WI-FI 6 VERSUS 5G

With the latest iterations will 5G replace Wi-Fi or will the two technologies remain complementary?
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Patents serve an important purpose, but are they still relevant in a world of fast-moving innovation?

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MISSION STATEMENT
‘New Electronics keeps designers and managers abreast of the latest developments in the world’s fastest moving industry.’
Earlier this month the European Patent Office (EPO) reported that UK companies filed over 5,700 patent applications in 2018, a rise of almost 8 per cent, while the number of European patents granted to British companies jumped 22 per cent reaching 3,800.

Companies like Imagination, Dyson and Arm all argue that it’s in their interest to have strong patent protection and are determined to strengthen their patent portfolios, not only in established markets but in markets like China where there is a growing focus on patent protection.

With this focus on Intellectual Property, however, there is an increase in litigation: Qualcomm v Apple, Daimler v Nokia are high-profile cases that reveal a growing scramble to protect rights in the fast-developing world of the Internet of Things and the roll-out of 5G.

It raises the question as to where IP rights reside and where the value of the connected world can be found – with large, established companies or the myriad of small businesses and owners of digital technology?

The IoT is a space where small companies, universities and spin-outs are developing an innovation ecosystem. As Martin Cotter of ADI explains to New Electronics on page 10, “Innovation is coming from everywhere.”

So, is IP and its protection helping or hindering in the promotion of technology? Do we need to amend IP laws and regulation and look to encourage more open innovation? Have patents, in fact, become the greatest inhibitor to innovation?

Many small businesses own patents themselves but research, conducted in the US, suggests that most senior management had hardly any knowledge on how to leverage that IP for growth. Many see IP as an expensive instrument that can, on occasion, help to attract investors.

For many the IP system is seen as confusing and inaccessible, being too complicated and too high in cost, and is seen solely as a legal tool promoting the interests of large technology companies.

Does the future of the IoT even lie in patents, or should we be focusing on the development of more open environments, taking a radically different approach to IP and in new business models?

Innovation and IP represent incredible investments of time and resources and the promise of strong IP protection, it is argued, makes these investments worth carrying out.

But does IP protection incentivise innovative activity or hold it back? In an era of exponential technologies, isn’t the only way of staying ahead of the competition to innovate more, be quicker to market and to be constantly reinventing?

I don’t claim to have an answer, but it’s certainly an interesting debate, and one that needs to be had as technology invades ever more aspects of our lives.

Neil Tyler, Editor (neil.tyler@markallengroup.com)
TechWorks appoints Alan Banks as CEO

THE INDUSTRY ASSOCIATION FOR DEEP TECH APPOINTS ALAN BANKS AS CEO. NEIL TYLER REPORTS

TechWorks, the UK’s industry association for deep tech connected communities, has announced the appointment of Alan Banks as CEO, with immediate effect.

TechWorks, which is the parent organisation to the NMI (semiconductors and electronic systems), Power Electronics UK, AESIN (automotive electronics innovation) and the IoT Security Foundation, was established to strengthen the UK’s leadership in deep tech.

Banks, who replaces Gary Travers, brings to the role extensive leadership, business and industry experience across automotive electronics, IT and telecommunications.

He has chaired AESIN since its inception in 2012, playing a leading role in developing and implementing a vision and strategy for the UK automotive electronic systems sector and, in addition to this, has spent 17 years at tier 1 automotive supplier Visteon, where he was engineering director and developed/delivered vehicle cockpit electronics.

Commenting on his appointment Sir Hossein Yassaie, TechWorks’ chair said: “Advances in deep tech, underpinned by engineering excellence and scientific discoveries, are fuelling growth in many contemporary and emerging markets. The UK plays a leadership role in the research, development and application in this field and TechWorks is dedicated to supporting and helping to strengthen this vital role.

“Given the multidisciplinary and complex nature of modern systems it is crucial our new CEO has the experience, passion and vision to bring together the skills from across multiple technology and engineering communities and help shape advancements to further strengthen the UK’s position.”

“We are facing a once-in-a-generation change in technology and the old models are being challenged,” said Banks. “The only way to ensure UK companies can address the fundamental changes and come out stronger is through collaboration.

“TechWorks is an ideal model for this, acting as a catalyst and creating non-competitive connected communities where we can build successful partnerships and can lead innovation of exciting, emerging technology markets.”

ams in new sensors joint venture

ams and Wise Road Capital, a private equity firm, have launched a sensors joint venture.

Wise Road focuses on emerging high-tech industries, and the agreement is intended to create a JV to advance the development and global sales of environmental, flow and pressure sensor solutions.

Under the agreement employees, IP, sensor products and solutions and related customers will transfer from ams to the joint venture, while Wise Road will provide guidance, market knowledge and channel and customer support.

The company’s HQ will be located in the Netherlands, and Stefan Raible will serve as Managing Director. He is currently General Manager of the Environmental Sensors business at ams. The agreement, which values the new business at $120million, is expected to be concluded this autumn.

ADI make strategic investment in UnitedSiC

UnitedSiC, a manufacturer of silicon carbide (SiC) power semiconductors, has announced a strategic investment and long-term supply agreement from Analog Devices, (ADI).

UnitedSiC and ADI have been collaborating on SiC-based products and devices for more than two years. As wide bandgap power devices, and SiC in particular, become more mainstream and cost effective, the inclusion of these devices should help to further strengthen ADI’s portfolio of analogue power devices.

Commenting Steve Pietkiewicz, Senior VP of Power Products at ADI said, “For the last few years, we have been actively following the development and progress of silicon carbide technology and devices. We found UnitedSiC’s FET technology to be highly suited for ADI’s high performance power platforms and our pursuit of additional high voltage applications.”
Qualcomm has chosen by Qualcomm Technologies to provide virtualisation-based security for its Qualcomm Snapdragon platforms, in a newly inked collaboration agreement.

Cog’s security and virtualisation APIs will be available in select Snapdragon mobile platforms, including the Snapdragon 855.

This will enable connected devices, such as Android phones and IoT devices, to access Cog’s virtualised modular security technology, known as D4 Secure.

D4 Secure is a security and virtualisation platform for connected devices. Cog’s virtualisation enables end-point innovation through modularity and provides a platform for a variety of use cases like advanced biometrics, AI and machine learning algorithms, simultaneous dual OS, and others without compromising either security or performance.

This collaboration with Qualcomm Technologies is expected to help raise the company’s profile with OEMs worldwide.

Bias algorithms

Algorithms have huge potential for preventing crime, protecting the public and improving the way services are delivered. However, there’s a risk that any human bias in that data will be reflected in recommendations made by the algorithm.

The establishment of the Centre for Data Ethics and Innovation (CDEI) was set up to make sure data-driven technologies and artificial intelligence are used for the benefit of society. It will partner with the Race Disparity Unit to explore the potential for bias based on ethnicity in decisions made in the crime and justice system.

The CDEI will also explore the opportunities for data-driven technology to address the potential for bias in existing systems and to support fairer decision-making. This may include increasing opportunities for those in the job or credit markets in existing recruitment and financial services systems.

The CDEI has now set out its priorities in its first work programme and strategy, which includes plans to investigate how data is used to shape online experiences through personalisation and micro-targeting. A series of nationwide workshops will be launched to explore public views on such matters.

MindSphere member

Arrow has joined Siemens’ MindSphere Partner Program for the Industrial Internet of Things (IIoT) solutions and technology providers.

MindSphere is a cloud-based, open IoT operating system developed by Siemens that connects products, plants, systems and machines, enabling businesses to access and use data generated by the IoT with advanced analytics.

As a MindSphere Platinum Partner, Arrow will have multiple technical staff trained by Siemens through the MindSphere technical curriculum, a variety of MindSphere applications in development, and a joint go-to-market agreement to assist customers with IoT technology generally and MindSphere specifically.

Arrow has a broad portfolio of products, services and expertise that enables it to address and support every layer of an IoT solution stack, ranging from electronic components to IT solutions. It is able to provide coverage from the edge to end-of-life, including: sensors, connectivity, cloud, analytics, security, IT infrastructure, and asset disposition. IoT solutions providers will be able to benefit from these and other services delivered by Arrow, such as remote management and monitoring, design and integration, as well as the digital transformation solutions offered by Arrow subsidiary eInfochips.

As a member of the Siemens MindSphere Partner Program, Arrow can offer market-ready solutions including Retrofit – which enables companies to integrate old industrial equipment with the new – smart city and end-to-end asset tracking. These, together with analytics services, are intended to help lower barriers to starting a new project low.

Organic growth

The signs are still set for growth in the organic and printed electronics industry, according to the latest business climate survey conducted by the Organic and Printed Electronics Association (OE-A).

The results of the survey, which were presented at LOPEC 2019 in Munich by newly elected OE-A Chair Stan Farnsworth, revealed that 73 per cent of participants expect the industry to continue its positive development in the coming year.

With a projected sales revenue growth of 9 per cent, 2019 is predicted to be another successful year for OE-A members, the Association said.

For 2020, a continuation of this positive trend within the organic and printed electronics industry is expected around the world. The companies expect further development and a stable growth in revenue of 10 per cent.

The positive forecasts for 2019 are also reflected in other areas such as R&D. Nearly three quarters of the responding OE-A members plan to expand R&D activities within the next six months. According to the survey respondents, the investment in production as well as the employment situation also remains stable.
Developers, Developers, Developers

At this year’s GPU Developer’s Conference, NVIDIA’s CEO Jensen Huang took to the stage with a series of announcements. Neil Tyler reports

In what was its 10th annual GPU Technology Conference, NVIDIA made a series of announcements covering developments in data centres, autonomous vehicles and robotics.

The company’s founder and CEO Jensen Huang delivered what was described as a ‘sweeping’ opening keynote at San Jose State University, describing the company’s progress in supporting a variety of dynamic industries and how he took the opportunity to point to advances the company has been making in developing the computing power needed to transform data into insights and intelligence.

“Accelerated computing is not just about the chips,” Huang said. “It is a collaboration, a codesign, a continuous optimisation between the architecture of the chip, the systems, the algorithm and the application.”

Huang used his address to conference to make several announcements.

The first was that mainstream servers optimised to run NVIDIA’s data science acceleration software were now available from seven of the world’s largest systems manufacturers, including Cisco, Dell EMC, Fujitsu, Hewlett Packard Enterprise (HPE), Inspur, Lenovo and Sugon.

Featuring NVIDIA 4 GPUs and fine-tuned to run NVIDIA CUDA-X AI acceleration libraries, the servers provide an efficient platform for data analytics as well as a wide range of other enterprise workloads.

Very power efficient, the T4 GPUs can accelerate AI training and inference, machine learning, data analytics and virtual desktops and have helped to create a new class of enterprise servers that, through GPU acceleration, can provide businesses with much greater versatility.

“The rapid adoption of T4 heralds a new modern era in enterprise computing - one in which GPU acceleration has become standard,” said Ian Buck, vice president and general manager of Accelerated Computing at NVIDIA.

Turning to the automotive sector, Huang said that NVIDIA was collaborating with Toyota, Toyota Research Institute-Advanced Development in Japan and Toyota Research Institute in the United States in developing, training and validating self-driving vehicles.

Building on its existing relationship with Toyota to use DRIVE AGX Xavier AV compute, the deal expands that collaboration to new testing validation using DRIVE Constellation - which is now available and allows automakers to simulate billions of miles of driving in all conditions.

Jetson Nano

Huang also unveiled the Jetson Nano, an AI computer.

The CUDA-X AI computer is able to deliver 472 GFLOPS of compute performance and can be used to run modern AI workloads and is, according to Huang, highly power-efficient, consuming just 5W.

The Jetson Nano comes in two versions - a $99 devkit for developers, makers and enthusiasts and a slightly more expensive production-ready module for companies looking to create mass-market edge systems.

The Jetson Nano can support high-resolution sensors, can process many sensors in parallel and run multiple modern neural networks on each sensor stream. It also supports a number of popular AI frameworks.

The aim, according to the company, is to make it easy for developers to integrate their preferred models and frameworks into the product.

The Jetson Nano is part of the company’s Jetson family lineup, which includes the Jetson AGX Xavier for fully autonomous machines and the Jetson TX2 for AI at the edge.

The Jetson AI computer platform is also now able to support the Amazon Web Services (AWS) RoboMaker, enabling both simulation and development to take place in the cloud.

AWS’s RoboMaker is a service that developers can use to develop, test and deploy intelligent robotic applications at scale.

It includes a development environment that enables the editing and debugging of robotics applications in the cloud and a simulation service that lets developers fine-tune robotics applications in simulated environments, rather than perform costly and time-consuming physical testing.

An over-the-air update system means that it is possible to securely deploy the application to Jetson-powered robots and it’s possible to push updates while they’re in use.

“The AWS RoboMaker provides pre-built functionality to support customers during their entire project, making it significantly easier to build robots, simulate performance in various environments, iterate faster and drive greater innovation,” said Roger Barga, of AWS’s Robotics and Automation Services division.
It’s been a busy few months for Martin Cotter, SVP Worldwide Sales & Digital Marketing at Analog Devices. From electronica last year to the Consumer Electronics Show in January, he’s been engaging with partners and customers in a market that is changing rapidly.

“We now talk about sensing the entire world,” explains Cotter. “Everything is being measured and improved upon and there has been an explosion in data. Whether that’s in automation, consumer applications or in the automotive space there is a requirement for higher performance and that is driving the need to take and interpret data securely.

Our customers need data that is both reliable and trusted and without that they won’t be able to achieve the higher impact outcomes they’re looking for.”

Cotter talks about a future of higher outcomes and the development of ever-expanding use cases that are helping to influence sensing road maps.

“What I mean by that, for example, is safer vehicles and the provision of improved clinical outcomes, not just wellness. All this requires us to solve the bigger problems; getting insight from accurate data, so you can take the right actions.”

Analog Devices is well positioned to benefit from this trend being, as Cotter describes it, the company that, “Starts with taking what is analogue information and providing a bridge to the digital world. We are in a position to look at longer terms patterns and do something interesting with them.”

Analog Devices is, according to Cotter, all about focusing on high end, high impact problems.

“We are looking at a wave of innovation at present in which the number of disruptive businesses impacting the market is growing rapidly. New ideas are being generated from many different places. As a business we are interacting with a lot of start-ups, and silicon is getting much closer to the solution which means that we, as a business, are having to collaborate with more solution providers - not just start-ups but large OEMs as well.

“While the integration between the silicon and sensor means that we are seeing more collaboration that, in turn, has led us to expand our eco-system to address this. “Like I said, innovation is coming from everywhere.”

According to Cotter this wave of innovation is being driven by a significant increase in semiconductor content.

“This ‘Third Wave of ICT’ is a world in which everything is being instrumented, it’s way above the components level. Hardware is critical in delivering this but fewer of our customers have the necessary analogue skills required, so we have been working to strengthen our base capabilities to address this.”

Earlier this month ADI made a strategic investment into UnitedSiC, a manufacturer of silicon carbide (SiC) power semiconductors.

At a time when wide bandgap power devices, and SiC in particular, are becoming more mainstream and cost effective, the inclusion of these devices was seen as helping to strengthen ADI’s portfolio of analogue power devices.

While this was about strengthening ADI’s capabilities, it has also made several outright acquisitions in the past few years.

“We have a long history of acquisition but it’s not about scale but rather about capability. While we’re seeing some positive results, it takes a lot of effort to integrate businesses and to do it properly.”

Artificial Intelligence, edge computing, 5G, autonomous driving and Industry 4.0 are all part of a wave of extra smarter solutions, according to Cotter.

“These are the mega trends that are generating value and for ADI what’s so important is that these trends require mixed signal content and that’s a big deal. Crucially, as our abilities scale, we will be able to solve more problems in a better way.”
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One of the perennial debates within the mobile communications sector relates to the stand-off between the worlds of IEEE 802.11 and 3GPP standards and specifications.

The topic is no less heated today as the industry is preparing to roll out the latest iterations of the two - Wi-Fi 6, till recently referred to as 802.11ax and 5G.

So, will the former make the 5G New Radio redundant? Or, will we really need Wi-Fi once 5G starts kicking in? Put another way, will 5G, with the prospect of covering so many bases for both indoor and outdoor connectivity, start squeezing Wi-Fi out once an unlicensed version of 5G takes off?

The reality, as all those interviewed for this feature suggest, is – none of the above. The debate is a false one, and the two technologies will continue to coexist. And for those who prefer this to be otherwise – it is yet another wasted opportunity to align the two wireless platforms closer together.

As Monica Paolini, founder and head of consulting group Senza Fili told New Electronics, “The current equilibrium between Wi-Fi and cellular will be fundamentally preserved as we move to 5G. While Wi-Fi and 5G/legacy cellular will retain their relative strengths and continue to complement each other, there are several areas where the technology is converging.”
Perhaps the most important of these, she notes, is that both the major connectivity regimes have moved into new spectrum bands to accommodate emerging and exciting user cases, for applications such as IoT and hyper-dense traffic location.

One distinction between the two that will remain is that because it uses unlicensed bands, Wi-Fi has better spectrum re-use, even if in licensed bands 5G is more spectrally efficient.

Paolini stresses that while the upcoming Wi-Fi 6 is currently capturing much of the attention, with its increased throughput, spectrum efficiency and device battery life, the evolution of Wi-Fi covers more ground, for instance traffic management, improved security, and the additional spectrum bands - all of which means the development of ever more use cases - many, importantly, for 5G applications.

She references a recent conversation with Carlos Cordeiro, Senior Principal Engineer and Senior Director in the Next Generation and Standards Group at Intel, in which he stressed that Intel, “Sees this complementary relationship growing with 5G. 5G is going to open up even more opportunities for Wi-Fi, because 5G capacity and latency requirements suit the Wi-Fi technology that is being developed today”. The clear message from Dr Cordeiro, stresses Paolini, was that the two will remain complimentary, but whenever the industry feels there is a need to bring them closer together, that is something that’s likely to happen. Not in the near future, however.

Claus Hetting, CEO of the Danish event organiser group Wi-Fi Now, concurs with this view - up to a point.

“We really must stop confusing these two technologies, and in particular that Wi-Fi is destined to become a sub-set of 5G. Nothing is further from reality or the truth” asserts Hetting.

He told New Electronics Wi-Fi 6 will ensure that the technology will continue to remain the mainstay of mobile communication for indoors and most enterprise applications. “Indeed with the really successful implementation of ‘ax’, 5G will just not compete.

“I really don’t believe Wi-Fi needs 5G at all, if anything, it is the other way round.”

Hetting notes that, “In any case, Wi-Fi 6 is already available in many access point (AP) products targeting both consumer and enterprise applications, chip companies including Broadcom, Intel, Qualcomm and Quanterra are shipping silicon, the industry has undertaken numerous successful ‘plugfests’ with routers and AP’s from major suppliers, and official certification of products will soon start under the auspices of the Wi-Fi Alliance.

“And where exactly are 5G products?” queries the Wi-Fi evangelist.

He also added that Intel surprised many at last month’s Mobile World Congress with a demonstration of what the technology will offer when 6GHz Wi-Fi becomes a reality. The timing hinges on when regulators allow Wi-Fi to operate in that frequency spectrum – unlikely before 2021 and then probably, only in the US.

However, the industry is speculating that when that enhancement (i.e. Wi-Fi in the 6GHz spectrum) does arrive, it will more than double the Wi-Fi spectrum, with up to 4x more 160Mhz channels deployment options, offering hugely improved network capacity and reduced latency. And, by implication, even more necessary in the 5G era.

Hetting also welcomed the decision earlier this year by the IEEE 802.11 working group that is responsible for defining Wi-Fi standards that only Wi-Fi 6 capable devices be permitted to operate in the forthcoming new 6 GHz bands.

This, he said, would unleash a veritable smorgasbord of powerful new services in just about every Wi-Fi segment and category, leading to numerous new applications - notably in dense environments - taking advantage of the huge potential additional quality and capacity. The decision means Wi-Fi 6 will be defined for operation in all current Wi-Fi bands, including 2.4GHz, 5GHz and future 6GHz.

Conversely, the current Wi-Fi 5 (802.11ac) will continue to operate in 5GHz only while the original 2.4GHz will support the earlier versions of Wi-Fi. The decision means Wi-Fi and 5G will get even closer in various potential performance levels.

Greater convergence

Indeed, broadband connectivity and the convergence of Wi-Fi and 5G is set to become one of the defining trends this year. For instance, wireless industry organisations the NGMN (Next Generation Mobile Networks) and the Wireless Broadband Alliance (WBA) published a joint report in January that outlines several potential use-cases in a converged world. The significant message of the document is that convergence between 5G and Wi-Fi, at least at the network level, is completely feasible, with each radio access network (RAN) bringing unique and complementary capabilities, and thus seamless services.

A major requirement for overcoming challenges towards convergence is seen as the enablement of Wi-Fi only devices to connect to the 5G core, and the report stresses that more research will be needed to ensure tight integration between the two networks. This may need an interface “to enable certain levels of network manageability and policy control between the 5G core and Wi-Fi networks, and the ability of a client to route traffic over one or more
accesses, making optimal use of the available connectivity."

The report suggests some specific technical developments, including devising specifications for tightly integrating 3GPP and non-3GPP radio technologies, and, importantly, ensuring this works within the core cellular network.

Despite this, and other initiatives, the feeling lingers that the two standardisation bodies (IEEE and 3GPP) continue to miss opportunities to align the two wireless technologies, despite the overlap that exists.

Many feel a trick was lost early on when the 5G standards process kicked off. There were talks between the two organisations about the potential from both a technical and user community viewpoint about integrating IEEE Wi-Fi related contributions into the 3GPP process, but these came to nothing, so the chance of a single, multi-RAT platform was lost.

The situation is frustrating many in the industry, who note that there are many common pointers in common within both organisations’ roadmaps, and that each could learn and benefit from the other’s initiatives in wireless connectivity.

For instance, the Wi-Fi crowd has moved much quicker than 3GPP in deploying mm-wave spectrum commercially. And it has taken a while for Wi-Fi to start deploying a technology that has been a mainstay of cellular for quite a while - namely OFDMA (orthogonal frequency division multiplexing). Wi-Fi 6 does – such that not only will it now be significantly faster, and also better able to handle the fast-growing need for client density that is now a must for modern IT systems.

And there are no indications that this stand-off will change any time soon. For instance, the IEEE seems not to have any plans to submit its 802.11 spec for potential recognition as an IMT-2020 (cellular) technology, and, similarly, it seems clear the 3GPP’s 5G will be the only recognised candidate to be an official next generation wireless standard.

As well as industry groupings, it seems numerous enterprises are also urging the two to find more common ground - business users are very keen to apply a single security protocol across both cellular and Wi-Fi networks.

Regulators are also getting in their ‘tuppence’ worth, and sometimes with a less optimistic view regarding the long-term prospects for Wi-Fi. For instance, in a wide-ranging interview with Telecom TV, the CTO of Ofcom suggested Wi-Fi could face a challenge to stay relevant as it does not seem to project an overarching vision for the future, at least when compared to that expounded by the 5G bandwagon.

Specifically, Mansoor Hanif said Wi-Fi proponents need to promote the technology beyond the immediacy of its coverage and connectivity, and come up with an n end-to-end development plan.

Hanif warned that despite its major advantage for indoor coverage, it could just become a piece in the jigsaw of the wider 5G framework, rather than having a unique framework of its own. He suggested that thanks to network slicing, cellular operators could set up virtualised network services that will be much more cost effective indoors than they are now.

Ofcom’s CTO also upset many at last November’s WBA Global Congress in London when he suggested the Wi-Fi sector needs to accelerate its developments if it wants to play a full part in a converged Wi-Fi/5G world, and focused most of his talk on the bright future of 5G, without referencing the late arrival of what he terms ‘an elephant of a technology’.

To be fair, there is still work to be done to have Wi-Fi 6 fully embedded. “Our certification project, crucial for an orderly implementation, and to ensure interoperability, is just getting started. And it is not a simple task, because of the amount of innovation and new features embedded in the latest iteration”, Kevin Robinson, director of marketing at the Wi-Fi Alliance told New Electronics.

“We are also seeing a fundamental shift in the way Wi-Fi will be perceived. For the past 20 years, the focus has been on evolution and to achieve ever higher data rates. Now with the adoption of multi-user MIMO (which allows more data to be transmitted at the same time) and OFDMA (which splits each radio channel into many more, thus allowing it to handle multiple devices) the focus is shifting to improving the way a network handles traffic.”

Robinson used a novel analogy to explain the shift, likening the concept to a delivery fleet. MU-MIMO adds more trucks to a fleet, while OFDMA enables each truck to make multiple stops on its route. The end result is significantly more efficient use of both the space and capacity that the ‘truck’ can provide.

Actual certification will start in earnest by the third quarter of the year, Robinson said. And he adds, it will allow significantly better security than previous generations of Wi-Fi, using the WPA3 protocols, a successor of Wi-Fi Protected Access 2 that has been the mainstay for over 15 years.

The major difference will be the way devices greet a router or other AP to which they are trying to connect, using a handshake mechanism called Simultaneous Authentication of Equals – more often referenced as a ‘dragonfly handshake’

With all these advancements, “Wi-Fi will continue to have inherent strengths, one of the biggest being that it will be able to deliver some of the 5G use cases on the horizon. So the message is the two worlds will need to be complementary”.

"Wi-Fi 6 is already available in many access point (AP) products targeting both consumer and enterprise applications..... where exactly are 5G products?" Claus Hetting
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No networking protocol has experienced the success of TCP/IP. Thirty years ago, it seemed possible that IBM might have fended it off with its SAA family of protocols or we might have ended up using the Open Systems Interconnection (OSI) family of protocols. But, thanks to the opening up of the US Arpanet once TCP/IP had been developed, the other options were quickly swept aside.

IPv4 itself is so successful that long after the internet was meant to have run out of addresses, IPv6 penetration remains stubbornly below 30 per cent globally, according to Google’s analysis and growth has been tailing off after reaching an apparent asymptote in early 2018.

Address-translation techniques appear to have staved off the threat to IPv4. And yet researchers and a handful of networking infrastructure suppliers are planning the unthinkable: to replace IP.

All of the options on the table start from the same place - a plan that removes the idea of compute nodes with unique addresses serving up a smorgasbord of data and services. In its place, under a protocol that employs named-data networking (NDN) every piece of data gets its own address. And that data can live anywhere on the internet that has room for it. There is no need to look up an associated IP address using the Domain Name System (DNS), at least in the purest form of NDN. This ability may be what makes NDN, ultimately, viable as an alternative to conventional IP.

Experimental NDN systems
The experimental NDN systems constructed so far work through “interest packets”. Each of these packets is a request for data attached to a name that’s constructed according to some predefined namespace hierarchy. And there can be many hierarchies: there is no need to shoehorn everything into one long list of dotted addresses.

One application where NDN may gain a foothold is in vehicle-to-vehicle (V2V) communication with its promised ability to sever the link between location and machine ID. The naming hierarchy might be based on the road network rather than the vehicles travelling around it. To use it, a car trying to look at road conditions ahead could harness data from whichever vehicle the network considers to be closest to the point of interest.

In contrast, the IP-based alternative demands a constantly updated centralised map of vehicle addresses, which could easily add unwanted latency to a fast-moving environment. With NDN, the car’s ID – which would also be its IP address in today’s network – does not matter. A different application would not encode the location but some other aspect of the data, such as a group of frames in a long video.

To get data from A to B, NDN routers, like their IP counterparts, maintain forwarding tables. NDN has two types. One is a pending-interest table (PIT), which keeps a record of any requests for which the router has not seen a reply. Returned data uses the PIT entries to find the breadcrumb trail back to whoever made the request. Van Jacobsen, one of the original IP developers who then came up with the initial ideas for NDN in the mid-2000s, argues the design architecture is much better for multicasting for IP as a router can forward to many ports at once using the PIT entries.

Because chunks of data are no longer located by their IP address, they can be held anywhere on the network and potentially inside content stores managed by the routers themselves, allowing the data to migrate from the original server closer to regions of high request activity. The source data elements themselves are found by looking up portions of the name in a forwarding table and then relaying the request to that upstream port. Each piece of data is encrypted individually to protect it although there may be issues with privacy. Anyone monitoring the network can see the requests for named data passing back and forth, assuming the systems that move into production do not find some way of obfuscating that information.

Problems likely to surface
Other problems are likely to surface as trials expand. During a panel session at an ICN workshop in Kansas City last year, UCLA professor Lixia Zhang pointed to the period after TCP/IP first appeared on the Arpanet as one where the protocol stack was tuned gradually over time to deal with problems that emerged as more users joined the network.

Even with small-scale trials performed so far issues have emerged with locating the sources of data.

A pure NDN implementation would

Oh data, the places you’ll go

Both autonomous driving and the IoT could lead to major changes in how the internet works, but IP is a stubborn incumbent. By Chris Edwards

“IPv4 itself is so successful that long after the internet was meant to have run out of addresses, IPv6 penetration remains below 30 per cent globally.”
flood the network with broadcast packets announcing the availability of various pieces of data. Zhang and colleagues proposed a distributed directory analogous to IP’s DNS to deal with the problem. However, experiments have shown that subtle conflicts in how objects are named in a highly distributed system can cause problems. Zhang says a lot more work is needed to research good naming strategies for use with NDN.

Then there is the question of deployment on real-world devices. The development toolkits provided for many operating systems naturally assume the presence of TCP/IP networks and applications may need to be reworked to work efficiently with NDN. Because of this, much of the current R&D work, including several EU-funded Horizon 2020 projects, are looking at ways of making NDN or other forms of ICN coexist with IP.

One option is to simply deploy NDN on top of IP, similar to the tunneling used for other protocols today, but it’s far from the only approach.

Two years ago, shortly after buying the content-centric networking technology from Xerox’s PARC research organisation, Cisco said it had started work on what it calls Hybrid ICN (HiICN), claiming that its approach solves the compatibility problem by absorbing data-centric methods into IPv6 itself.

The HiICN method encodes the names of data into the dotted-number form of IP addresses, taking advantage of the massive expansion of the address space made possible by IPv6. Because of IPv6’s slow growth, Cisco has still had to make its HiICN work with the older version of the protocol, which means interconnecting IPv6 islands with IPv4.

The rise of software-defined networking (SDN) provides other options do not involve porting a naming system onto IP addresses. SDN switches in the network watch for the packets from these different networks and invoke customised routines to handle each one.

The Horizon 2020 POINT project has also used SDN to implement what researchers call NDN as an underlay. The project ran a couple of small trials based around a treasure-hunt game in Bristol in the summer of 2017. In the open trial, players downloaded an app to their Android devices, which used the standard IP stack. But, connected to a private Wi-fi network, requests for video were handled by SDN switches that mapped the HTTP requests onto an ICN protocol. This made it easier to serve up video from the nearest router that had the necessary content in its cache, reducing overall latency.

**Video delivery**

One of the early promises of NDN was to deal with the problem of delivering video and other high-bandwidth data to users spread around the world.

However, this is an application that led to the creation of IP-based network caches – content delivery networks (CDNs) – which do not need a novel protocol to operate. Instead, large markets for IP-free ICN may lie in applications that produce far less data but already have problems with IP. These are devices that connect using low-energy protocols such as Lora and 6Lowpan that have severe restrictions on packet size.

One example is US startup Operant Solar, which aims to provide wireless modules for rooftop solar farms using a form of NDN developed with UCLA. The company claims NDN makes it easier to build mesh networks and route around failures. However, as full names could easily consume multiple packets on low-end IoT networks production protocols will most likely compress them for delivery to a gateway that then regenerates the full name that can proceed into the ICN backbone.

Although ICN may make the IoT work better, it still faces an uphill struggle. The rise of CDNs and network-address translation has demonstrated the ability of the IP world to evolve and head off challenges to a protocol with some major flaws. ICN could easily be a victim of another evolution in applications that sit on top of IP that deal with its mobility issues.
At the Consumer Electronics Show (CES), earlier this year, Plessey unveiled augmented reality (AR) and virtual reality (VR) glasses using microLEDs and which ditched OLEDs completely.

According to Plessey, these microLEDs were able to offer 10 times the resolution, 100 times the contrast ratio, and up to 1,000 times the luminance of traditional OLEDs, all of which was achieved by the light being generated directly by the pixels themselves. They’re able to turn off entirely to create a so-called “perfect” black, which means that the overall image has a far greater sense of vibrancy and depth while power consumption is reduced.

Plessey also used CES to show off a 0.7 inch 1080p microLED comprising of separate red, green and blue panels, and an addressable blue 0.7 inch microLED display running 1080p video.

The company has developed a scalable and repeatable GaN-on-Silicon monolithic process that is able, according to the company, to guarantee uniformly high quality and exceptional performance and has eliminated the problems associated with more traditional pick-and-place manufacturing techniques.

“We see our microLEDs going into the three main product areas,” explains Clive Beech. “The first is backlight systems in large screens. In combination with quantum dot films we are able to produce very high quality colour images but also the smart backlights are zoned so that they effectively carry a low-resolution monochrome image when the film screen carries the higher resolution image. So, it’s a low power, high brightness television system.

“The other one is where people are making screens by placing red, green, and blue LEDs. We can actually make a tricolour small colour pixel for that sort of application of mass transfer.”

The third area, as demonstrated at CES, is with wearable AR/VR systems.

“At the moment there are really only three solutions for this type of application,” Beech suggests. “There are two types of reflective display illuminated by a light source - Liquid Crystal on Silicon (LCOS) is one, and DMD, or Digital Multi-Mirror displays, another. Both are illuminated and the light goes directly into the projection lens and then into the glasses worn by the viewer.

“The third type of system is an OLED display, which can be designed to be very small.”

According to Beech, “The first two, the reflective designs, are not particularly suitable. When it comes to AR, you only light up about 20% of the pixels at any one time and reflective displays have to be illuminated completely because the system doesn’t know which pixels need to be on. It means that you have to power up the whole of the display, which will require a substantial battery pack to operate.

“The OLED option is a much better option as you only light up the pixels that you’re going to view. The problem with OLED, however, is that they’re not particularly bright and they don’t couple well into the optics. So, the display is very much like a normal television display and it’s visible over a wide range of angles. In an AR/VR headset we need the light to go into the projection lens, so most of the light produced by the OLED display is wasted.”

Beech argues that microLEDs overcome these problems.

“They make AR systems more achieveable as you’re only lighting the pixels that you use and they’re considerably brighter than an OLED – up to 250 times – and that makes...
it more than capable of being visible against an unattenuated outside world.”

Because of that capability Plessey finds that many large tech companies looking to enter the AR market are keen to talk to them.

“Reflective displays don’t work for them because of their high-power consumption, and OLED doesn’t work because it’s not bright enough. So, we’re working to develop a full emissive display for augmented reality systems, in particular, and probably VR as well. The problem with VR systems is that they get very hot.”

They get hot because VR systems, unlike AR, tend to be enclosed environments, as Beech explains.

“They’re very unpleasant to use, they get very hot as they rely on DMD or LCOS displays. OLED is ok, as it’s not competing against the outside world, but they are not particularly efficient. If you want brightness in your image then those devices will tend to get very hot indeed.”

**Replacing DMD and LCOS**

microLEDs are a suitable replacement for DMD and LCOS, particularly in AR, according to Beech.

“We’re working with our own technology which is gallium nitride on silicon (GaN-on-Si). Now one thing about that is it makes these LEDs produce blue light. Blue light is just one of the three colours that you need. So, we are working with Nanoco Technologies to add red and green light.”

Nanoco is a manufacturer of quantum dots and semiconductor nanoparticles for use in displays and lighting and the two companies are looking to shrink the pixel size of monolithic microLED displays by using Nanoco’s technology.

Plessey wants to integrate the quantum dots into selected regions of blue LED wafers in order to add red and green light.

“This technique means we can shrink the pixel size from today’s 30µm to just 4µm, a reduction of 87%. The process will enable the production of smaller, higher-resolution, microLED displays in applications such as AR/VR devices and wearables, while enhancing both colour rendition and energy efficiency,” according to Beech.

“Quantum dots produce very pure reds and greens, so you get a good colour gamut.”

The process of transferring this technology to the micro display, which is what is needed for augmented reality, is not without its problems.

“The flux of photons going in is very high, much higher than you would have on a television screen. So, these quantum dots need to be engineered to take very high photon flux without being saturated or destroyed by that process.”

The manufacturing process, that’s being developed with Nanoco, is complex but market leading.

“Our displays are arrays of microLED dots but as an array, it’s not controllable, so it has to be bonded to a CMOS backplane. The backplane controls all the LEDs to give us, effectively, a monochrome display. What we then have to do is to take those monochrome pixels, around a third, and colorize them to red with quantum dots, and another third to green.

“In order to do that, we’ve got to be able to print quantum dot material at the scale of just a few microns in size.

“A pixel is eight microns by eight microns, and that pixel has to be sub-divided down into red, green and blue. So, the red pixel will be two by eight, and the green will be two by eight, and the blue, at the side of it, will be two by eight. There’ll be a small gap between each. So, the two big challenges are that the quantum dots have to survive the high flux density and the high temperatures associated with these displays.

“We’ve then got to be able to print them, but on a very small scale. We are looking at something of the order of two or three microns in size. They’ve got to survive the high flux density. They’ve got to survive the local high temperature. And they’ve got to be protected from the outside world. Those are not insignificant problems to be overcome.”

Plessey has a number of microLED contracts in place with leading tech companies, according to Beech.

“They all want different sizes, different size pixels, but most of those will have prototypes in their hands in Q4 this year and pre-production samples will be available around that sort of time; our aim is to have product in the market next year.”

microLED adoption is expected to accelerate post 2020, yet in the mobile space its brightness is an issue, and the cost of microLED displays remains prohibitive.

“OLED displays work well enough. At present microLEDs would be very expensive to use - so for phone screens it’s not really an option,” said Beech.

“We’ve got the performance up to a very high level and I believe it’s a technology whose time has come. We are hitting a point where the adoption of microLEDs is certainly accelerating, but the challenge remains manufacturing at scale.”
When standalone discrete passives or even integrated passive networks are included as part of a chipset, then routing parasitics, device compatibility and board assembly considerations need to be carefully considered. The importance of integrated passives only becomes apparent when they are included in system in package applications.

An integrated passives technology initiative (iPassives) was begun at ADI, with the aim of delivering passive components that could encompass more of the signal chain while overcoming the limitations and complexities of the existing approaches used with passive components.

iPassives can be viewed as a flexible design tool that enables the design of system solutions.

Integrated passives technology is being used to tie this all together in highly customisable networks and packaged up via system in package technology to create μModule devices.

Passives generally constitute over 80% of the bill of materials in an application, occupy about 60% of the area, and make up about 20% of the overall component spend.

There is often a high degree of uniqueness to components and that can contribute to errors that degrade time zero circuit performance across the operating lifetime of the circuit. The assembly and wiring of individual components also takes time.

The elements are connected using a soldering process, generally through-hole or surface-mount technology (SMT) assembly that has enabled the development of smaller passive components; in this case, a landing pattern is etched on a PCB, solder paste is used to cover the patterns, and then SMT components are positioned using a machine.

The PCB is then run through a soldering reflow process, where the solder liquefies and establishes electrical connections, and, when cooled, the solder solidifies and mechanically affixes the SMT components to the PCB. The primary problem is that soldering processes can be very unreliable.

The actual composition of the solder, mechanical stability during the solder reflow process, the purity of the solder and the time and temperature in the solder reflow process can all have an impact on quality.

Another limitation in employing passive components is that trace lengths need to be long, which can introduce unaccounted for parasitic elements that can limit performance and the repeatability of results.

Passive devices also present a lot of potential contact points where ESD events can occur.

**Integrated Passives**

Integrated circuits contain many transistors wired together with very well defined metal interconnections. Special processes have been developed for analogue type applications like DACs and ADCs that contain portfolios of passive components in addition to the transistors. To achieve the performances required, very high quality passive components have been developed and these are used to build integrated passives.

Just as integrated circuits contain many transistors, integrated passives can contain many high quality passive components packed into a very small area. They are fabricated on large area substrates where multiple passive networks are produced at the same time.

One of the most compelling advantages of integrated passives over discrete passives is the precise matching that can be achieved with them. When integrated passive networks are fabricated, all components within a network are manufactured at the same time, under the same conditions, with the same material set and, because of network compactness, essentially in the same place.

To illustrate this let’s say we have...
an application that requires two matched resistors. These resistors are fabricated on circular substrates such as silicon wafers (Figure 1). Due to slight process variations like resistive film thickness, chemical properties of the film, contact resistance, etc., there will be some level of resistance variation within a batch and even more variation across multiple batches. In Figure 1, dark green indicates the resistance is on the high side of the tolerance range and yellow indicates the resistance is on the low side of the tolerance range. For standard discrete devices, there is the possibility that each of the two resistors may come from different fabrication batches as indicated by the two separate resistors drawn in red. The full tolerance range of the process may be observable between the two discrete resistors and hence the matching will not be very good. With special ordering restrictions it may be possible to have the two discrete resistors chosen from the same batch as indicated by the two separate resistors drawn in blue. The tolerance range within just one batch may be observable between the two resistors. While the matching between these resistors will be better than the random discrete case, there is still scope for some level of mismatch. Finally, with integrated passives, the two resistors come from the same die, as indicated by the resistors drawn in black in Figure 1. The tolerance range within one die is the only range that will be observable between the two resistors. Hence, matching between the two resistors will be excellent.

The individual components within integrated passives are placed closely together and, because of this, the interconnect parasitics such as trace resistance and inductance can be kept to an absolute minimum.

On PCBs, interconnect parasitics can be variable due to trace tolerances and component placement tolerances. With integrated passives, interconnect tolerances and component placement tolerances are extremely tight due to the photolithographic processes employed in their manufacture.

The miniaturisation of passive networks through integrated passives has the added benefit of making circuit boards smaller, reducing circuit board costs and allowing more functionality and performance to be added. Building systems with high channel counts becomes much more practical when using integrated passives.

Another significant advantage of integrated passives is the robustness of the complete wiring network around them. Rather than needing lots of soldered connections, integrated passives are essentially forged together in one complete unit, sealed up with glass, and then further protected with a robust plastic encapsulant.

An additional benefit of integrated passive networks being so well sealed up is that the number of exposed nodes in a system is much reduced. Integrated passives, having multiple passive components within one device, greatly unburdens the customers’ bill of materials, which results in the cost of ownership going down. Customers receive integrated passive networks fully tested and proven to be good. High quality passive devices have been core to the circuit performances achieved by many of ADI’s products and the integrated passives portfolio now contains a significant number of components.

The integrated passives process is modular, which means that the processing steps needed to produce a certain type of passive device need only be performed if that particular component is needed. An iPasseives network can essentially be built up with just the processing complexity required. There are a number of passive building blocks to choose from and constructing an integrated passives network can be as simple as piecing together the required components.

Integrated passives hold many advantages over discrete passives and ADI’s μModule devices leverage off the capabilities of a diverse range of integrated circuits.

These circuits are manufactured through tailored processes that provide enhanced performance and that are not achievable from any one single process. ADI is using iPasseives to tie these integrated circuits together and in doing so are building complete precision signal chains within a single device.

By adopting a reusability approach from a huge portfolio of field proven ICs and combining this approach with the versatility of iPasseives, both the development cycle times and costs are dropping significantly.

At first glance, the use of integrated passives may appear only incrementally more advantageous over established approaches but, in truth, they turn out to be significant and iPasseives are redefining what can be done, but also what speeds, costs, and sizes are beneficial to customers.
The sun is setting on plug-in hybrids (PHEVs) in the UK. A series of market, regulatory and technical changes mean that demand is slowing, and as those factors continue to snowball, we will soon see the ultimate demise of PHEVs, and a corresponding increase in battery electric vehicle (BEV) sales.

The Society of Motor Manufacturers and Traders (SMMT) recently published new car registration figures for 2018, which showed that registrations of all plug-in cars reached record levels last year, but demand specifically for PHEVs showed signs of waning. This is understandable as hybrid plug-ins were always intended to be an interim solution until BEV vehicles, with longer ranges, became more affordable and practical.

The Plug-in Car Grant for PHEVs was axed by the government in October 2018, as part of a new and improved system intended to increase uptake of electric and hydrogen fuel cell vehicles. Although the changes were initially meant to take place from 9 November 2018, the Department for Transport brought forward the start date to 22 October 2018, after a huge spike in last minute sales.

In November 2018, the overall European passenger plug-in market achieved +31% year over year (YoY) sales. There were some 37,500 registrations, pulling the year-to-date (YTD) count to 345,000 deliveries (+34%). In the broader context, the 2018 EV market share grew to 2.4%, thanks to a 3.2% market share in November. However, BEVs here were still a bit less than half PHEV sales at best in a given month.

The top electric cars (in terms of YTD unit sales) across the bulk of Europe included the Nissan Leaf, Renault Zoe, Mitsubishi Outlander PHEV, VW e-Golf, BMW i3 and Volvo XC60.

When comparing sales for BEV and PHEV, there are significant variations. On the fully electric vehicle side, sales jumped 96% YoY, the segment’s highest growth rate since July 2014, and hit a record 23,000 registrations (61% share of all plug-ins), allowing them to surpass PHEVs in the total year breakdown.

One can infer from the growth rate that BEV sales will cannibalise PHEV sales, although there were multiple factors forcing PHEVs to lose ground.

Why are PHEVs in trouble?
At the Electric Vehicle Charging Innovations event, held last year, speakers said that the days of PHEV were numbered, for several reasons. Firstly, PHEVs have inbuilt complexity of running both a petrol engine and an EV drive train, which complicates servicing and maintenance costing more per vehicle.

In the early days of the electric vehicle market, PHEV manufacturers argued that batteries were expensive, and slow to charge, which led to a limited range and inconvenience for users.

However, as BEVs can today attain longer ranges, the argument for using a hybrid system becomes less compelling.

END OF THE ROAD?

Does a ‘tsunami’ of market, regulatory and technical issues mean the end of hybrid cars? Perhaps, suggests Dunstan Power.
has become less compelling. Drivers can enjoy 280 miles in a Hyundai Kona and Nissan has a 60kWh Leaf coming out this year with similar range performance, which the Tesla model S also boasts. BEVs are becoming more affordable, have improved charging times, better infrastructure, improved design and usability features, while acceleration has become best-in-class. In addition, as consumer awareness has improved, the purchase of a BEV has become a stronger social statement than owning a hybrid.

Another key factor is that PHEVs have in the past been used as a tax avoidance measure for company car drivers, as they benefit from a low carbon output on paper. However, most PHEV drivers simply do not charge their cars and just use them as an inefficient petrol vehicle - Governments have got wise to this and therefore are phasing out subsidies on PHEVs.

PHEV sales continue to feel the sting of the new WLTP (the Worldwide Harmonised Light Vehicle Test Procedure) standard - used to measure vehicle fuel consumption and CO2 emissions, which came into force in Europe last year. WLTP results are now closer to real-world usage than the figures created by the previous New European Driving Cycle (NEDC) tests. Consequently, nine of the top-10 best-selling plug-in hybrids in the first half of the year have either been removed from sale or are no longer rated as offering less than 50 grams per kilometre of CO2, the figure below which the car is rated as being ultra-low emission and therefore eligible for tax breaks.

At a practical level, the fact that all hybrids have some form of dual drive-train means that production costs are higher, which ensures that in the long term BEVs will become cheaper than hybrids first, and eventually cheaper than fossil fuel cars.

At a psychological level, it is certainly arguable that the phrase ‘hybrid’ implies a bridge technology to somewhere else (in this case pure electric cars) and since hybrids are often purchased for ethical or running cost reasons their buyers will always be incentivised to choose a more refined option where they can. While initial hybrid marketing successfully portrayed them as being the most practical face of electric vehicles, this is already no longer the case, and will increasingly cease to be so.

Electric vehicle adoption

Although incremental progress in car manufacturing over the past century has been the norm, we now face a technological revolution.

In the very late Victorian to early 20th century, the internal combustion engine (ICE) had to compete with other vehicle technologies including steam and (surprisingly) electric cars. That competition is equivalent to what we’re seeing now with various forms of hybrid technology and promise of hydrogen fuel cells (though they are a dead end for normal cars). The difference now is that environmental and potentially geopolitical considerations are forcing battery, energy and charging innovation to favour BEVs.

The UK government’s position is that pure ICE cars can no longer be sold after 2040, but based on previous transitions it is likely the transition will be much sooner. The government has already published its Road to Zero strategy, which contains a proposal to remove cars powered by petrol and diesel cars entirely from UK roads by 2050, placing a hard stop on the debate.

Initiatives such as London’s new Ultra-Low Emission Zone (ULEZ) also highlight the push to adopt “cleaner” vehicles, as drivers of older cars will have to pay a £12.50 daily charge across a zone reaching out to the North and South Circular in 2021.

However, new technology must be significantly better than incumbent technology in order to reach market parity, simply because people buy what they are most familiar with.

Is this really the beginning of the end of the road for PHEVs? Once a new technology reaches market parity, there’s very little incentive to buy the alternative, causing a sudden catastrophic drop in demand. Today BEVs primarily compete with PHEVs, and thus when they reach parity (which is where I believe we are now), PHEV adoption will plummet, boosting BEV sales further. Hybrids are now the primary competitor for petrol cars as they both displace diesels, but once BEVs reach parity with hybrids, the same effect will take place and this is highly likely to happen around the 2022 to 2025 timeframe for new sales.

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The VIGIL project

ByteSnap Design is working with a consortium of partners on this pioneering two-year collaborative project, VIGIL (Vehicle-to-Grid Intelligent Control). The VIGIL project is focussed on developing a new communication and control platform for Vehicle-to-Grid/Building (V2G/V2B) systems: an off-vehicle system that controls how, when and at what rate at which electric vehicle batteries are charged/discharged with respect to local substation constraints and EV/building energy requirements.
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Infotainment has always been a crucial part of the driving experience. But with the focus on improving vehicle safety, OEMs are having to explore alternative technologies - from voice to gesture recognition - to deliver a better and safer in-car experience.

As smartphone and smart home experiences have improved, expectations of the automotive experience have grown too. Voice recognition systems, such as those from Google and Alexa, have become central to a range of applications from smart speakers to lighting and heating. The convenience of smartphone applications are also helping to improve the user experience, with constant access to social media and emails.

Acknowledging the demand for a better in-car experience, Amazon launched the Echo Auto - an aftermarket product designed to bring Alexa into the car.

In a joint venture, IoT company, Klika Tech, and software company, aicas, have leveraged this technology to develop “a new standard for connecting drivers through voice recognition and real-time information”.

The technology uses aicas’ JamaicaCAR - a downloadable, connected application framework for car headunits and in-vehicle infotainment (IVI) systems based on real-time Java.

“Java removes the errors that C and C++ bring,” according to Dr. James Hunt, co-founder and CEO of aicas, “because the user doesn’t need to worry about memory management.”

He added, “Resource management is featured in the system so that each app can be limited to just what it needs. As a result, if there is an error, it doesn’t affect the whole system.”

The framework has a growing number of in-car apps and service offerings, with the car maker or Tier-1 supplier able to add new apps without having to discard the legacy platform.

It connects the car to the cloud and can be managed both inside and outside of the vehicle, opening it up to possibilities such as pre-programmed navigation. The platform supports the on- and off-board communication through a set of library interfaces like GPS, Internet and inter-application messaging.

“Consumers want the fully-integrated single voice-based service connecting them to the on-demand world and to all services in their cars,” explained Gennadiy M Borisov, Klika Tech’s President and Co-CEO. “At present, they are faced with disparate technologies that prevent intuitive and reliable control of services and information inside and around the vehicle.”

The aicas’ framework is based on the OSGi standard - a well-known module system for Java - to make it easy for any programmer to utilise it. The technology also has the benefit of real-time capability, a crucial quality added by aicas, according to Dr. Hunt. “You need instant feedback in a vehicle otherwise it’s a distraction for the driver.”

To further improve this real-time experience, both companies are working with Amazon to see what part of the system can be placed locally rather than on the cloud. “We want to do pre-filtering locally,” Dr. Hunt explained. This means that commands the driver would expect an instant reaction to e.g. “find me the nearest petrol station”, are processed locally and a response given in real-time. Whereas less urgent questions such as “is it raining in Kent?” will be dealt with in the cloud.

However, there is another challenge to be faced before the technology can advance to such a stage.

The car is a noisy environment and with the current voice assistants available, systems can have difficulty “hearing” commands. Qualcomm has been working on noise cancellation technology, using the know-how it has developed for phone handsets and
applying it to the automotive sector. “It will certainly be more complicated,” Thomas Dannemann, director of product marketing in Europe at Qualcomm, admitted, “but the technology can be adapted.” He points to an increased amount of a processing technology and additional DSP performance as the way forwards.

Although Dannemann, like Dr. Hunt, sees voice dominating I-V-I, he believes that there is potential in gesture control too. Accompanying this, he foresees a trend with more displays being deployed, along with much higher resolution. “I can imagine a system in which drivers point and say, ‘what building is that?’ and the system recognises where/what they’re pointing to and provides them with the information, e.g. that is the town hall.”

To achieve this, he describes a car with a series of cameras placed inside and outside which detect both the driver’s movements and the vehicle’s surroundings, which are then combined with map data and location services. “Augmented arrows,” he suggested, “on top of a live streaming of the road could then be used to indicate where, for example, a building entrance is situated.”

To allow automakers to deliver these types of customisable options, Qualcomm has developed fully scalable 3rd Generation Snapdragon Automotive Cockpit Platforms, designed with a modular architecture.

The platform supports higher levels of computing and intelligence needed for advanced capabilities featured in next generation vehicles, including AI experiences for in-car virtual assistance, natural interactions between the vehicle and driver, and contextual safety use cases. It builds on the company’s Snapdragon 820a technology and aims to deliver a concurrent implementation of next generation high resolution digital instrument clusters.

“Right now, vehicles have a mixture of analogue and digital clusters. The next generation will be only digital, with information being shared between the multiple displays,” said Dannemann. “With our platform, we can provide auto manufacturers with the tools to design displays which not only ensure relevant information, such as gear shift, is always on show, but that also allows the style and arrangement of the clusters to be changed dependant on user preference.”

As AI advances within the car environment, Dannemann also envisions a system that learns and starts to understand driver behaviours. “The displays might even configure themselves based on your habits.”

Perhaps the user listens to the news every morning on their way to work - the car could start to automate that process.” Taking that one step further, Dannemann said an intelligent system where the car would notify the driver it requires a service and propose a date based on a connected personal calendar, was also a possibility of future I-V-I systems.

Looking further into the future, Dr. Hunt and Dannemann agreed that with the introduction of ADAS and, eventually, autonomous vehicles, the possibilities of infotainment will only grow. If the human driver becomes the passenger to an artificial driver, the ways that they were once restricted will become irrelevant, said Dannemann. This will open up potentials such as in-car video conferences and even allow for multiple forms of interaction such as video and audio streaming to occur simultaneously.

“Today the I-V-I system has developed to be part of the IoT ecosystem, but now it’s looking like it will become its own entity with an ever-growing role,” Dr. Hunt added. “As such, it will be a vital selling point.”

Dannemann agreed, adding that the future holds much more collaboration between the car makers and Internet companies like Google.
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Standing the test of time

With the release of a new direction finding feature, Bluetooth continues to evolve. By Bethan Grylls

Despite being in its 21st year the market for Bluetooth continues to grow. To put it in perspective in 2000, there were a total of 800,000 Bluetooth enabled devices shipped in a single year. Today, it’s 10 million per day.

Martin Woolley, Developer Relations Manager EMEA at the Bluetooth Special Interest Group (SIG), the official standards organisation for the wireless communication technology, suggests that Bluetooth’s survival and popularity is owed to its clever evolution that has made it applicable to new and relevant use cases.

It started with Bluetooth Basic Rate Enhanced Data Rate – essentially a cable replacement technology that allows for one-to-one wireless communication. Now there are three Bluetooth technologies, but arguably the biggest milestone emerged 8 years ago with the release of Bluetooth Low Energy (BLE).

BLE allows for super-efficient, wireless devices - and paved the way for applications that were previously not conceivable. For example, the smart home relies on battery-powered sensors hidden in non-accessible places.

With the introduction of BLE radio, the community also sought to address the market opportunity for standardised, lower-cost location services solutions. With forecasts anticipating more than 400 million products shipping per year by 2022, it appears it’s been successful in achieving that goal.

The location technology generally falls into two categories - proximity and positioning. These use the BLE radio to determine if two Bluetooth devices are in range of each other and, in many cases, use received signal strength (RSSI) measurements to estimate the distance between the two devices.

With proximity solutions, one Bluetooth device is used to determine if another Bluetooth device is within range and how far away it is. Point of interest (PoI) information and item finding are two popular types of use case.

In a PoI information solution, small, battery powered Bluetooth transmitters, often referred to as beacons, are scattered throughout a facility to improve visitor experience, for example a beacon can be deployed in a museum to offer visitors information about the exhibits. Typically, these kinds of solutions will need the individual to download an app onto their mobile phone, which enables the Bluetooth radio in their device to ‘listen’ for nearby beacons.

Item finding is another PoI solution, which, according to SIG, has experienced tremendous growth over the last few years. Again, these are small, battery powered Bluetooth devices – often known as personal property tags – that can be attached to movable objects such as car keys. They include an application that enables the Bluetooth in a
solutions can provide meter-level accuracy (~1-10 meters).

The third technology of the Bluetooth evolution is Bluetooth mesh. “This creates networks of tens of thousands of smart devices and was designed for smart buildings where every light, air con system, thermostat, and so on, becomes a device in your network,” explains Woolley. “This enables you to monitor and control these systems and create automation. For example, when a specific temperature is met, the heating will turn off.”

And now, the evolution of Bluetooth has taken one step further with the introduction of the new finding feature.

**Direction finding**

The new release of the core specification – version 5.1 – stipulated some enhancements and error corrections, but the primary announcement is the addition of the direction finding capability.

This feature holds the potential to significantly enhance the performance of Bluetooth location services solutions, going from metre-level to centimetre-level accuracy, according to SIG.

The feature supports two methods for determining the direction of a Bluetooth signal, both of which are based on the use of an antenna array: angle of arrival (AoA) and angle of departure (AoD).

In the AoA method, the device to which direction is being determined, such as a tag in an RTLS solution, transmits a special direction finding signal using a single antenna. The receiver device, such as a locator in that same RTLS solution, has multiple antenna arranged in an array. As the transmitted signal crosses the array, the receiving devices sees a signal phase difference, calculating this using In-Phase and Quadrature (IQ) sampling.

“Small differences in the distances between the antennae in an array within one device and the single antenna of the other device can be determined by measuring the phase of radio waves incident upon the receiver’s antenna or antennae. From these distance differences, we can use trigonometry to calculate the direction of one device from the other as an angle,” Woolley said.

AoD works the opposite way, with the signal emitted from a transmitting device such as a beacon rather than the receiver device such as a tag.

With both, the sampled data is passed up the stack via the Host Controller Interface where it will then be possible to apply a suitable algorithm to the sampled data to calculate the direction of one device from the other.

“This feature offers accuracy that is leagues better than the old beacons. However, this doesn’t mean it will replace this technology – because it all depends on your use case,” said Woolley. “But where more precision is needed, this new tech will be utilised.”

The hope is that Bluetooth will now be able to better address the varied and evolving needs – like it has done so in the past – of the location industry, enabling more flexible, scalable and future-proof deployments.

As for the future, Woolley said that “the community never sits still”. He pointed to next generation Bluetooth audio as the technology’s ensuing innovation.

“There are lots of alternative listening scenarios that are not headphones and phones,” he hinted, “but that’s all I can say. One of the balancing acts of being a standardised body is finding a way for competing companies to work together. The way we’ve achieved that is strict confidentiality.”

Although the future of Bluetooth can’t be unveiled just yet, this is a technology that has stood the test of time, and so, it holds promise that whatever it is, it’ll be revolutionary. For now, with the publication of 5.1 still relatively fresh, it’ll be interesting to see how exactly the industry will utilise it.
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Over the last few decades, rapid growth in the optoelectronics industry has altered the way products are designed and manufactured, with the ready availability of off-the-shelf components leading companies to differentiate themselves with unique software, rather than hardware.

But for niche applications, bespoke hardware can be a necessity — and requires a sophisticated, flexible design process.

Design for Manufacturing (DFM), or the practice of designing products so that they are easier and more economical to manufacture is becoming increasingly important. From the start of the design phase, manufacturability is being considered and any potential problems addressed during the design phase - which is both more cost effective than waiting until the unit is closer to production.

**Hard and soft innovation**
As more electronic products come to rely on standard components, companies are innovating not with hardware, but with software - using layers of code to create unique uses for components manufactured en masse.

In this way, the sphere of innovation has moved from hardware to software. The intelligent doorbell, for instance, is a complex video tool that allows you to view visitors remotely, relies on similar hardware to decades-old tools like motion-detecting security lights.

But although consumer products, which have a short lifespan and generally serve personal purposes are able to innovate with software alone, the use of off-the-shelf components within a standardised design process can limit innovation and create significant problems when applied in commercial or industrial contexts.

Pacer’s Matthew Ashton, an optoelectronic specialist, believes that bespoke hardware solutions have particular relevance in an age of mass production, giving top-tier customers the best possible opportunity to implement ideas and differentiate their products in a diverse range of markets.

**The pitfalls of standardised design**
The short lifetime of consumer components and products, due to planned obsolescence or the changing demands of market are a nuisance at the best of times but can play havoc in heavily regulated industries where products must undergo thorough testing, according to Ashton.

For example, military and medical
products demand longevity. With machinery that could mean the difference between life or death, the switching of a single specification on a very small component could bring the whole operation crashing to the ground. And, as Ashton explains: “It’s those types of components that can be here one day, gone the next. If a designer decides to put one of those things in because it only costs three cents, they will find that in three years’ time when the product reaches maturity, the component is gone.

“Because components sourced from bulk manufacturers remain subject to upgrades and changes, which can come at any time, the final product is vulnerable to disruption. Successful bespoke design therefore demands a bespoke process, and one that stretches all the way from supply chain management through to the final customer solution.”

**Bespoke design**

Pacer looks to apply its optoelectronic expertise in a diverse range of niches, across all stages of the design process, according to Ashton.

“This could mean taking a product all the way from initial design concept to delivery to market - through a feasibility study, prototyping, pre-production, field trials, and process improvement. Or, it could mean delving into a specific segment of the design process to prevent the whole production from faltering.

“As each stage of the design process is gated with strict parameters, it can be altered according to the needs of the customer, to ensure the most efficient possible navigation of the whole process. This might mean securing a robust supply chain, isolating components for individual renewal, or reducing costs with process improvement,” explains Ashton.

Such a process is of particular importance in heavily regulated industries that cannot afford to be at the mercy of manufacturer obsolescence. Products must often pass multiple trials to gain the approval of a specific design, which cannot be later adjusted by the changing of a single component, because, as Ashton says: “You don’t know the end result within the system.”

The mass production of LEDs, as Ashton points out, prompted legions of engineers to design products around components that six months later were superseded by brighter, more efficient, and cheaper variants. Then, the products designed around the specific characteristics of those LEDs were left high and dry.

“Hole-in-the-wall ATMs provide another example whereby they rely on hundreds of individual sensors to carefully convey notes from vault to dispenser. Should the specification of simply one of these sensors change, then the whole flow could be disrupted and could result in a situation where the machine is spewing out wads of notes or not functioning at all,” says Ashton.

**Optoelectronic detectives**

The advantage for a company like Pacer, Ashton suggests, is not about being able to ensure that these changes never happen. But that when they do, they are “managed well, rather than the customer being told, bad luck because it’s a commercial part.”

By moving to bespoke products, customers are not insuring against change, as off-the-shelf components can still be vulnerable to obsolescence, but choosing to manufacture in a way that is not subject to the “fickle wind of the commercial market”, as Ashton puts it.

Taking more control over the supply chain requires an investment and sidestepping the standardised design process can require additional expertise. But while this investment could be expected to work out cheaper in the long-run, it can also yield immediate savings.

By cutting out the unnecessary functions of one-size-fits-all standard components, costs can be reduced from the outset - a “stripping down” process that Pacer has used to reduce costs for one customer who required specific components to monitor levels of liquid in a waste bottle.

“Instead of a one-size-fits-all off the shelf sensor, which can change power gain, is highly configurable for different applications and can come at a high cost, what we’re doing is coming up with a stripped-down version that meets all those requirements. Such an approach gives the client the performance they need without the undue processes attributed to the standard product and can be sold to the customer significantly cheaper, even at high volumes,” says divisional manager James Woodhead from Pacer.

Deviating from standard products and procedures can raise a lot of questions, and these can often only be resolved with expertise.

But, as Ashton concludes, it’s a process that requires unique powers of observation, knowledge and insight, “as you never know what case is going to walk through the door.”
Call James Creber on 01322 221144

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Current Transducer from Danisense

High-accuracy, large aperture current transducer from Danisense measures up to 1200 Arms

Targets testing of high power converters for today's electric and hybrid vehicles

Danisense, the leader in high-accuracy current transducers for demanding applications, today announced the DM1200, a high-accuracy current transducer capable of measuring signals up to 1200 Arms and 1500A/DC. Specifically targeting the EV and HEV markets which requires higher power converters that can be rapidly charged, the DM1200 also features a large, 45mm diameter aperture which makes testing easier and more cost-effectively as frequent installation and replacement of the system under test can be performed without the need to remove the primary cable connector.

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New CONNECT Enclosures For Wired Electronics

OKW's New CONNECT Enclosures For Wired Electronics

OKW's new CONNECT enclosures are designed for cable connected electronics or USB devices. Typical applications include medical, measurement and control devices. The cases can be pendant, handheld or laid on a desk.

The two-piece snap-together enclosures have a recess for a membrane keypad on one side. Three sizes are available: 54 x 22 x 76, 115 or 156 mm.

The material is UV-stable Off White ASA-PLCFR (UL 94 V-0). The end panels can be fitted at either end and have moulded-in cable glands for a 3.4 to 5.9 mm cables. Accessories include flat end panels and a holding clamp for bed frames.

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E – Paper Displays

Electronic paper and e-paper are display devices that mimic the appearance of ordinary ink on paper. Unlike conventional backlit flat panel displays that emit light, electronic paper displays reflect light like paper. This may make them more comfortable to read, and provide a wider viewing angle than most light-emitting displays.

Available sizes are 2.9", 5.65", 6", 9.7" 10.3" and 13.3" all with evaluation kits.

Applications include electronic pricing labels in retail shops and digital signage, time tables at bus stations, electronic billboards, health and fitness displays, etc.

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OMC introduces new FDH36 rugged bulkhead housing for fibre optic transmitters and receivers with ST connector

Suits industrial, automotive and mass-transit applications

OMC, the pioneer in optoelectronics design & manufacture, has announced its new FDH36 rugged bulkhead-mount housing for fibre optic receivers and transmitters. The new device incorporates an ST connector and has been developed as the ST version of OMC’s popular FDH1 transmitter and receiver housing. The robust design of the FDH36 helps it withstand the harsh operating environments often found in industrial, automotive, mass transit and similar applications, including off-road vehicles.

The new FDH36 consists of an all-metal, rugged turret design with a square base flange. The flange features mounting holes in each corner and is designed to be bolted flrmly to the bulkhead, helping to ensure a robust and secure fixing. As well as offering greater physical resilience than plastic housings, the FDH36’s metal construction also helps with screening against radio frequency interference.

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Power-Supply Transformers

New Power-Supply Transformers Complement Power Integrations’ SCALE-iDriver Gate-Driven IC Family

One-stop-shop solution speeds design and certification

Power Integrations (Nasdaq: POW), the leader in gate-driver technology for medium- and high-voltage inverter applications, today announced a range of galvanically isolated transformers that provide the correct voltage and power for the company’s SCALE-iDriver™ family of gate drivers. The combination delivers a simple, robust and cost-efficient DC-DC converter solution that does not require additional voltage regulation, reducing system cost and development time. The STI2xv2 transformer and SCALE-iDriver ICs are fully UL and VDE approved.

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Semiconductor Appoints Sherri Luther

Lattice Semiconductor Appoints Sherri Luther As Chief Financial Officer

Proven Executive to Lead Lattice’s Financial Organization

Lattice Semiconductor Corporation (NASDAQ: LSCC), a leading provider of customizable smart connectivity solutions, announced the appointment of Sherri Luther as the Company’s Chief Financial Officer, effective immediately. Ms. Luther brings extensive strategic and financial operations experience to her new role. Prior to Lattice, Ms. Luther was Corporate Vice President of Finance at Coherent Inc.

Jim Anderson, President and Chief Executive Officer, said, “We are pleased to welcome Sherri Luther to Lattice’s leadership team, as we continue to attract key talent with a background of execution and value creation. Her proven track record on a global scale will give her valuable perspective as we execute on our strategic plan to help Lattice better realize its potential.”

Ms. Luther said, “I am excited to join Lattice’s leadership team as it focuses on building greater value for the Company and its shareholders. I look forward to applying my expertise and unique perspective to help Lattice achieve even greater success.”

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