerDes reference clocks.

The device features up to 12 differential outputs and is available in frequency flexible A/B/C/D grade options.

A Precision Calibration P-grade option optimises RMS phase jitter performance with a 69 fs (typical) specification for the primary frequencies needed in 56G SerDes designs.

“The Si5391 is a true sub-100 fs “clock tree on a chip” solution designed to synthesise all output frequencies from the same IC while meeting 56G PAM-4 reference clock jitter requirements with margin,” says Wilson.

Other products include the Si539x jitter attenuator which has been designed to meet the demanding specifications and high-performance requirements associated with the Internet’s infrastructure. These any-frequency jitter attenuating clocks generate any combination of output frequencies from any input frequency while delivering jitter performance (90 fs RMS phase jitter).

Silicon Labs is also offering the Si54x Ultra Series XOs family for applications requiring stability and which guarantee long-term reliability and are intended for optical transport networking (OTN), broadband equipment, data centres and industrial systems.

Critically, the Si54x XOs are purpose-built for 56G designs, which rely on four-level pulse-amplitude modulation (PAM-4) signalling for serial data transmission to increase the bit rate per channel while keeping the bandwidth constant. Using an Si54x XO as a low-jitter reference clock maximises signal-to-noise ratio (SNR) headroom, minimises bit errors and enhances signal integrity.

Among the latest additions to the company’s growing portfolio of timing devices is a new family of high-performance I2C-programmable crystal oscillators (XOs), offering a typical jitter performance that’s as low as 95 femtoseconds (fs).

The devices are capable of generating any frequency from 200 kHz to 1.5 GHz with no frequency gaps and 4 parts-per-trillion (ppt) tuning resolution, enabling a single device to be used across a broad spectrum of applications.

“These devices offer much greater configuration flexibility and a single oscillator can now do the work of multiple single, dual and quad-frequency XOs and multiplexer (mux) devices,” Wilson says.

“With the growth in optical networks, hyperscale data centres and developments around 5G, in terms of the mobile fronthaul/backhaul networks which are now moving to much higher speeds, the need for ultra-low-jitter timing solutions is set to increase,” concludes Wilson.
Using DDS to unlock the power of TSN

Bringing DDS and TSN together helps to create a powerful, distributed data-centric integration framework. By Reinier Torenbeek

Combining the Data Distribution Service (DDS) for Real-Time Systems standard with the emerging IEEE Time Sensitive Networking (TSN) standards could help to create a powerful distributed data-centric integration framework.

DDS is a standard managed by the Object Management Group (OMG), addresses the needs of big data applications.

Time-Sensitive Networking (TSN) standards, set by the Time-Sensitive Networking task group of the IEEE 802.1 working group, define mechanisms for the time-sensitive transmission of data over Ethernet networks.

Both provide one-to-many communications that support different levels of data reliability.

DDS revolves around a strongly typed Publish/Subscribe model where DataWriters update particular types of data and DataReaders observe those updates, or Topics.

The combination of a DataWriter with its Topic name can be seen as an identifier of the source of a DDS dataflow. All matching DataReaders are sinks to that same flow.

Similarly, TSN has Talkers that update streams delivering data to the connected Listeners. Streams are identified by their VLAN tag id and the combination of a Talker with a VLAN tag id can be seen as an identifier of the source of a TSN stream.

From this description, it is clear how DDS dataflows can be mapped directly onto TSN streams. Most DDS systems already leverage IP multicasting and replacing that mechanism with communications over TSN streams would be logical and the impact minimal, the details of the underlying transport are invisible to DDS users.

Quality of Service

DDS has a set of different Quality of Service settings, the purpose being to instruct the middleware about the importance of the information in the different dataflows - these QoS settings are applied per dataflow.

Some of those QoS settings have close similarities to the mechanisms that define TSN Traffic Classes e.g. the Deadline, LatencyBudget and TransportPriority QoS settings.

By selecting the correct QoS settings at the DDS level, system designers can rely on data distribution behaviour from the producing application all the way down to the network stack, over the network, and back up to the consuming application.

Thousands of mission-critical systems rely on DDS infrastructures and DDS ecosystems are suitable for application domains that are targeted by TSN technologies, like automotive and industrial automation.

So why combine the two?

While the interaction models for DDS and TSN are similar, applying DDS on top of TSN results in a programming model at a higher level of abstraction. DDS users develop their systems by using strongly typed, predefined elements of data.

Application developers see their data in native programming language constructs whereas the middleware takes care of all lower level mechanisms like de/serialization or network interactions.

DDS consists of a group of open standards that includes a standardised API to be used by application developers. With a DDS-TSN integration, this API can be leveraged for a simpler learning curve and off the shelf ecosystem support.

Many systems consist of
a combination of subsystems with different requirements and capabilities. Not all will require the stringent real-time behaviour provided by TSN. With DDS, it is possible to reuse the same infrastructure in a different subsystem, seamlessly connecting them with gateways while preserving a unified data model.

DDS is agnostic to Operating System and programming language and can be leveraged in different types of environments. In such situations, the common theme between the subsystems remains the data model as well as the rich ecosystem provided by DDS. This simplifies the task of introducing TSN into an existing system or design, or of extending a TSN-based system with additional subsystems with different non-functional requirements.

Management of a robotic device via a DDS infrastructure is an application that could leverage TSN at the lower level.

In this example, a system for controlling a robotic arm in a distributed setup, the controlling application runs on a different machine than the robotic device itself so, for analysis and predictive maintenance purposes, another machine is observing the robot’s functioning. All of these applications issue alarms whenever irregularities are discovered which are displayed in a dedicated user interface application running on a separate machine. All applications communicate over DDS.

In DDS speak, the flow name is equivalent to the Topic name.

OMG DDS-XML defines a schema for defining DDS Entities in an XML format, allowing for a mechanism to capture system data flows in a descriptive way. With additional tags, an indication of critical versus non-critical data flows as well as their frequencies and bandwidth can be provided. In combination with physical endpoint information, information is available to feed to a TSN network scheduler for calculation of the different TSN flows with their tags as well as the timings and durations of the associated network time slices.

Using TSN terminology: a DDS-aware Central User Configurator (CUC) tool will ingest the DDS-specific information and translate that into an interaction with the Centralized Network Configurator (CNC) tool with the goal to obtain a calculated network schedule, expressed in a TSN-standardised format.

For non-critical DDS data flows, no information is provided to the TSN network scheduler, so any associated data is transported in the remaining TSN best effort time slices.

Critical Topics DesiredPos and ActualPos need to be accompanied by their update frequencies, for the network scheduler to take into account. The Alarm Topic is critical as well, but aperiodic. In order to make that work with the concept of pre-scheduled time slots, an estimate of the required or desired allocated bandwidth as well as the maximum acceptable latency needs to be made upfront. This could happen with the help of tooling. Finally, the Heartbeat Topic is not critical and no additional information is required.

Runtime selection
With the TSN flows and timings calculated in the previous step, each DDS DataWriter is considered a TSN Talker and each DDS DataReader is considered a TSN Listener for those DDS Topics flagged as critical.

In addition, the DDS middleware is able to select the correct VLAN tag for each of them, providing the required network-level quality of service as delivered by TSN.

DataWriters and DataReaders for Topics not marked as critical will communicate their data over the TSN best effort time slices.

In this example, network packets for the critical Topics DesiredPos, ActualPos and Alarm need to have their headers stamped with the correct Ethernet-level tags, as indicated by the TSN flows calculated in the previous step. The DDS infrastructure will be responsible for that. No such mechanism is needed for the Heartbeat Topic because it is not a critical flow.

In addition to instrumentation of the DDS middleware itself, the different TSN-aware network equipment elements need to be configured to align with the DDS data flows. This could be the combined task of the CUC and the CNC, with the CNC either directly instructing all network switches about the schedule or the CNC providing the CUC with the information required for this. Additionally, the CUC will instruct the network interfaces.

For our example, this means that the network interface cards for the machines running the Controller, Arm, Twin and AlarmUI processes need to be made aware of the calculated time slices for their associated Topics. Additionally, TSN-aware switch needs to be instructed accordingly.

The Object Management Group has identified the need for a standardised approach to combining DDS and TNS and having open standards in place will allow DDS as well as TSN vendors to develop their integration solutions in a portable and vendor-independent fashion.
Waiting to light up the server
How the use of fibre-optic interconnects is helping to re-architect the concept of the server. By Chris Edwards

Cloud computing has had a dramatic effect on the cost of high-performance processing. But there have been knock-on effects from an architecture that assumes workloads can hop around machines whenever spare capacity appears. One of the biggest is a spike in network traffic, with much of the communication shuttling back and forth inside data centres: “east-west” in data-centre parlance rather than the traditional “north-south” of server to client.

The rate of growth in interprocessor traffic is not slowing down and is beginning to have an effect on the way architects look at the multicore devices that go into server blades. Imec researcher Yoojin Ban, said at the VLSI Technology Symposium in Honolulu in mid-June that the throughput demands of multicore processes based on nanometre-scale nodes such as 7nm would demand an optical interconnect.

Ban claimed typical processor designs for data centres based on a 16nm finFET technology demands an I/O bandwidth of more than 10Tb/s. “Below 7nm we need even higher bandwidths: more than 50Tb/s over distances of 1m to 500m. We believe those can only be achieved with single-mode fibre-optic interconnect.”

Experimental machines are showing how fibre-optic interconnect can break apart and re-architect the concept of the server. HP’s The Machine takes the idea to its logical conclusion: make multiple racks work as one virtual server.

To get there, HP aims to make heavy use of photonic interconnects, claiming that, “photonics destroys distance.” It’s a claim that by not taking into account the speed of light does not scale far. No-one is going to attempt to spread a single server across multiple data centres for that reason. But at the scale of a single data centre, the argument makes more sense: once a photon has been launched into fibre it is far less susceptible to losses over distances of up to a few hundred metres than an electrical signal. Photonic interconnect promises lower power consumption, which is vital for data centre-type designs where their energy usage has become a major concern.

Amir Khosrowshahi, CTO of artificial intelligence (AI) at Intel, said at the Design Automation Conference (DAC) in San Francisco in June, that optical networking will be vital for cloud-based machine learning. “The silicon-photonics group [at Intel] was surprised we wanted to talk to them about using their work in machine learning. But if you are a very large-scale operator like Google, you have one rack that is Xeons and another is TPUs [Tensorflow processing units]. These things have to communicate.”

Photonic interconnect means, “you don’t necessarily have to put machine-learning IP into your Xeon”, Khosrowshahi added. “What’s most interesting is where the laser is bonded into the device. If it’s done at wafer level, it can really change the nature of your systems.”

Deployment remains a problem
Despite the attractions of photonic interconnect, the ability to deploy it remains a problem even two decades on from Bookham Technology’s forays into using micromachined silicon to cut assembly costs. At the device level, researchers are begining to overcome silicon’s lack of a direct bandgap, which makes it hard to build electro-optical devices into wafers. Today, at institutions such as Imec, multi-wafer bonding provides the ability to integrate the optical components with silicon-based circuitry.

The integrated-optical devices presented at VLSI by Imec take advantage of silicon’s transparency at wavelengths used for optical communication to build modulators into the core wafer. One such component is an active filter. “You can turn the optical signal on and off with an electrical bias signal and use a heater to fix the filter in the sweetspot,” Ban said. This is combined with germanium photodetectors and silicon PIN photodiodes on a “silicon photonics” die on top of which is mounted an SoC based on GlobalFoundries’ 14nm finFET process. “We have a scaling path to terabytes per second per square millimetre,” Ban said, which will be helped by techniques such as wavelength division multiplexing.

Although wafer-level integration can give silicon the tools needed to talk directly to photonic networks, the interconnect fabric currently
presents a bigger problem. One major issue is the way that using silicon imposes a severe constraint on the type of fibre that can be used. Multimode fibre is easier to attach as it requires less accuracy. But silicon can only be made transparent to the infrared wavelengths that are suitable for single-mode fibre, which places more stringent demands on assembly tolerances. Today’s single-mode optical connections need to be based on physical contact, which can lead to a damaging amount of force, particularly for the high-density parallel connectors that will be needed to maintain good airflow for cooling.

Even with easier assembly techniques, fibre management itself could become a major problem in the dense fabric of a data-centre network where each blade may have multiple fibres going to the top-of-rack switch, even when the optical connections are made from the front or backplanes.

At the 2018 Optical Fibre Conference in Los Angeles, Chengliang Zhang, vice president of China Telecom’s Beijing research institute, showed how telecom operators already have a spaghetti-wiring problem with the reconfigurable optical add-drop multiplexers (ROADMs) used in telecom switching. “In some situations there are hundreds of connections. This is a total nightmare. As the ROADM gets popular, fibre connectivity needs to evolve.”

Zhang looks forward to replacing the fibre connections with an optical backplane and PCBs able to carry the photons direct from SoCs to the rear connector.

A collaboration between the International Electronics Manufacturing Initiative (iNEMI) and the MIT Microphotonics Center may come up with answers to these interconnect problems. The Integrated Photonic Systems Roadmap (IPSR) is working on ways to make it easier to bring photonics to the SoC and make it far less manually intensive and completed its first phase earlier this summer.

The IPSR’s first two phases focus on making cable connections to the board, with the second phase just getting underway to explore how to make the connectors. The focus of the IPSR group is on expanded beam connectors, which uses tiny lenses to increase the size of the illuminated spot at the joining point almost tenfold to around 80µm. According to 3M senior staff scientist Terry Smith, a larger spot would be even easier to work with but the group is conscious of the need for size reductions to enable parallel connectors. The result is a lower mating force because the fibre does not have to make a solid joint with the connector optics, although it increases losses from internal reflections. The angular alignment also needs to be precise but the R&D team believes this can be handled in the manufacture of the connector itself.

The IPSR group expects to start work on phase two in September. It will develop prototype connectors for the front plane and those that can be mounted on an SoC. Phase three moves onto the more difficult problem of embedding optical waveguides into PCBs. Although some researchers have developed plastic waveguides, Smith says inorganic materials may be needed to support the longer wavelengths needed.

“Ideally, we want a transceiver module that’s compatible with reflow. When it’s attached electrically, it’s also attached optically. It would eliminate all the labour that might be needed to make the connections,” Smith explained in an iNEMI online seminar. “It’s a very aggressive plan but it’s where optical interconnect needs to go.”
New LFPACK56 MOSFETs

New LFPACK56 MOSFETs from Nexperia feature improved creepage and clearance, meeting UL9595

Industry’s only available devices compatible with Power-SOI footprint to meet new standard for battery-powered equipment

Nexperia, the global leader in discrete, logic and MOSFET devices, today announced that two of its LFPACK56-packaged portfolio of MOSFETs are now available with improved creepage and clearance to meet UL9595 requirements for battery-powered equipment rated between 25 and 32 V. Devices are 100% compatible with the industry-standard Power-SOI footprint, no other compact, surface-mount devices yet meet UL9595 which calls for minimum creepage and clearance distances of 1.5mm between Source and Drain terminals.

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New rugged modular

New rugged modular 1.27 mm pitch connector series from Nemic Tactics meets MIL-83513

EMM series suits harsh environment defense applications

Nemic, the leading manufacturer of high-performance interconnect solutions, has announced the launch of a new, rugged micro connector, the 1.27 mm pitch EMM series, which targets defense and other high-reliability applications. Designed to meet the performance requirements of MIL-83513, EMM series connectors occupy 40% less space than previous-generation connectors from the company, are 20% smaller than Micro D connectors for 16-pin configurations and are around 10 percent smaller in footprint than the closest industry competitor.

Innovative design features such as reversed contacts, integrated 90° back protection and interchangeable hardware, ensures that the new EMM connector series combines rugged design with enhanced electrical and environmental performance.

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OMC’s new high brightness purple LED

OMC’s new high brightness purple LED brings greater flexibility for designers

Easy to drive Active Diffuser Technology™ compact footprint, suits backlighting, displays, status indication, signalling, mood lighting and more

OMC, the pioneer in optoelectronics design & manufacture, has launched a new high brightness purple surface-mount LED lamp featuring the company’s proprietary Active Diffuser Technology™, which produces a far richer and more efficient output than traditional single-wavelength devices. The vibrant output and ease of driving of the new purple LED SMD lamp makes it ideal for applications such as backlighting, mood lighting, displays and status indication on items such as front panels and keypads, as well as signalling and industrial electronics. Designated LPRM93268xKx, this new SMD lamp requires very low current, has a compact footprint of only 3.2mm by 2.8mm, and a depth of 1.3mm, with the industry-standard PCC package.

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Picocore MX7ULP

New module offers smallest size and lowest power ARM module

Many PIC® MX7ULP applications processor Cortex® A7 & M4 – up to 800MHz

1GB LPDDR3 RAM, 64MB SPI Flash, 32GB eMMC

LCD Interface for TFT, MIPI-DSI

USB 2.0 OTG

6x UART, 4x I2C, SPI

Audio Line IN/OUT MIC/Headphone

33 Digital I/O

The first member of the new and compact PicCore® COM product family by F&S Elektronik Systeme is offered with the NPI MX7ULP ARM® based Applications Processor (AP). Further pin compatible PicCore® COMs will follow. The module is based on an MX7ULP Applications Processor implementing the Heterogeneous Multi-core Processing architecture with ARM® Cortex® A7 core and ARM® Cortex® M4 core.

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Smallest Through-Hole Reed Relay

Industry’s Smallest Through-Hole Reed Relay launched by Pickering Electronics

Tiny footprint relays feature very fast operate and release times making them ideal for high speed test systems

Pickering Electronics, the reed relay company which has pioneered miniaturisation and high performance for over 50 years, has announced industry’s smallest reed relay. The Series 124 is part of Pickering’s new ultra-high density 3mm Z™ reed relay range product line, which takes up the minimum board area of only 4mm x 4mm, allowing the highest packing density possible. Series 124 relays are also the lowest profile on the 4x4mm footprint, measuring just 9.5mm high. Devices are currently available in 1 Form A (energize to make) with options of 3 or 5 volt coils. Series 124 reed relay feature a sputtered ruthenium switch rated at 5 watts, 0.5 amps. These are the same reed switches as used in the long-established Pickering Series 111, 111P and 112 but are orientated vertically within the package, facilitating such high density.

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STMicroelectronics’ STM32H7 MCUs

Now at Mouser: STMicroelectronics’ STM32H7 MCUs with Arm PSA Protection for Connected Devices

Mouser Electronics, Inc., the authorized global distributor with the newest microcontrollers and electronic components, is now stocking STM32H7 microcontrollers from STMmicroelectronics [ST]. The high-performing STM32H7 microcontrollers are designed with the same security concepts as the Arm® Platform Security Architecture (PSA) framework and combine these principles with STM32 family enhanced security features and services to boost protection for connected smart devices.

STM32H7-based microcontrollers, available from Mouser Electronics, are based on a 32-bit Arm Cortex®-M7 core with double-precision floating point unit (FPu), up to 2 Mbytes of Flash, and 1 Mbyte of RAM. The microcontrollers integrate hardware-based security features including a True Random-Number Generator (TRNG) and advanced cryptographic processor, which will simplify protecting embedded applications and global Internet of Things (IoT) systems against attacks.

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Ultra-Low Power Lattice sensAI

Ultra-Low Power Lattice sensAI Leads Mass Market Enablement of Artificial Intelligence in Edge Devices

New FPGA Solutions Open Doors for Rapid Deployment of Machine Learning Inference Across Broad Market IoT Applications Demanding Milliwatt Range Power Consumption

Accelerates deployment of AI into fast growth consumer and industrial IoT applications including mobile, smart home, smart city, smart factory, and smart car products

Optimized to provide ultra-low power [under 1 mW – 1 W], small size, and production-priced [$51-$10 USD] benefits of ASICs, with FPGA flexibility to support evolving algorithms, interfaces, and tailored performance

Full-featured Lattice sensAI stack offers modular hardware platforms, neural network IP cores, software tools, reference designs, and custom solutions via partner eco-system

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