T H E E L E C T R O N

N E W S L E T T E R O F T H E I N S T I T U T I O N O F E L E C T R O N I C S

Issue 48: Winter 2020

EDITORIAL

Welcome to the Winter 2020 issue of *The Electron*, the last in what has been a year to remember for all the wrong reasons. Whilst, however, some areas of the economy have taken a dive, the electronics sector has remained relatively buoyant, and, in some areas, such as online retailing, have even expanded as more people have looked for electronic solutions during the Covid-19 pandemic.

The extended closure of traditional exhibitions and conferences continues to frustrate the many personnel who would normally have been employed in areas such as event management, and this looks likely to continue well into next year, but at last there is light at the end of the tunnel as the vaccination programme will hopefully allow events to return by the autumn. Naturally we all look forward to seeing our exhibition centres return once their role as Nightingale hospitals are finally over. That said, electronics has clearly played a vital role in keeping events alive in virtual form.

As for the electronics industry itself, a lot has still been happening as evidenced by a record number of submissions to *The Electron* from October to December, and we are pleased to report on a selection of them in the pages that follow. The Institution of course, as ever, extends a big thank you to all of those who have provided submissions, both online and in journal form.

5G INNOVATIONS IN SHIPPING

There are two related articles on this subject, the first from *Data Centre Review News*, and the second from *New Electronics* (8th. December 2020), p. 10-12.

5G Innovations in the Port of Antwerp

From augmented field operations to connected tugboats, Orange Belgium and its industrial partners have unveiled a unique collection of applications co-created in the Port of Antwerp using Orange Belgium's 5G network.

The 5G network rolled out by Orange Belgium is the first large-scale stand alone network of the country, offering in particular high-speed, low-latency and a unique network slicing capability. This offered considerable potential for the Port of Antwerp with its strategically placed Industry 4.0 campus.

Both partners worked together to connect a tugboat of the Antwerp Port Authority to the 5G network, allowing the ship to stream real-time images, plus other data such as radar and sonar, to the Port's control room. With this real-time information, the Antwerp Port Authority was able to improve both the safety and the efficiency of the towing of vessels within the Port, and increase the number of ships able to enter and leave the Port safely.

Erwin Verstraelen, Chief Digital and Innovation Officer for the Antwerp Port Authority, states:

"At the Port of Antwerp, we are looking at a number of concrete 5G applications, such as smart cameras, drones and autonomous ships and trucks.

It is important to learn about this technology as a company and gradually prepare for the arrival of it, because the great potential lies in B2B applications. It's also important to realise that 5G is part of our country's digital infrastructure and that we cannot afford to miss the boat there."

The Smart Port Network

This article, by *New Electronics* Editor Neil Tyler, focuses on the use of 5G to create a network of smart interconnected ports, a smart port being defined as "a port in which processes are automated and connected using emerging technologies such as Big Data, the Internet of Things, Artificial Intelligence, blockchain and other technologies that improve both the port's performance and its competitiveness".

The author states:

'Ports are using sensors and cameras, which automatically collect and share information such as weather, traffic and pollution data, to optimise operational planning, while the use of AI is speeding up security checks and automating screening processes improving both safety and reliability.'

Practical examples include Rotterdam, where a platform co-developed by Dutch start-up Teqplay and the Port has allowed vessel operators to reduce waiting times by up to 20 per cent, and Valencia, where a smart IoT network spans 200 cranes, straddle carriers trucks and forklifts enabling data to be gathered on the status of operations and energy consumption.

5G is seen as having a major role to play:

'Hamburg has been testing 5G technology as it sets itself up as a hub for next-generation industrial mobile communications, while the Hong Kong-based port and shipping conglomerate China Merchants Port (CMP) Group is leading a 5G-enabled port transformation project with Huawei, Alibaba and Tencent at the Haixing (Mawan) Port in Shenzhen, China. It represents the first upgrade in China of a traditional sea port to an automated smart port.'

In the UK BT and Belfast Harbour have signed a partnership to build a 5G ecosystem within the Port of Belfast with the aim of delivering a series of 5G-led innovations:

'BT will build and manage a live 5G private network delivering ultrafast mobile connectivity, coverage, reliability and security across the Port's operations in transport, logistics, supply chain and shipping.

The partnership will explore how 5G could help pave the way for other technologies, functioning in tandem with the Internet of Things and AI. The IoT, for example, will enable equipment to transfer data through sensor technology and make operations more independent, automated and efficient - supporting data analytics-enabled decision making.'

The deployment of 5G is noted in particular to make it possible to connect and interact with billions of devices across all aspects of a port's commercial operations, and Deloitte predicts that ports, airports and other logistics hubs will represent a third of the 2020-25 private 5G market.

The author quotes Michael Mehlem, Senior Technical Project Manager for Advantech Service-IoT, a company that specialises in the supply of infrastructure components to ports, as follows:

"Ports operate over several square kilometres and are filled with moving metal objects and radio frequency emitting devices. Using communication technologies, such as 4G and Wi-Fi, are relatively straightforward, given range, bandwidth and resilience considerations, but 5G will be essential in delivering a smarter port.

The biggest advantage of 5G is not its speed, but its capability of transporting vast amounts of data simulations, making 5G-powered technologies one of the key building blocks in digital ports."

ORANGE AND LACROIX TEST 5G IN ELECTRONICS PLANT

In France, telecoms and digital services provider Orange and technological equipment manufacturer Lacroix Group are exploring the benefits of 5G at the Lacroix Electronics plant in Montrevault-sur-Evre.

Full scale tests have been set up to evaluate the benefits of 5G and its use in Industry 4.0 as part of the "Symbiose" project to create the French electronics factory of the future.

In order to carry out the test Orange designed and installed an indoor 5G network based on Ericsson equipment. Four Ericsson Dot indoor 5G antennas were installed within the plant, which broadcast experimental frequencies to cover the production space. Orange operates a virtualised network core distributed between its own premises and the plant, which allows for local processing and data security as well as network performance and efficiency.

The reliability of wireless connectivity is expected to provide greater flexibility in the organisation of machines, and production islands in the factory may eventually be modified according to the type of production required.

Another expected benefit is improved quality control. By taking high-resolution photographs of electronic processes, for example, real-time verification of the quality of welds and the presence of components can be performed. The taking and sending of images in real-time can then be combined with machine learning to improve detection algorithms, ensure that there are no errors in batches produced, and ascertain if any machine adjustment is required.

The companies are also testing how 5G can contribute to the improvement of the technical management of buildings and infrastructure. This experiment is being conducted in a controlled environment, where electronic cards are produced for the aviation sector, where the assembly of components requires strict temperature and hydrometric regulation to prevent damage.

5G should also allow a response to be made to the increasing number of sensors in the plant through its ability to support up to a million sensors per square kilometre (3GPP 5G standard).

[Contribution from *Maintenance and Engineering*]

NOKIA TO DEPLOY 4G NETWORK ON MOON

A few years ago it would have sounded like science fiction, but NASA really has selected European communications giant Nokia to construct the first ever mobile network on the Moon in a bid to improve technological access on the lunar surface.

Nokia Bell Labs anticipates having the LTE/4G network ready for deployment by late 2022.

In order to deal with the unique conditions of space, Nokia Bell Labs will develop a small-scale, low-power communications system that is more resilient than those used on Earth, consisting of an LTE Base Station with integrated Evolved Packet Core (EPC) functionalities, LTE User Equipment, RF antennas and operations and maintenance control software.

Nokia is also partnering with US-based autonomous systems provider Intuitive Machines to integrate the network into the lunar lander and ensure that the system is able to self-configure when landing on the Moon's surface.

The network will serve a range of applications including vital command and control functions, remote control of lunar rovers, real-time navigation and streaming of high-definition video. NASA hopes that with these applications it will be able to establish 'a long-term human presence on the Moon'.

Nokia was selected as part of NASA's Tipping Point initiative, which seeks industry-developed space technologies that will enhance commercial space capabilities and benefit future NASA missions. Establishing sustainable operations on the Moon is considered to be the next major hurdle in NASA's quest to launch the first expedition to Mars, as outlined in their Artemis road map.

[Contribution by James Orme, Technerati].

NASA FABRICATES NETWORK CABLES FOR SUPERSONIC FLIGHT TESTING

NASA has commenced building of a new generation of network cables that can transfer data during supersonic flight as part of a project to demonstrate the possibility of flying much more quietly at supersonic speeds.

The new technology has been developed for use in the experimental Quiet Supersonic Technology X-plane, or QueSST, that is claimed to reduce the intensity of the land sonic booms that are typically heard beneath aircraft when they are flying at supersonic speeds. It is hoped that ultimately this noise will be no more than the noise of a car closing in at a distance.

As part of its testing the acoustic signature of the aircraft has to be validated, a task which has fallen to the Armstrong Flight Research Center in California. This will utilise tools known as Schlieren, Airborne Measurement and Range Operations for QueSST (SCHAMROQ). These incorporate a device that evaluates the characteristics of the aircraft's shockwaves whilst in flight, which utilises a Schlieren photography technique that visualises the shockwaves as they distort light through a camera, combined with navigation software that allows pilots to fly accurately during testing.

All of this technology will be placed on board a NASA F-15 research aircraft in flight in order to collect data. For this NASA needed to fabricate a network switch and cables that could support a network for the technology on board the F-15.

With Covid-19 impacting on the Armstrong Center's fabrication capabilities, the Kennedy Space Center was contacted and supplied with on-site subcontractors who were able to fabricate and design the cables.

QueSST community testing flights are expected to commence soon and data will be presented to U.S. and international regulators who should then be able to devise new noise-based rules that will allow commercial supersonic flight over land.

[Contribution by James Orme].

CHIPS PROTECT SATELLITES FROM RADIATION

Researchers at Nanyang Technological University in Singapore have developed a smart chip designed to protect satellites from radiation damage, enabling them to be able to carry more sophisticated equipment and be less costly to build.

The patented technology is capable of detecting incoming heavy-ion radiation which can cause serious damage to satellite electronics. Specifically, when the effects of the radiation, known as single event latchup (SEL), are detected the chip will shut down critical electronics within the satellite whilst the danger is present. The chip itself is hardened and protected against the heavy-ion radiation and can remain "awake" throughout the duration of the event.

Protection is afforded by means of a radiation-hardened power management integrated circuit for small satellite components, which allows electronic components to operate optimally without interruption to the power supply from heavy-ion radiation. There is also a radiation-hardened 'building block' for silicon chip makers, which eliminates almost all errors in electronic circuits caused by random heavy ions.

The Latchup Detection and Protection (LDAP) smart chip has already been installed as part of the radiation protection circuitry in three pico-satellites built by the Kyushu Institute of Technology in Japan for use by Japan, the Philippines and Paraguay. These are expected to be launched in 2021.

Commercialisation of the LDAP chip is being managed by the University's spin-off company Zero-Error Systems, or ZES, enabling satellite manufacturers to use consumer-grade electronics, which are lighter, more compact, more cost-efficient, yet significantly more sophisticated than conventional radiation-hardened components.

The technology for the LDAP currently holds two patents and has been verified under heavy-ion test in a cyclotron (particle accelerator that generates radiation particles).

More information is available from http://www.ntu.edu.sg

[Contribution by Softei].

ML STRATEGIES FOR AUTOMATING CODE REVIEWS

This article, by Jill Britton, Director of Compliance at Perforce Software, in *New Electronics* (24th. November, p.29-30), examines the benefits of using machine learning in software code review.

Code review is an essential part of the software development life-cycle in electronic design and to automate it requires an industry-standardised static code analyser, but even with the best of these there can be an overwhelming number of defects reported, particularly at the start of a project or when a new module is added. Sophisticated dataflow algorithms perform the semantic analysis needed to enforce undecidable rules in static code analysis, but their complexity combined with the need for balance between performance and precision often leads to false positives, one of the main reasons why some developers refrain from using static code analysis tools.

The author states:

'Identification and review of static analysis findings can be time-consuming, particularly when it is a violation of an undecidable guideline.'

The case is therefore brought for the application of machine learning in static code analysis, providing a method that 'can assist in detecting code structures that may lead to false positives' and 'makes analysis more accurate and reduces the time needed for review'.

With this backdrop, Ms. Britton then turns to the strategies that need to be considered when pairing machine learning with static analysis.

Grouping/Clustering

Defects that are similar in nature can be addressed together once a 'similarity measure' has been defined and calculated:

'Some static analysers assign a severity level to each defect, which enables them to group together defects that are similar in nature at the same level. Defects could also be grouped by whether they are likely to produce false positives. The assignment of a defect to an appropriate level is dependent on the interpretation of the static code analyser developer. However, this may not guarantee a real relationship with every defect in the group.

This strategy can be enhanced by using an unsupervised machine learning clustering algorithm, such as the "K-Means" clustering algorithm. This is the simplest of unsupervised learning algorithms that automatically groups defects, and the idea of it is to define "K" centres, one for each cluster. The algorithm will iteratively compute the centre of clusters'.

AI-Assisted Ranking

Under this strategy the author looks at prioritising defects that are likely to be true positives based on them being "similar" to defects reported in the past and confirmed to be real problems by users. Similarly, if a defect "looks like" a problem that has previously been reported but found not to be an issue, likely false positives can be deprioritised by the ranking system.

The author states:

'Defects can be accurately mapped to the appropriate group and prioritised for further review by using "supervised machine learning algorithms", which are a family of machine learning algorithms that build their statistical models based on sets of labelled examples. As more data becomes available, these algorithms are continually improved.'

In her conclusion she says:

'Machine learning can improve the results of static analysis tools when used for post-processing analysis results reports. Applying clustering and ranking either separately or together will reduce the effort required by users to review defects and thus increase confidence and adoption of static analysis in the development environment.'

NVIDIA LAUNCHES AI STARTER KIT

A developer kit to teach AI has been launched by Nvidia.

The Nvidia Jetson Nano 2Gbyte developer kit is supported by Nvidia's free online training and AI-certification programs, supplementing the many open-source projects contributed by thousands of developers in the Jetson community.

The kit is the latest offering in Nvidia's Jetson AI at the Edge platform, which ranges from entry-level AI devices to advanced platforms for fully autonomous machines. It is supported by Nvidia's JetPack software development kit, which comes with Nvidia container runtime and a full Linux software development environment. This allows developers to package their applications for Jetson with all its dependencies into a single container that is designed to work in any deployment. It is also powered by the same CUDA-X accelerated computing stack that is used to create breakthrough AI products in such fields as self-driving cars, Industrial IoT and smart cities.

The Jetson Nano 2Gbyte developer kit can run a diverse set of AI models and frameworks and provides a scalable platform for learning and creating AI applications as they evolve.

Aimed at a new generation of students, educators and hobbyists, it has been endorsed by a number of organisations in the embedded computing ecosystem.

Jim McGregor, Principal Analyst at Tarias Research, states:

"Nvidia's Jetson is driving the biggest revolution in industrial AIoT. With the new Jetson Nano 2GB Nvidia opens up AI learning and development to a broader audience, using the same software stack as its data centre AI computing platform."

Emilio Frazzoli, Professor of Dynamic Systems and Control at ETH Zurich, adds:

"The Duckietown educational platform provides a hands-on, scaled down, accessible version of real-world autonomous systems. Integrating Nvidia's Jetson Nano power in Duckietown enables unprecedented, affordable access to state-of-the-art compute solutions for learning autonomy."

The Jetson Nano 2GB DEveloper Kit is currently priced at $59 and is available through Nvidia's distribution channels.

More information is available from http://www.nvidia.com

XILINX PILOTS X-RAY DEEP LEARNING MODEL

Adaptive computing company Xilinx has partnered with Spline AI to develop an X-ray classification deep learning model and reference design on Amazon Web Services.

The new model enables medical equipment makers and healthcare service providers to develop trained models for clinical and radiological applications.

The model is deployed on the ZCI104, which is based on the Xilinx Zynq UltraScale+ MPSoC. It leverages the Xilinx deep learning processor unit, or DPU, and uses a soft-IP tensor accelerator to run a variety of neural networks, including classification and detection of diseases.

An open source model runs on a Python programming platform on the Xilinx Zynq UltraScale+ MPSoC, allowing it to be adapted by researchers to suit different application specific requirements. Medical diagnostic, clinical equipment makers and healthcare service providers can use the open source design to quickly develop and deploy trained models for clinical and radiological applications in a mobile, portable or point-of-care edge device with the option to scale using the cloud.

The artificial intelligence model is trained using Amazon SageMaker and is deployed from cloud to edge using Amazon Web Service IoT Greengrass. This enables remote machine learning model updates, geographically distributed inference, and the ability to scale across remote networks.

This technology has been applied to pneumonia and Covid-19 detection, displaying a high level of accuracy and low inference latency. The development team leveraged over 30,000 curated and labelled pneumonia images and 500 Covid-19 images to train the deep learning models.

Kapil Shankar, Vice-president of Marketing and Business Development for the Core Markets Group at Xilinx, states:

"AI is one of the fastest growing and high demand application areas of healthcare, so we're excited to share this adaptable, open-source solution with the industry. The collaborative model is characterised by low latency, power efficiency and scalability. It can also be easily adapted to similar clinical and diagnostic applications. Medical equipment makers and healthcare providers are empowered to swiftly develop future clinical and radiological applications using the reference design kit."

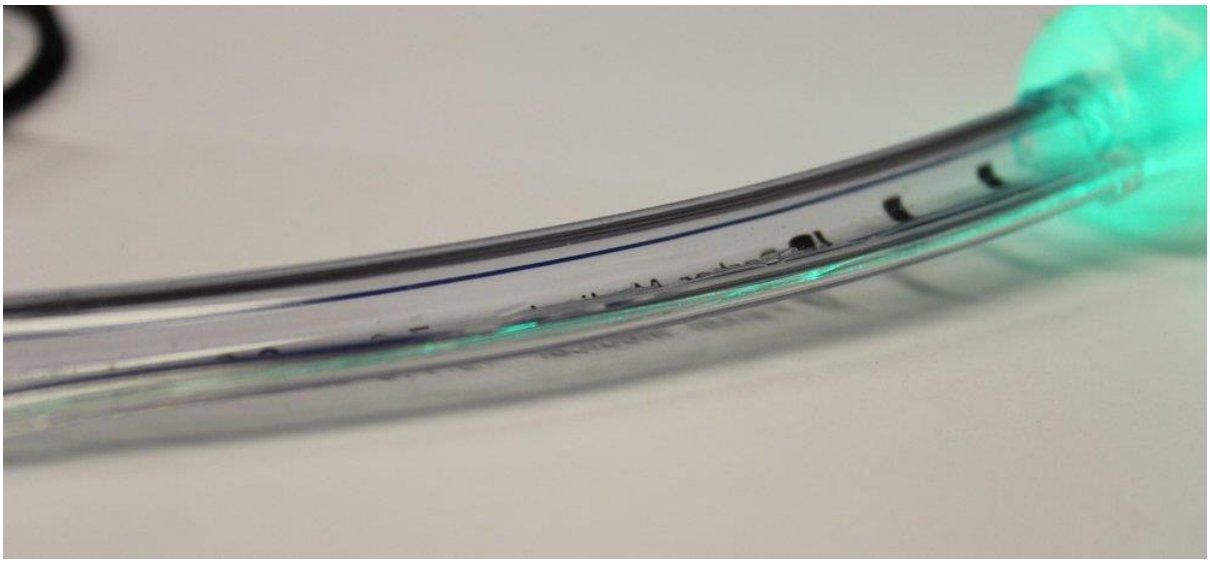
Dirk Didascalou, Vice-president IoT at Amazon Web Services, adds:

"Amazon SageMaker enabled Xilinx and Spline AI to develop a high quality solution that can support highly accurate clinical diagnostics using low cost medical appliances. The integration of AWSIoT Greengrass enables physicians to easily upload X-ray images to the cloud without the need of a physical medical device, enabling physicians to extend the delivery of care to more remote locations".

More information is available from http://www.xilinx.com

[Contribution from Softei].

NOTTINGHAM UNIVERSITY SECURES FUNDING FOR SMART BREATHING TUBE



The University of Nottingham has been awarded £801,874 from the Medical Research Council to accelerate development of the world's first optical fibre sensor-equipped endotracheal tube, known as iTraXS.

Endotracheal tubes, or ETTs, are placed in the trachea in patients who require artificial breathing support. The iTraXS aims to prevent pressure injury to the airway and assist with the monitoring of vital signs.

Globally some 120 million surgical and intensive care patients rely on ETTs every year. The tube has an inflatable balloon-like "cuff" which sits inside the trachea forming a gas-tight seal that prevents leakage of oxygen-rich air and maintains effective ventilation. The seal also protects the lungs from contamination by vomit or blood, which can lead to ventilator associated pneumonia, or VAP, a condition that occurs in 8 to 28 per cent of ventilated ICU patients, increases length of stay by an average of six days, increases mortality by up to 50 per cent, and costs the NHS an average of £12,000 per case.

Incorrect cuff inflation pressure is a concern because if pressure is too low it can risk fluid getting past the cuff with resultant VAP, but if it is too high there is a risk of pressure injury in the trachea. Currently there is no medical device that is capable of accurately and safely

monitoring the contact pressure of the inflated cuff and the associated blood flow in the tracheal lining, or mucosa.

Current best practice recommends maintaining a fixed pressure in all patients, but iTraXS aims to improve on this by allowing clinical staff to find the correct pressure for each patient, balancing a good seal with appropriate tissue pressure and blood flow.

The iTraXS uses thin, flexible, optical fibre sensors incorporated into a standard disposable ETT, which is linked to an optoelectronic monitoring and display unit. It monitors both the contact pressure and the blood supply at the cuff-trachea interface in order to ensure that there is a good gas seal whilst at the same time avoiding windpipe injury. The iTraXS measurements could also aid ETT placement and vital sign monitoring, such as oxygen saturation, heart rate, pulse volume and temperature, in pre-hospital conditions, which could replace the need for multiple devices such as finger clip oxygen monitors.

The iTraXS has been developed in partnership with P3 Medical, a Bristol-based manufacturer of endotracheal tubes, and Nottingham University Hospitals NHS Trust. With the additional funding the researchers hope to develop regulatory compliant hardware and software as well as expanding the number and functionality of sensors built into iTraXS.

Professor of Biomedical Engineering and Co-director of the University's Centre for Healthcare Technologies, Dr. Steve Morgan, states:

"iTraXS demonstrates the potential of emerging optical sensor technology to enable real-time monitoring inside patients, providing previously unavailable data to aid clinical decision making and improving the surgical experience of patients worldwide.

Optical fibre sensing is a versatile platform technology that can measure a range of physical and biochemical parameters and could equally be applied to any internal catheter. With appropriate modification, such as a functional coating, the sensing capability can be significantly extended to monitor, for example, biofilm formation [bacterial growth] which is a major cause of infection."

Dr. David Hewson, Consultant Anaesthetist at Nottingham University Hospitals NHS Trust, and one of those involved in the research, adds:

"This substantial award from the Medical Research Council means this innovative smart medical device is one step closer to being used in patients. This project is about new ways to monitor the health of patients in ICU and reduce their risk of pneumonia and damage to their trachea while on life support ventilators. If we are able to do that, we could reduce the length of time patients need to stay on intensive care and improve their recovery from critical illness. The technology used in this project could be translated into many other medical situations allowing doctors to accurately monitor patients using 21st. century smart devices."

[Contribution from *Med-Tech Innovation News*].

PROXIMITY ADDS THREE NEW DATA CENTRES TO EDGE NETWORK

Proximity Data Centres has announced an expansion of its edge data centre network with the opening of three new data centres in Liverpool, Chester and Coventry, meaning that

Proximity now has six data centres in the UK, the others being in Wakefield, Nottingham and Bridgend.

John Hall, Managing Director of Proximity Data Centres, comments:

"With the ongoing support of our funding partner ICG Real Estate, we are locating high quality, high capacity, scalable and extremely resilient internet edge data centres within easy reach of enterprise businesses, cloud and content providers. Ensuring low latency connectivity will help them achieve maximum operational efficiency and deliver excellent customer service - essential for businesses in today's hyperconnected digital economy.

Proximity's two North West data centres will prove very attractive to public and private sector businesses in the region as they increasingly take advantage of the growing fibre infrastructure around Greater Manchester and Merseyside. Having highly connected colocation data centres like ours on their doorstep will be a bonus."

[Contribution from *Data Centre Review*].

NTT OPENS LONDON 1 DATA CENTRE

NTT has now formally opened its London 1 Data Centre in Dagenham, making NTT the world's third largest data centre company.

When fully operational it is expected that London 1 will employ 100 people with technical and operational skills, will occupy 25,600 square metres of IT space, and have a maximum IT load of 64MW. It will provide businesses with N+T UPS systems, generator backup and highly redundant cooling systems. There is also a Technology Experience Lab which will be used to test new technologies and validate hybrid cloud services and innovations faster and at lower cost.

The data centre has a Power Usage Effectiveness (PUE) of 1.2, which is aligned with industry best practice, and uses smaller generators so generating fewer greenhouse gases. Use of latest technology removes the need for compressors and refrigerants.

Masaaki Moribayashi, Senior Executive Vice-president for Services for NTT Limited, states:

"The London 1 Data Centre is the latest addition to our NTT global portfolio. Offering flexible, scalable and secure infrastructure along with customisable solutions, London 1 has been designed to accommodate a wide range of NTT clients and partners, from large scale Cloud/SaaS providers to enterprise clients who require full-stack services such as managed hybrid cloud solutions with global network services delivered from an industry-leading and carrier neutral colocation facility. It is a great advantage that we can provide a variety of cloud infrastructure services such as private cloud, public cloud and colocation within the same data centre."

Elsewhere, NTT is also planning to open another data centre in Hemel Hempstead, the Hemel Hempstead 4 Data Centre, whilst Ionos has announced that it will be moving forward with plans to build a £20 million Tier IV data centre in Worcester following approval by Wychavon District Council.

DATA CENTRE CASE STUDY: NEWCASTLE CITY COUNCIL

Newcastle City Council has recently transformed its data centre operations, consolidating its main IT systems into a single data hall, with upgraded power and cooling infrastructure and new management software from Schneider Electric. With this the Council has improved resilience and uptime, simplified the management of all of its infrastructure equipment, and been able to make part of its data centre available to other organisations, offsetting some of the costs of operation.

The data centre hosts numerous applications, including those supporting council tax collection, social services, library services, education and road traffic management .It also links to the IT systems of other public bodies such as the NHS and police. Twenty four hour reliability is required.

The Council's IT systems had grown steadily over the years to support the e-Government approach, but in time this had resulted in a layout that was 'haphazard and disorganised' with many infrastructure elements nearing end-of-life.

The article 'Provisioning the Digital Transformation of Newcastle City Council Services' in *Data Centre Review* (November 2020, p.12-14), quotes James Dickman, Senior ICT Solutions Analyst at Newcastle City Council, as follows:

"We had three different server rooms with links between them. Telecoms routers were in one room and servers in another, so it was difficult to manage them. We also had separate UPS systems in each room, and air handlers for cooling, many of which were old and in need of replacement. Also, we had the inevitable 'spaghetti effect' of legacy systems with numerous cables installed under the floor over many years, now causing choke points and becoming very difficult to manage and maintain."

A competitive tender led to the selection of EcoStruxure for Data Centres, Schneider Electric's IoT-enabled open and interoperable System architecture, with design and build by Schneider's partner Advanced Power Technology:

'For uninterruptible power, Newcastle City Council has standardised on the Galaxy range of UPS, specifically the Symmetra PX250 modular system. In N+1 redundant configuration, the new UPS solution enables Newcastle City Council to scale power protection and runtime as its business requirements evolve and change.

Standardisation on the UPS has greatly improved the data centre's ability to withstand power outages.'

More effective data cable management has also resulted:

'More structured cabling provides greater certainty about connectivity within the data centre, reducing complexity and the potential for human error, improving maintenance and serviceability with easier and safer access. The cable management solution also increases cooling efficiency by improving airflow in the cabinets, as well as providing improved scalability by simplifying moves, additions and changes in the space.'

The new data centre is managed using Schneider Electric's next generation data centre infrastructure management (DCIM) software, EcoStruxure IT Expert, whilst the technical environment is monitored using an APC NetBotz appliance along with temperature and humidity.

Previously, monitoring systems were not integrated, which required continual manual checking. With the new system 40 NetShelter IT racks are installed in three aisles, each with sensors that allow for continuous monitoring. This enables issues to be flagged and routed to mobile devices, which is useful should an event occur out of normal working hours.

The software also allows for the monitoring of the power consumption of each rack.

The article concludes:

'Power consumption data not only helps the Council to improve its own electrical efficiency, but also opens up elements of the facility to cooperate with other bodies.

For example, about 10 per cent of the data centre's real estate is now leased out to other public sector bodies, including HM Courts and the arbitration service ACAS. By carefully monitoring the power supply of each rack, the Council can charge accurately for its hosting services, producing a revenue stream that helps to offset its overall operating costs.

It also makes possible the operation of a reciprocal disaster recovery operation with another council, which greatly improves the resilience and continuous uptime of each body.'

NATIONAL CYBER FORCE NOW OPERATIONAL

The Government has confirmed that the long-awaited National Cyber Force is now operational.

The new Agency, plans for which were revealed in 2018, is the UK's Government Agency for dealing with online threats, such as hacking against the national infrastructure, spreading fake news and interference in elections.

The announcement has been notably welcomed by the French multinational Thales, which specialises in the design and building of electrical and electronic systems and provides services for the aerospace, defence, transportation and security sectors. Its Vice-president of Secure Communications and Information Systems, Gareth Williams, states:

"As boundaries continue to blur between peacetime and warfare and civil and military objectives, we absolutely must accelerate our investment in initiatives like the National Cyber Force. This will allow the UK to prepare and respond to the rapidly changing nature of low intensity conflict, which fuses diplomatic, economic, cyber and kinetic actions. As such this is a significant and positive step for the country's critical cybersecurity capabilities and demonstrates the Prime Minister's commitment to protecting the UK from hostile states and terror groups.

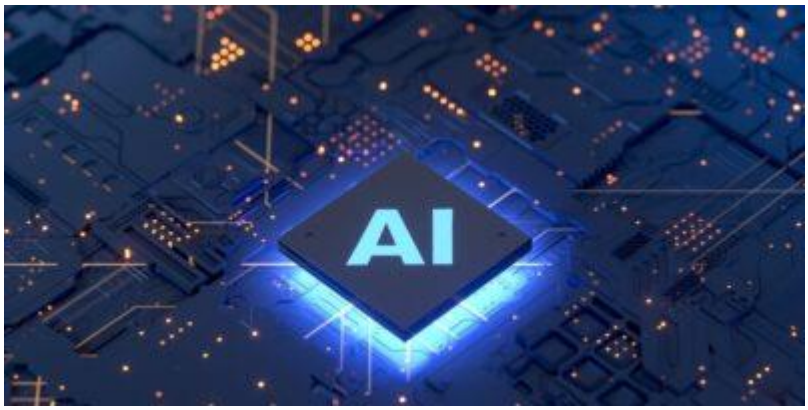
Additionally, this specialist unit will help to solidify the major operating theatres of the military - land, sea, air and cyber - and bring the UK more in line with the US' Cyber Command. A dedicated military cyber command will position our defence forces to protect us against both operational and espionage cyber attacks, through a more coordinated ability to conduct defensive and offensive cyber actions. The UK's new operational command will enable it to enact strategic and tactical missions and respond to those responsible for attacks against the UK's national interest."

The National Cyber Force is jointly managed by the Ministry of Defence and GCHQ.

An Artificial Intelligence Agency, designed to concentrate on the use of AI for defence purposes, has also been planned.

[Contribution from *Data Centre Review*].

FIRST OPEN AND CODE-FREE SOFTWARE PLATFORM TO SPAN COMPLETE EDGE AI OPERATIONAL WORKFLOW



The new AI Studio by Blaize is believed to be the first open and code-free software platform to span the complete edge AI operational workflow from idea to development, deployment and management.

The new platform is said to dramatically reduce edge AI application deployment complexity, time and cost by breaking the barriers within existing application development and machine learning operations (MLOps) infrastructure. In particular, it eliminates the complexities associated with integrating disparate tools and workflows, and introduces multiple ease-of-use and intelligence features.

Users can deploy models with one click to plug into any workflow across multiple open standards, including ONNX, Open VX, containers, Python or GStreamer.

The company states:

'No other solution offers the same degree of open standard deployment support, as most are proprietary and lock in users with limited options. Support for these open standards allows AI Studio to deploy any hardware that fully supports the standards.

Users can continuously scale proven AI edge models and vertical AI solutions to effectively re-use across enterprises, choosing from hundreds of models with drag and drop ease to speed application development.

The AI Studio model development workflow allows users to easily train and optimise models for specific datasets and use cases, and deploy quickly into multiple formats and packages. Its Transfer Learning feature quickly retrains imported models for the user's data and use case. Another feature is the edge-aware optimisation tool, NetDeploy, which automatically optimises the models to the user's specific accuracy and performance needs. Users can build and customise complete application flows, other than neural networks, such as image signal processing, tracking or sensor fusion functions.

AI Studio helps users deploy, manage, monitor and continuously improve their edge AI applications. It is built on a cloud-native infrastructure based on microservices, containers and Kubemetes for scalable and reliable production.'

Application areas are envisaged in smart retail, smart city and Industry 4.0 projects.

More information is available from http://www.blaize.com

[Contribution from Softei].

WORLD-FIRST ROBOTIC INTEGRATED CONTROLLER

Traditionally, automation equipment for production facilities has been controlled by a number of controllers, creating challenges at set-up and when coordinating the speed and timing between devices. It is also difficult to verify a process design in advance and, after the equipment has been decommissioned, adjustments have to be made onsite. Back tracking and specification changes are common, all adding more time to the project.

In response to this challenge, automation specialist Omron has launched a new kind of robotic integrated controller, the NJ501-R, which makes it possible to automate advanced and complex manual work and simulate the design and modification of production facilities in a virtual environment and conduct maintenance remotely.

The company states:

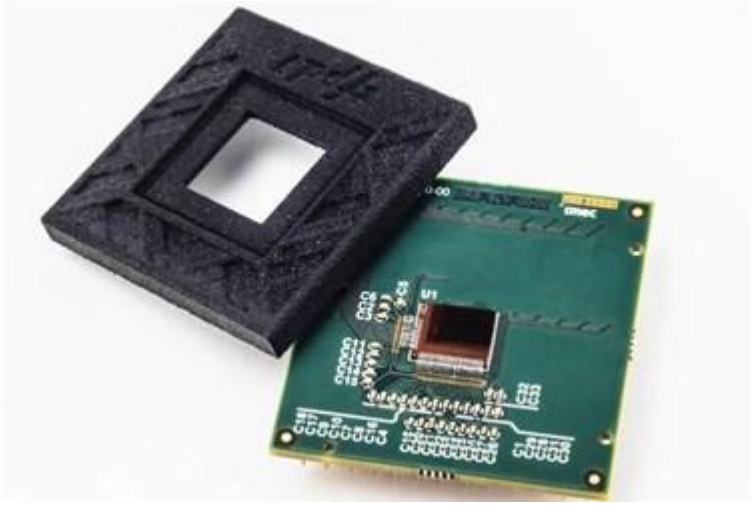
'The NJ501-R machine controller offers real-time synchronisation between all automation equipment, including robots, vision components, drives and safety equipment. Improving the speed and accuracy of production, users can simulate entire production lines without having to deploy physical equipment. This will simplify maintenance and reduce time-to-market during the design, planning, commissioning and changeover processes.

The NJ501-R robotic integrated controller automates inserting and assembling processes. Robots and equipment are controlled and fully synchronised in real-time by a single controller, and achieve the world's highest level of throughput.'

More information may be found at http://www.omron.com

[Contribution by Softei].

SHORT-WAVE INFRARED IMAGE SENSOR BREAKS NEW GROUND



Until recently short-wave infrared (SWIR) image sensors have been produced using a hybrid technology in which a III-V-based photodetector, usually InGaAs-based, is flip-flop bonded to a silicon readout circuit. The resulting sensor is often highly sensitive, but the technology is expensive for mass manufacturing and limited in both pixel size and number of pixels,

which hinders its adoption in markets for which cost, resolution and/or form factor are crucial.

In order to address this challenge Imec has developed a prototype high-resolution SWIR image sensor with a record small pixel pitch of 1.82µm. This is based on a thin-film photodetector that is monolithically integrated on a custom Si-CMOS readout circuit. A fab-compatible process flow paves the way for high-throughput, wafer-level manufacturing.

The technology largely exceeds the capabilities of today's InGaAs-based SWIR imagers in terms of pixel pitch and resolution and offers disruptive cost and form factor potential.

The photodetector pixel stack implements a thin absorber layer such as 5.5µm PbS quantum dots, corresponding to peak absorption at 1400nm wavelength. The peak absorption wavelength can be tuned by adjusting the nanocrystal size and can be extended to wavelengths even above 2000nm. At the peak SWIR wavelength an external quantum efficiency (EQE) of 18 per cent is achieved, which can be upgraded to approaching 50 per cent with further improvements.

The photodetector stack is monolithically integrated with a custom readout circuit, processed in 130nm CMOS technology, in which a 3-transistor pixel design is optimised for the scaling of pixel size in the accessible 130nm technology node. This enables the record small pitch of 1.82µm to be realised.

Pawel Malinowski, Thin-film Imagers Program Manager for Imec, says:

"With our compact, high resolution SWIR image sensor technology, we offer our customers a path to affordable low-volume manufacturing within Imec's 200mm facility.

These image sensors can be deployed in industrial machine vision, for example photovoltaic panel monitoring, smart agriculture, for example inspection and sorting, automotive, surveillance, life sciences, for example lens-free imaging, and many more. Due to their small form factor, they can potentially be integrated in small cameras such as in smart phones or AR/VR glasses, with eye-safe SWIR light sources.

Some exciting future developments include increasing the EQE, which currently is already at 50 per cent in SWIR on test samples, reducing the sensor noise and introducing multispectral arrays with customised patterning approach."

[Contribution by Neil Tyler, Editor, *New Electronics*].

UV LIGHT DISINFECTION TECHNOLOGY COMBATS COVID-19

Swedish cleantech company LightLab Sweden has developed a new ultra-violet disinfection technology called PureFize® that has been proven to eliminate Covid-19.

Tests at the University of Siena in Italy showed that PureFize was effective in inactivating 99.9 per cent of Covid-19 in samples in under three minutes and 99.9999 per cent within ten minutes, the first time a scientific study has been conducted and published using a prototype of a real consumer product for the UVC disinfection of surfaces.

PureFize has been developed to utilise a wider and more effective wavelength spectrum such that it is both fast and effective, and generates minimal thermal heating, making it energy efficient without generating ozone. It offers excellent integration opportunities and can be used in a wide range of applications and installed in products without major redesigns or adaptations.

PureFize currently has 96 granted patents with a further 47 awaiting approval.

Rune Torbjonsen, CEO of LightLab Sweden, states:

"Many companies on the market state that their products inactivate SARS-CoV-2 [Covid-19] from surfaces, but few have actually conducted scientific tests with their products. Scientific validation is something that is very important to us. The effectiveness of PureFize has now been validated by the University of Siena. PureFize makes it possible to bring UVC into everyday life in a safe and sustainable way. We aim to raise the standard for UVC disinfection and show that PureFize can be effective in inactivating bacteria and viruses, but also sustainable in minimising the impact of the technology on the environment."

[Contribution by frederik.forssell@lightlab.se].

WELSH FIRE SERVICE GOES DIGITAL WITH HOLOGRAMS

Mid and West Wales Fire and Rescue Service is piloting the use of Microsoft HoloLens in order to create life-sized holograms of some buildings in mid and west Wales, which firefighters can look at and interact with during training at their station or on the way to an emergency. This will allow them to understand potential risks, identify safe routes through those buildings, and learn about the location of hydrants and sprinklers.

Previously firefighters have only been able to look at single line drawings of buildings on a computer screen.

A further application is envisaged in training fire officers in how to respond to emergencies at oil refineries.

Chris Davies, Chief Fire Officer for Mid and West Wales Fire and Rescue Service, states:

"We have a number of oil refineries in the area and historically we've always trained on these sites. What HoloLens will enable us to do is actually put Incident Commanders into these scenarios, in an almost live experience but in a safe environment. I firmly believe this is going to change the way that we can train and maintain the competencies of our firefighters. My vision of what is possible has been completely blown away by Microsoft."

Chris Perkins, General Manager Public Sector at Microsoft UK, adds:

"There has never been a more important time for companies and organisations to use technology that helps staff collaborate, communicate and gain insight into the world around them. This is even more critical when these people are employed by our vital public services, which work tirelessly to keep us all safe and well.

Mid and West Wales Fire and Rescue Service is adopting technology at scale, allowing firefighters and officers to create a network of information that can be shared and acted upon. It is a fantastic example of how placing cutting-edge technology in the hands of skilled people can lead to ground-breaking solutions."

[Contribution by *Data Centre Review*].

Membership Elections and Transfers

Direct Election to Fellow: -

Stephen Robert Pearson MSc, MIET, CEng, FIHE, MInstE.

Direct Election to Student: -

Euan Caskie: - Winner of the 2020 National Electronics Competition.

Jasmin: - 2020 Arkwright Scholar.

Transfer from Graduate to Member: -

Elaine MacQueen