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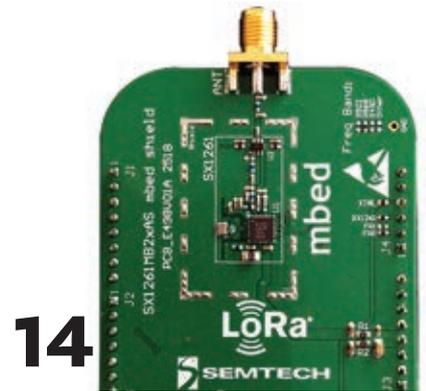
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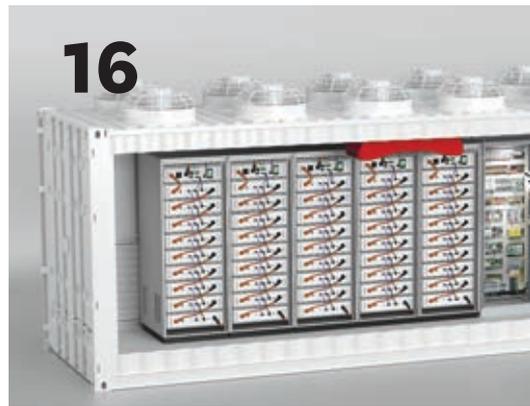
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# Our survey says!

## Canada's only nationwide report on the electronics industry



Here it is! For the first time in the 44-year history of EP&T, we have produced an Industry Report on the electronics engineering and design sector for Canada. Based on the results of a nationwide survey of electronic industry players this past summer, this 28-page supplement has been polybagged along with this October edition.

The inaugural version of this report set out with specific intent to determine a baseline on what the biggest business challenges in the Canadian electronics industry. We also wanted to discover how engineers are continuing to transform with the times amid this era of disruption - pursuing their professional and personal expectations and aspirations.

The survey questionnaire was designed to help us gain a better understanding of the country-wide impact Covid-19 has had on the design cycle, as supply chains strained under component allocation pressures. Not surprisingly, problems related to supply channels clearly stood out as the number one business hurdle, cited by two-thirds of those surveyed.

### Pandemic pain

Our results determined that 95% of businesses have faced challenges related to supply chain disruption in the past year. Among the top cited problems were sourcing components and trying to allocate alternate parts. We found that the impact of semiconductor shortages forced companies to pay more, use replacement parts and actually stopped or delayed production runs.

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### Staffing challenges

Attraction and retention of staff was determined to be the number two issue and more likely to be cited by management (49% of respondents) versus engineers (36%). We also found that the pandemic may have also accelerated 'the great resignation', whereby professionals in many fields migrated to improved working conditions. In some cases, employees were hard to retain, departing when enticed by a raise in salary, a bonus, promotion or job flexibility. During the pandemic 58% of our readers said staff left their organization for a number of different reasons. Among the drivers included: work/life balance, early retirement, and childcare reasons when schools were closed.

### Environmental

Rising consumer awareness of global environmental issues are being reflected in design initiatives. These days there is often a blend between end-user and engineer, as design teams invoke a more environmental approach to creating a new product. However, it turns out that a large percentage of them are not willing to pay a whole lot more for it. This creates a big challenge for OEMs, who spend more money in BOM cost, making a product more environmentally sound - but fail to get the revenue in return.

A majority 85% of those surveyed say they included at least some environmental concerns in their design process. The most frequent were product life cycle, reparability, sustainability and attention to restrictions on substances. Of those surveyed, 79% identified a benefit of including environmental considerations into the design. The top cited benefits included:

- A sense of doing good for the world, for employees and clients
- Marketing advantage
- Competitive differentiation
- Customer demands are met
- Product innovation

### Thank you

Our goal is for this report to serve as a blue print to help the Canadian electronics industry gain an understanding of its ecosystem - where its strengths and weaknesses lie. In the end, we are intrigued, inspired and introspective while dissecting the data that has been compiled. We hope you enjoy diving into the data with us and hearing what our panel of industry experts had to say on the various subject matters.

I owe a great deal of gratitude for the support of my roundtable panelists - Titu Botos of NeuronicWorks, Kin Leong of Dorigo Systems and Rob Blake of Leister Blake Enterprises Ltd. And, of course, we could not have tackled this project without the support of our sponsors Mouser Electronics (Coby Kleinjan), Interpower Corp. (Bob Wersen) and TDK Corp. (Ludger Trockel). All participants came ready to engage and deliver - and not hold back with their first-hand knowledge and insights.

To you - our readers who took the time to complete the survey questionnaire, we thank you - and hope you enjoy pouring over the results that deliver perspective to the current state of the electronics industry in Canada. **EP&T**

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# NEWSWATCH

## INTERCONNECT

### ASTERA LABS ADDS VANCOUVER FACILITY

Astera Labs, a Santa Clara CA-based provider of purpose-built connectivity solutions for intelligent and accelerated systems, recently opened a new office and state-of-the-art lab in Vancouver to support the company's development of cutting-edge interconnect technologies for artificial intelligence and machine learning architectures.

The new location will tap into the region's rich technology talent base to drive product development, customer support and marketing.

"We are in a tremendous growth phase in every aspect of our business and the new Astera Labs Vancouver location will be instrumental in driving our continued expansion as a leader in advanced data and memory connectivity," says Sanjay Gajendra, chief business officer, Astera Labs. "We will accelerate our vision to enable the true potential of AI and machine learning in the cloud with our purpose-built intelligent connectivity solutions."

The Vancouver area is a suitable



**Astera Labs opens its state-of-the-art lab. Pictured from left are: Kush Saxena, Burnaby BC Mayor Mike Hurley, Sanjay Gajendra, Paul Holden, James Wang, Mike Hillman, Dave Nelson, Sanjay Charagulla. (Source: Astera Labs)**

location for expansion given its reputation as a leading North American technology hub and strong university ecosystem. Astera Labs is actively hiring across multiple engineering and marketing disciplines to support end-to-end product and application development and overall go-to-market operations.

## ROBOTICS

### DRONE FIRM TO MANUFACTURE IN ONTARIO

RDARS Inc., an autonomous robotics and drone technology OEM specializing

in alarm system augmentation and surveillance, has opened a manufacturing facility in Pickering, Ontario, for the production of its Eagle Eye and Eagle Nest products.

The new facility represents an important phase in the firm's development process, according to company CEO and director Charles Zwebner, as the firm will be producing 20 systems. These will be immediately deployed into selected locations for testing purposes to achieve certifications for Beyond Visual Line of Sight (BVLOS) flight missions with the Federal Aviation Administration (FAA) and Transport Canada.

Eagle Watch is comprised of a drone, a drone station, and indoor robotic system called Eagle Rover and a software application called Eagle Watch, which acts as a command-and-control environment to manage, maintain and control all remote systems around the globe.

## MEDICAL

### DIABETES MONITOR CAN DETECT GLUCOSE LEVELS USING BREATH

A next-generation diabetes monitor



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PARIS



BERLIN

that analyses breath might soon mean no more needle pricks to check blood sugar levels. The health-tech device created by researchers at the University of Waterloo and is being developed through a start-up company called OrientaMED.

The device uses gas sensors to measure breath instantly, then links via Bluetooth with a program on a mobile device to give a readout. Distinct biomarkers in exhaled breath carry a subtle signature that the device picks up before the app uses a deep learning algorithm to produce rapid individual results.

“It’s about the size of a mobile phone and also has a detachable mouthpiece,” says Nathalia Nascimento, a postdoctoral researcher in the Cheriton School of Computer Science at the university. “We’ve developed it through a series of prototypes and are getting set for clinical trials.”

The fledgling company has already received support from the European Union, Brazil and health-tech companies. Nascimento said they are now looking to form a partnership as they begin controlled human trials of the product ahead of release to the public.

**AEROSPACE**

**TORONTO AEROSPACE HUB NETS FUNDING**

FedDev Ontario has announced more than \$2.6-million in funding for Downsview Aerospace Innovation & Research (DAIR). The investment aims to help improve the aerospace sector’s overall environmental footprint



*OrientaMED’s next-gen diabetes monitor analyses patient’s breath.*

by funding projects that will support the government’s initiative to a greener future and will help SMEs enhance operations to meet customer needs and become more competitive in the global supply chain.

DAIR is an incorporated not for profit organization, working to build a physical aerospace innovation hub at Downsview Park in Toronto. With this non-repayable investment, the organization will support sustainable aviation with the launch of the Green Fund, a program to help the commercialization of projects and processes that will reduce the environmental footprint of the aerospace sector. DAIR will also launch a Supplier Development Initiative, which will improve the capabilities of 16 SMEs in the region, advancing them in the local and global aerospace supply chain, and providing them with growth opportunities. More information on these programs and details on how to

apply will be available on the DAIR website in the fall.

“Investing in the work and capabilities of SMEs will yield long-term benefits for the nation’s aerospace sector and the broader Canadian economy. Stronger Canadian companies will be well positioned to compete and thrive in the global aerospace industry, which is projected to grow substantially over the next decade,” Maryse Harvey, executive director at DAIR.

**ELECTRIC VEHICLES**

**PROEV OPENS 2ND ELECTRIFICATION SITE IN MONTREAL**

Quebec-based ProEV, a division of Electrical Components International (ECI), has opened the largest electrification site dedicated to the engineering and manufacturing of commercial and industrial electric vehicles in North America. This site becomes ECI’s 38th facility worldwide, enabling it to serve its more than 500 global customers with its 25,000 employees.

The opening of this new facility on Côte-de-Liesse Road is coupled with the announcement of a \$10-million investment over five years to support the high quality facilities in a completely refurbished building. The site will also include an innovation department to optimize manufacturing processes and increase the impact of existing technologies.

“The opening of this second electrification center proves that economic growth can be done in a green and environmentally sustainable way. We’re proud of

how far we’ve come in the past 35 years and excited to see how far we can take the industry,” says ProEV president Jarred Knecht.

ProEV will create 250 new skilled jobs through its new facility. Among the professionals sought are manufacturing technicians, engineers, project managers and, most importantly, developers, allowing for the establishment of a wide range of expertise within the facility.

**CYBERSECURITY**

**TORONTO FIRM TO DELIVER SECURITY SOLUTIONS FOR PROJECT ARROW**

QA Consultants Inc, a Toronto-based independent software quality engineering services firm, has been awarded the role of onboarding and integrating the cybersecurity solutions for Project Arrow, Canada’s first, original, full-build and zero-emission concept vehicle.

The Automotive Parts Manufacturers’ Association (APMA) of Canada launched the first, original, full-build zero-emission concept vehicle named Project Arrow. This first-of-its-kind concept car is currently in its engineering and build phase until December 2022 with an anticipated release and tour in 2023.

An all-Canadian effort, Project Arrow is designed, engineered and built by Canada’s world-class automotive supply sector and post-secondary institutions. This innovative and timely project is already bringing together the best of the best of Canada’s electric-drive, alternative-fuel, connected and autonomous and light-weight technology companies to showcase the abilities and readiness of the Canadian Automotive part sector to support electric vehicle manufacturing.

The scope of the cybersecurity coverage includes regulatory compliance to UNECE WP.29, ISO 21434 and function coverage of security vulnerabilities in V2X (Privacy and Data Security), Telematics, Smart Mobility, Communications Protocols, ECU, Architecture and Redundancy.



*ProEV specializes in manufacturing high-voltage cables for the electric vehicle market. The Quebec-based firm has opened an electrification site dedicated to engineering and making commercial, industrial EVs.*

Photo: OrientaMED; ProEV

# IoT security system detects intrusion

BY STEPHEN LAW, EP&T EDITOR

 An old proverb tells us that ‘necessity is the mother of invention’. Nothing could be closer to the truth than what drove Rob Blake, president of Leister Blake Enterprises Ltd. to found a new company – featuring IoT security systems that serve as intrusion alarms in mobile applications.

Blake and four industry colleagues put their collective skills and creativity together to form Remote IoT Security Ltd. (RIoTS) while seeking a solution for a neighbour in their industrial plaza who experienced a theft inside his portable construction trailer.

In the fall of 2020, Blake’s neighbour came to him with a tale of woe, indicating that the theft took place despite gates, cameras and security patrols in his complex. Blake asked why the trailer wasn’t alarmed and his neighbour replied, “I’m not sure it’s possible.”

## Opportunity arises

Upon further investigation Blake determined that because the trailer is mobile, it doesn’t have power or WiFi connections, since those provisions aren’t possible when the trailer is moved.

“It’s quite easy and quite common in fact to have tracking devices to track assets, but it is not at all common to be able to detect intrusion into that mobile asset,” Blake says.

Sensing a business opportunity, Blake got a flash of inspiration. If he could just figure out how to wirelessly connect a small, portable, battery operated device with intrusion sensors

to the internet, he thought there would have to be a market for something like that. Riding the arrival of 5G LTE Internet of Things (IoT) technology, while exploring low-cost chipsets emerging onto the market, Blakes’ team realized that it may be relatively easy to implement a small, cost-effective device that could stay alive for years on 4AA batteries.

“If somebody tries to break into it, an alert will be sent to you. If somebody does break into it another alert will be sent to you. And, if somebody tries to take it away, you will be able to track it,” Blake enthuses. “We will tell you where it went, how fast is going, and in what direction. It will last up to three years, depending on how often the intrusion alarm goes off,” he adds.

With John Turner, an experienced RF designer on board, Blake then recruited Jack Woida for his broad business background in the tech industry and Jason Hennig for his software expertise. The team quickly created

*When the RIoTS IoT module detects an intrusion attempt, it automatically sends messages over the cellular phone network, including alerts sent to preprogrammed cellphone numbers plus further details to a web-based application in the cloud. (Source: RIoTS)*

a working prototype that includes a cellular modem for connecting to the 5G IoT network. Users can communicate with the device remotely over the cellular network, or locally using either Bluetooth, a USB port, or an NFC reader capability.

The IoT device is triggered by onboard sensors that include a microphone as well as an accelerometer, both of which are used to detect the noise and vibration of an intrusion attempt. The device includes inputs where the user can connect door switches which will trigger if a door is compromised. There’s also a GPS receiver on board which is triggered to take a fix if the trailer is moved.

All this data is immediately transmitted over the 5G network to a cloud-based data collection site and then communicated either to the security monitoring company or to the end user. There is also SMS messaging capability so that an alert can be sent to the end-user’s cellphone. **EP&T**



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# Using AI to provide better health outcomes

## Clarius upgrades handheld ultrasound devices

BY SOHAIL KAMAL, WEST COAST CORRESPONDENT

→ Safer, better medical imaging tools that improve patient care in every setting. That is what Clarius Mobile Health is offering with its 10 AI-powered wireless scanners and advanced cloud-connected ‘Software-as-a Service’ packages designed to optimize imaging across medical specialties and applications. Physiotherapists and medical practitioners can now make an instant, accurate diagnosis with and visualize where exactly to land their needle when injecting localized medications, and they can do so without needing to cart around bulky machinery into treatment rooms.

West Tech Report had the opportunity to chat with Ohad Arazi, president and CEO of Clarius, together with Laurent Pelissier, Clarius founder and chief innovation officer to learn more about the impact they seek to make on healthcare, by delivering affordable ultrasound to medical specialties. The pair are applying AI technology to improve these offerings - now and in the future.

Imagine a future where instead of making a referral for diagnostic tests at specialty clinics, your clinician performs a real-time ultrasound scan on-site on that same visit and, perhaps even performs the procedure safely under ultrasound imagery guidance. According to Clarius, that future is now. For example, a physiotherapist can use a Clarius L15 HD3 to scan your Achilles tendon to see with certainty if it has ruptured, or your general practitioner, using the Clarius C3 HD3, can diagnose your sudden back pain as either gallbladder disease or kidney stones.

Since 2015, Clarius has grown from a small start-up with a big idea, to gaining the third largest market share among handheld ultrasound sales in the Americas and Europe.

“Our high-definition wireless

scanners are designed for any medical clinician who needs to see under their patients’ skin to accurately diagnose medical issues and to guide safe, precise treatment,” explains Arazi. “Currently, Clarius is most popular with clinicians who deal with musculoskeletal issues such as orthopedic surgeons, sports medicine physicians, physiotherapists and naturopaths, plastic surgeons and aesthetic clinicians, emergency medicine physicians and veterinarians.”

The firm has even worked out a deal with the Vancouver Aquarium so that their veterinary staff can use Clarius devices to look after sea lions and other aquatic creatures.

With decades of experience in medical imaging, Clarius has unlocked the power of the radiology department with a line of 10 wireless ultrasound scanners that are little bigger than an iPhone. Pelissier pioneered a PC-based ultrasound system in the 1990s as part of Ultrasonix, which he sold prior to starting Clarius with the goal to further miniaturize ultrasound systems. Much has changed in the industry, and Clarius has been on the forefront of that change. Clarius released its third-generation family of ultrasound scanners this year.

“When we released our first product in 2016, it was considered revolutionary,” observes Pelissier. “Physicians likened it to the Star Trek Medical Tricorder. But, it had its limitations. Like the very first mobile phone, our first-generation wireless scanner was large and too big for smaller hands to hold,” he says.

Today, Clarius HD3 delivers best-in-class portable ultrasound for your specialty, with an easy-to-use app powered by artificial intelligence and connected to the cloud. At the heart of Clarius hardware lies a cutting edge ‘system-on-a-chip’ that supports the system’s Octal Beamforming technology, enabling the wireless



Ohad Arazi, president & CEO (left) with Laurent Pelissier, founder & chief innovation officer of Clarius Mobile Health in Vancouver.

scanners to deliver up to eight times the processing power and image resolution of other handhelds. The team has worked hard to help practitioners provide early diagnosis for many medical conditions, from urgent heart conditions to the progress of a pregnancy.

“Other products feel like toys in comparison. Our handheld image quality is uniquely comparable to the big ultrasound machines in hospitals. Clarius is helping redefine patient engagement and fostering trust by making medical imaging more accessible,” says Arazi.

It’s well-known that early diagnosis and interventions improve prognosis. In standard medical clinics, time is lost navigating an inefficient multi-staged process steeped in inefficiencies. Backlogs at imaging clinics, scarcity of expensive ultrasound machines, especially at remote locations, waste time that can be avoided if healthcare providers could have instant access to medical imaging. Clarius is enabling and accelerating this modernization process.

“We are fortunate to be able to work with BC-based institutions who share our mission to spread the use of point-of-care ultrasound machine,” Arazi explains.

Clarius is laser-focused on

broadening the delivery of this AI technology to diverse fields and applications. “Clarius is the first ultrasound scanner to use artificial intelligence to automatically detect anatomy at the macro level, allowing physicians to scan without having to adjust the system. AI is also used to automatically optimize image quality on every scanner, eliminating the need to master complex knobs and buttons,” Arazi continues.

Moving forward, the group is keen, using AI, to help practitioners aim at, or detect the appropriate anatomy and optimize the view of the image that needs to be scanned. The Clarius software enables easy archival and retrieval of images both on the Android and the Apple platforms. The firm’s software is also connected to the Cloud to facilitate data transfer and accessibility.

Exciting times ahead for both patients and practitioners, and for the engineers doing magic in the background. **EP&T**  
[www.clarius.com](http://www.clarius.com)



**Sohail Kamal** is EP&T's West Coast correspondent.  
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# Blockchain-based commercial platform promotes sustainable use of recycled materials

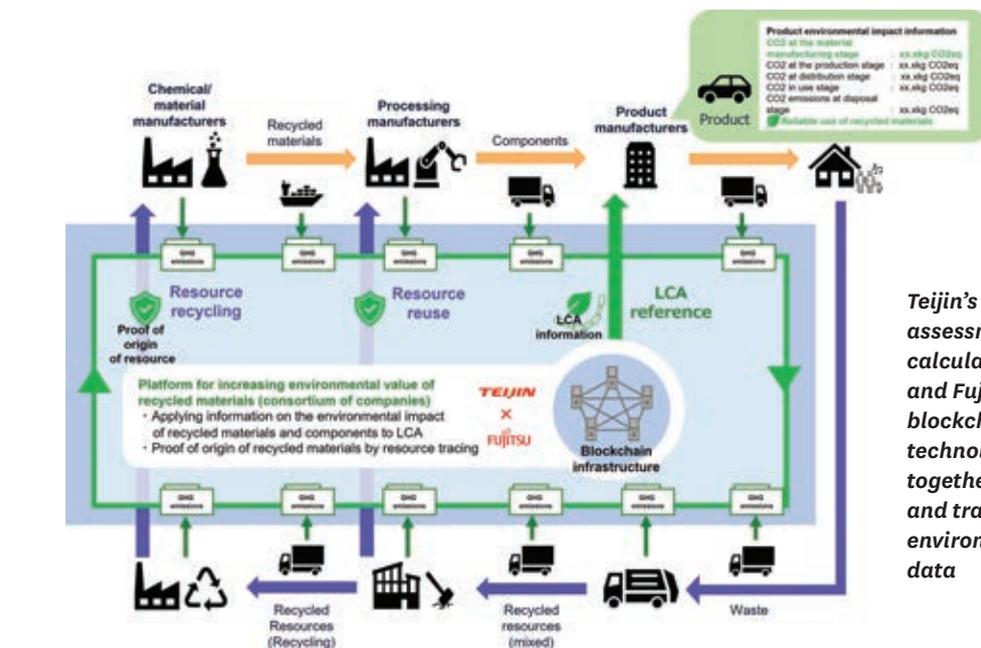


Teijin Ltd., a chemical, pharmaceutical and information technology company and Fujitsu Ltd., a multinational communications technology equipment and services firm, have launched a joint project to realize a blockchain-based commercial platform for enhancing the environmental value of recycled materials for manufacturers. Collaboration between the two Japanese based firms will promote environmentally conscious design by leveraging Teijin's Life Cycle Assessment (LCA) Calculation Method for measuring the environmental impact of manufacturing processes across the value chain, as well as Fujitsu's blockchain technology to collect and track primary data on environmental impact (including GHG emissions) to deliver reliable, transparent traceability. The new platform will promote the use of recycled materials and environmentally friendly designs by providing manufacturers who design products from recycled materials with accurate information about their environmental footprint, including proof of origin of recycled materials and data on GHG emissions.

This joint effort demonstrates the two companies' commitment to contributing to the realization of the common global goal of a carbon-neutral future for humanity.

## Features of the new platform

- Improve reliability and the environmental value of recycled materials by leveraging Fujitsu's blockchain technology to collect and trace primary data on environmental impact across the value-chain.
- Promotes environmentally friendly designs by providing OEMs with environmental impact information, including proof of origin of recycled materials and highly reliable GHG emissions.



Teijin's life cycle assessment calculation method and Fujitsu's blockchain technology work together to collect and track primary environmental data

As a first step in their collaboration, Teijin and Fujitsu will start full-scale trials with the aim of realizing business in the FRP field within fiscal 2022. Based on the results of these trials, the two companies will consider expanding the scope of the project for other types of materials.

Moving forward, Teijin and Fujitsu will continue to contribute to the materials industry as a starting point for the realization of a 'circular economy' and will promote environmentally conscious design in society by promoting the use of reliable recycled materials.

The two parties will further promote discussions and field trials with partner companies and organizations that support this initiative to contribute to the realization of carbon neutrality on a corporate and global level.

In order to realize a sustainable society, Teijin will provide innovative, people-centered solutions that improve peoples' quality of life. Teijin will further strive to mitigate the impact of its business activities on the environment and society to realize its long-term vision "to be a company that supports the society of the future."

Fujitsu is promoting 'sustainable manufacturing' to achieve growth through the coexistence of people and the earth as one of its key focus areas under its global business brand, Fujitsu Uvance.

Measuring and reducing the environmental impact of manufacturing processes as well as enhancing the environmental value of recycled materials represents an ongoing challenge for players in the manufacturing industry.

To this end, manufacturers are increasingly introducing LCA throughout the life cycle of products, disclosing evaluation results, and taking proactive measures to obtain environmental labels as part of their environmental impact management strategies.

The introduction of stricter environmental regulations in Europe in particular requires companies to not only adjust to additional requirements in the manufacturing process, but also to focus on environmentally friendly designs and materials.

In particular, fiber reinforced plastics (FRP), which are increasingly used for industrial purposes particularly in the transportation field such as aircraft and electric vehicles (EVs), will require more advanced, environmentally conscious design efforts in the future.

To achieve these goals, both the government and the private sector are actively working to regulate waste disposal and develop improved recycling technologies. However, transparency and traceability of recycled materials remain an ongoing challenge, and demand for solutions for reliable information management is expected to grow amidst trends to institutionalize the verification of the usage of recycled resources.

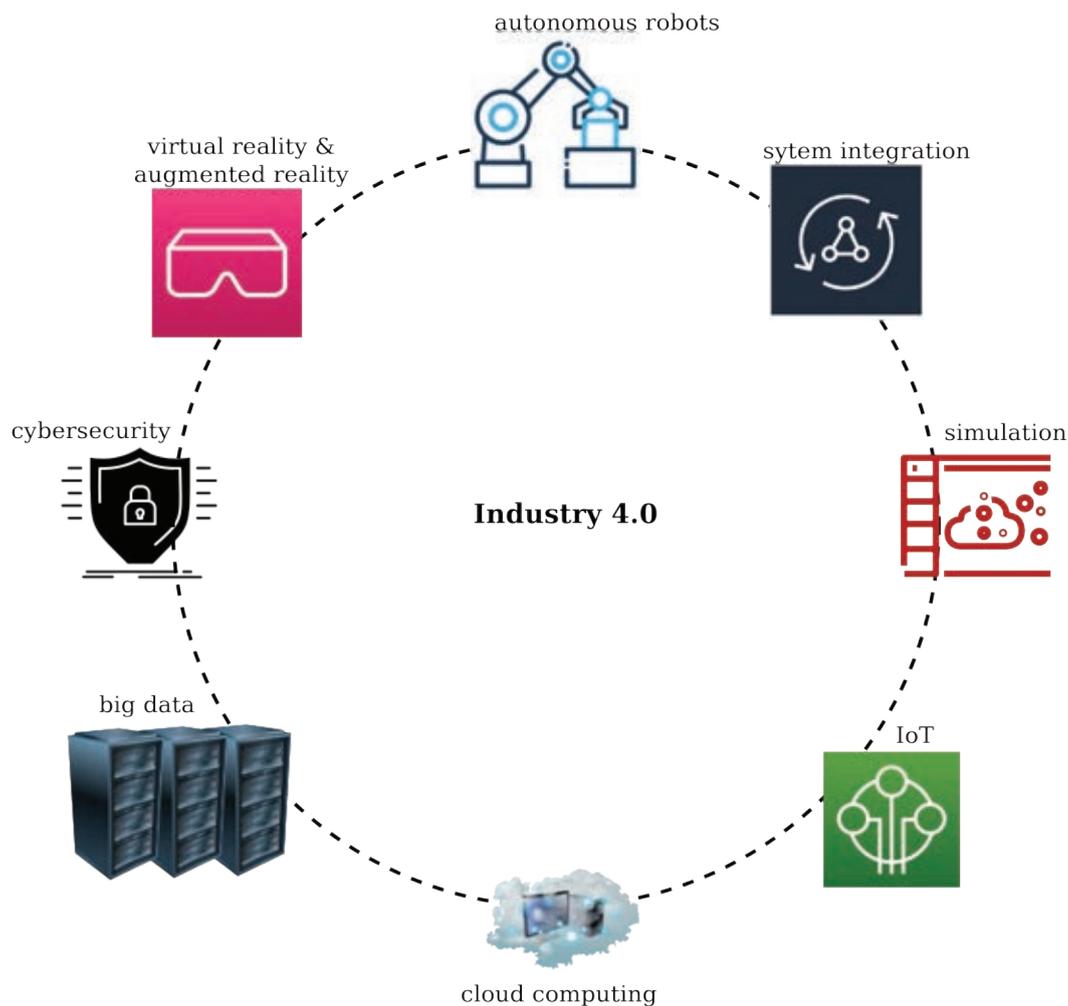
To address this issue, Teijin and Fujitsu started collaboration on a blockchain-based commercial platform to promote sustainable use of recycled materials and provide manufacturers with reliable and transparent information on the origin of recycled resources and data on GHG emissions.

Teijin has established a method for calculating greenhouse gas (GHG) emissions from carbon fiber and aramid fiber manufacturing processes and is also promoting initiatives related to FRP recycling. Fujitsu has a strong track record in building systems using blockchain technologies that ensure high transparency and traceability and makes it virtually impossible to falsify information. **EP&T**

# SDRs solve IIoT industrial systems

*Software defined radios reduce frequency hopping, incompatibility of standards*

**BY BRENDON MCHUGH, FIELD APPLICATION ENGINEER & SIMON NDIRITU, ELECTRICAL ENGINEER AT PER VICES**



The Industrial Internet of Things (IIoT) is gradually revolutionizing communication infrastructure in industry, as wireless systems are increasingly replacing wired solutions in various industrial systems. IIoT systems require low latency and tight synchronization to run, and often integrate software defined radio (SDR) to hit these technical requirements. This article discusses the various capabilities of SDR systems that make them suitable for implementing IIoT solutions, including wide tuning range, high bandwidth, multiple-input

multiple-output (MIMO), and low latency performance. SDRs also help to solve various issues in industrial environments, such as frequency hopping, incompatibility of standards, inflexibility of wireless/networking equipment, and more.

IIoT is one of the key enabling technologies for Industry 4.0 – which entails use of data-driven assembly and production and massive use of sensors for data acquisition and network monitoring. This level of connectivity requires hybrid wireless sensor networks that are capable of interconnecting various devices including programmable

logic controllers (PLCs), sensors and actuators. Figure 1 shows some of the technologies that enable IIoT.

Connectivity in conventional industrial environments is dominated by wired networks, however, most industries are switching to wireless infrastructure mainly because of their quick configuration, higher mobility, and lower cost of installation and maintenance.

In addition to connectivity, quality control and productivity are critical issues in today's industries. IIoT employs smart devices and autonomous systems to enhance flexibility and efficiency in manufacturing processes. Moreover, IIoT systems feature a variety of analytics tools that provide real-time insights required to enhance business agility. This allows for employees to monitor and assess production and make modifications if necessary for supply and demand, specifications, and other parameters.

The growth of IoT has helped to accelerate adoption of wireless sensor networks (WSNs) in a variety of industrial applications including remote control, environmental monitoring, telecommunication and disaster detection. IIoT devices utilize a wide range of non-interoperable wireless links and protocols. These standards include Long Range (LoRA), Wi-Fi, Sigfox, 2G, 3G, Ingenu, Weightless, ZigBee, WirelessHART, and Bluetooth Low Energy (BLE). As these standards evolve and advance in capability, the ability for radio and networking systems to adapt will be paramount to the success of IIoT implementations.

## SDR systems

A typical SDR platform features a radio front-end (RFE) and a digital backend. The RFE features transmit (Tx) and receive (Rx) functions and offers a broad tuning range, typically 0-18 GHz. The tuning range of best performance SDR systems can be extended up to 40GHz. Furthermore, the highest bandwidth SDR systems can offer an instantaneous bandwidth of 3GHz.

The backend of an SDR platform features a field programmable gate array (FPGA) with a broad range of onboard DSP capabilities including modulation, upconverting and demodulation. The reconfigurability of these modules enables implementation of new radio protocols and digital signal processing (DSP) algorithms, which allows for flexibility and ability to keep up with technological advances.

**Figure 1: Industry 4.0 ecosystem loop: An overview of the technologies enabling IIoT.**

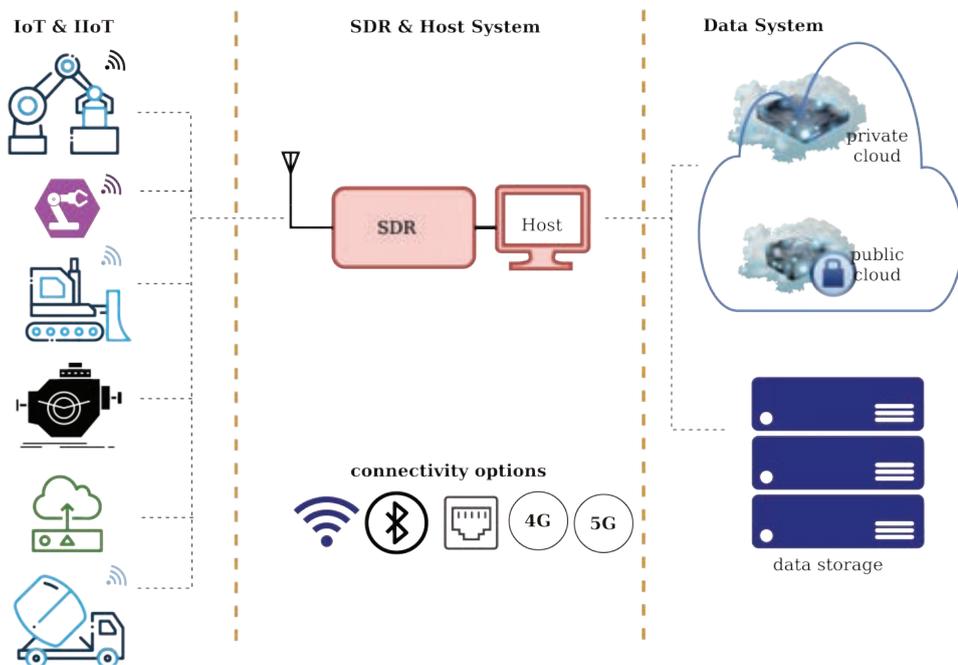


Figure 2: IIoT gateway based on an SDR system.

SDR platforms feature multiple Tx and Rx channels, with each of these independent channels featuring dedicated analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). Furthermore, high performance SDR platforms support a broad array of open source tool kits, such as GNU radio.

SDR platforms vary in size and complexity to meet the diverse needs of today's applications. The modular architecture of SDR systems allows more devices to be added by simply increasing the number of channels and allows for systems to be linked together for larger projects. This makes an SDR platform a cost effective solution for implementing scalable industrial solutions, such as ultra-high network backhaul systems.

### SDRs for IIoT applications

One of the main challenges facing the realization of IIoT is incompatibility due to the lack of a unifying technology that can work with a broad array of standards; often which are evolving regularly. The flexibility and reconfigurability of SDR systems enable them to seamlessly support a wide variety of wireless technologies. Moreover, the performance characteristics of SDR systems make them suitable for implementing a broad range of industrial solutions including data aggregators, base stations, and cloud and data center gateways.

Various SDR-based IIoT solutions have been implemented and have their performance tested to ensure successful operation before full-scale deployment. Tests with a prototype system, which was developed for routing data to and from a variety of IIoT devices utilizing different wireless protocols, such as ZigBee, LoRA, and BLE [1], have shown that these platforms are suitable for

developing highly scalable gateways. The solution utilized MQTT broker to enable IP-based packet transmission. Figure 2 shows an IIoT gateway developed using an SDR system.

Some of the key parameters to consider when selecting an SDR system for IIoT applications include power, sensitivity, selectivity and phase noise. The range of an RF system is significantly determined by the power of the transmitter and the sensitivity of the receiver. Careful consideration is required since authorities restrict the maximum power that can be transmitted and high power transmission devices are usually expensive.

For instance, one particularly important parameter is the ability of a receiver to distinguish between a signal of interest and an unwanted signal, which is determined by its sensitivity. Another related parameter is the capability of a system to receive a signal of interest when an unwanted signal is active in an adjacent channel is described in terms of adjacent channel rejection (ACR).

To achieve high blocking and selectivity figures, it is vital to ensure that the phase noise in the radio system is minimal. Phase noise is caused by short-duration fluctuations in a radio signal and is typically measured in dBc/Hz relative to the carrier. Minimizing phase noise induced by oscillators/synthesizers in a radio system is essential, particularly one's that are subject to vibration other disturbances in an industrial environment.

The resilience of a receiver to nearby high power sources of interference is mainly determined by its front-end linearity. The linearity of a receiver is usually given in terms of input third-order intercept (IIP3). This is critical in IIoT settings, where densely packed transmitters and power supplies are often causing

interference among one another.

SDR platforms offer high flexibility and can support a wide range of wireless technologies, making them particularly suitable for use in applications involving real-time acquisition and transmission of data. In addition, an SDR platform can operate over a broad range of frequencies, allowing one unit to replace many separate ones that operate over limited frequencies.

SDRs allow control and data links to be easily adapted to meet the conditions of a radio system. This means that parameters such as gain, error correction codes, and filtering methods can be adaptively adjusted. Furthermore, the high flexibility of SDR systems allows wireless links to be configured individually depending on the operating conditions (for instance, meeting environmental standards including vibrations and temperature).

One of the techniques that are commonly used to avoid interference is frequency hopping, which is the repeated switching of carrier frequency during transmission to reduce interference and avoid interception. SDRs support frequency hopping and a variety of modulation schemes used in an IIoT environment

There is a new SDR design that utilizes FPGA instead of a general-purpose computer. This model-based architecture allows the system to perform fast signal processing and is particularly suitable for time-critical applications. Moreover, use of software-based modules in SDRs helps to shorten the cycle of developing and evaluating new radio techniques.

### Software defined network

Integrating an SDR system with software defined network (SDN) technology enhances network management functions and enables security and resource orchestration. This combination also offers high immunity to latency-related problems and is therefore suitable for time-critical applications. In addition, SDN is capable of reconfiguring a network to real-time predefined requirements thereby enhancing the reliability of wireless communication systems.

SDRs offer unique capabilities that make them particularly suitable for implementing IIoT solutions. These capabilities include a wide tuning range, MIMO channels, and reconfigurability. SDRs are capable of supporting a wide variety of wireless protocols used in IIoT applications and their reconfigurability enables easy implementation of new protocols and algorithms, which are integral in adapting to new technology and innovations. Furthermore, combining SDR and SDN technologies enables realization of robust low-latency radio solutions for numerous IIoT applications by functioning as a gateway for different low-power radio protocols. **EP&T** <https://www.pervices.com/>

# Three ways to embrace Industry 4.0

BY HENRY MARTEL, FAE, ANTAIRA TECHNOLOGIES



➔ Global supply chains are buckling under the strain of unprecedented demand and constricted logistics capacity. Added to skyrocketing inflationary forces, it's no wonder that an increasing number of OEMs are embracing Industry 4.0 to bolster enterprise efficiency by making their manufacturing more aware, predictive, and autonomous.

The shift from Industry 3.0 to Industry 4.0 involves the convergence between information technology (IT) and operational technology (OT). Connecting OT systems to an IT network allows a more detailed view of individual equipment and creates a comprehensive view of the entire ecosystem, simplifying management and operation. Besides allowing machines to be largely operated autonomously without human supervision, Industry 4.0 creates higher value when data collected from intelligent sensors and actuators connected to equipment leads to better decision making, as well as to the 'learning' that's now possible with artificial intelligence (AI) and machine learning (ML).

**Industry 4.0 is expected to register substantial growth in the near future, attributed to demand for industrial automation, upsurge in the use of robot technology, and increase in government expenditure on digitalization**

For OEMs, Industry 4.0 unlocks actionable data throughout the plant and beyond, improving operational awareness in manufacturing and maintenance processes. For example, automated assembly systems that once operated in data silos can be connected with IT databases from purchasing, compliance, and customer service departments, or to data from a Manufacturing Execution System (MES) and Enterprise Resource Planning (ERP) to identify trends, detect bottlenecks, and take advantage of emerging opportunities.

As another example, analyzing big data collected from sensors on the factory floor provides real-time visibility of manufacturing assets to facilitate predictive maintenance in order to minimize costly downtime. In this instance, machine learning algorithms detect and target faulty parts before they wear out, rather than wait until repair work is more expensive.

Besides gaining insights from a local shop floor, warehouse, or assembly line, Industry 4.0 provides visibility into supply chains thousands of miles away where an OEM's

suppliers may be located. OEMs can be informed of where their assets are in the supply chain so they are in a better position to fulfill customer deliveries in a timely fashion. Historical supply chain data could be sent to the cloud for analysis, helping to create predictive models and develop condition-based alerts. If a delay is detected, software will alert the OEM so that it can pivot in strategy.

## Applying Industry 4.0

Here are three ways to embrace this megatrend shift to Industry 4.0:

- 1) Artificial Intelligence
- 2) Network Connectivity
- 3) Device Cybersecurity.

## Artificial Intelligence (AI)

AI is the simulation of human intelligence processes by computers to analyze data for correlations and patterns, and the use of these patterns to make accurate predictions about future states. AI is all around us. From agriculture applications that detect imperfections in fruits and vegetables during harvesting processes, to autonomous construction and farming machinery that use GPS technologies to navigate over predefined routes. Industry 4.0 uses AI to analyze sensor data to track equipment usage, improve workflows, streamline logistics, increase safety, and achieve higher overall efficiency across OT and IT operations.

One promising category for AI is providing intelligence for autonomous robotics. AI-driven 'cobots' reduce labor costs and increase productivity simply by continuously working around the clock without fatigue or breaks. In addition, safety is improved in hazardous environments, and insurance and injury leave costs are reduced significantly.

As AI continues to advance, problem solving and learning analytics will enable autonomous robots to be responsive to their environment with minimal or no human feedback. To give you an idea of what that means, think of the thousands of manned forklifts operating today in warehouses and port terminals. Forklifts are labor-intensive, expensive to maintain, and dangerous. As an alternative to a forklift, let's say AI is applied to an automated guided vehicle (AGV). Freight is picked using a barcode reader. The AGV then automatically reroutes itself with the freight onboard to the best path through the warehouse using wireless routers and

industrial switches. Sensors assure no collisions occur with obstacles or employees.

Potential for autonomous robots using these devices are virtually endless.

### Network Connectivity

With the exponential growth of Industry 4.0 technologies, operational networks are continually going through expansion processes, requiring the same type of bandwidth allocations and infrastructure support as the enterprise network counterparts. Furthermore, as Industry 4.0 is trending towards an increased focus on AI for big data analytics and cloud computing for process and control information collection, connectivity and connection points have become a critical piece in the industry 4.0 puzzle.

Ethernet is the technology of choice for operational networks, thanks to its standardization, versatility, and low cost. An all IP Ethernet infrastructure also helps to meet the imperatives of cybersecurity, determinism, and system reliability. Thanks to these advantages, legacy technologies such as analog fieldbus systems are migrating to Ethernet, allowing for communications with modern day technologies.

Ethernet thru TCP/IP-based communications now range from AI cloud-based processes to legacy bus systems that can interconnect the smallest application using just one twisted wire pair. In a recent development, the IEEE published a standard for 10 Mbit/s (IEEE 802.3cg) important to Industry 4.0 that allows transmission distances up to 1000 meters (3280 feet), therefore holding the potential to replace virtually all fieldbuses currently in use.

One of the main components underpinning Ethernet connectivity is the Ethernet switch. Managed and unmanaged Ethernet switches are staples of Industry 4.0 architectures able to transmit data between connected devices and wider networks in a way that is secure from outside threats. While a basic Ethernet switch simply filters and forwards network packets from one networking device to another, industrial switches offer much more.

### Device Cybersecurity

We are now seeing the Smart Interconnected Gigafactory that can monitor and control every facet of intelligent production processes. But just as these new technologies have created the opportunities for optimization, they have also introduced new risks and security threats.

For all its benefits, Industry 4.0 is an appealing target for cyber-attacks. The expanded attack surface gives bad actors the opportunity to move laterally across a network, jumping across IT and OT systems for industrial espionage, intellectual property theft, IP leakage, or even production sabotage. For this reason, cybersecurity best practices must be acknowledged as one of the pillars to a successful Industry 4.0 strategy. Adopting this risk-based security mindset includes:

- You must maintain a real-time inventory of all OT assets and monitor the network for devices that have been added without authorization.
- Identifying and monitoring who can access devices. Implementing secure password policies - prioritize length over complexity helps

**Designed for Industry 4.0 environment, Antaira's 10-port gigabit PoE+ Ethernet switch embedded with eight Ethernet ports that support a maximum of 30W/port.**

prevent unauthorized access.

- Taking a security-first approach to the deployment of any new connected devices. Require new devices go through verification before they can gain access to the network.
- Performing real-time vulnerability assessments and risk-based prioritizations to spot potential threats. Regularly scanning the network will identify suspicious communications or content, malicious software, improper access.
- Fixing any outdated systems, unpatched vulnerabilities, and poorly secured files.
- Implementing multi-factor authentication whenever possible.
- Segmenting networks and restricting host-to-host communication pathways.
- Ensuring that device suppliers commit to regular security and software patches and audits.
- Inform and involve the C-suite of the cybersecurity process.

Cybercriminals will go looking for easy targets and then work their way deeper inside the perimeter. In this case, the 'low-hanging fruit' are your connected OT devices, especially those with decades-long life cycles, an inability to patch systems due to stability concerns, and a lack of basic cybersecurity features such as user authentication or encryption. This threat environment has been further heightened by device vendors jumping into the industrial market from the IT space with little background into OT cybersecurity.

Before Industry 4.0, OT devices and systems were 'air-gapped' to isolate them from risk. That is not possible today. Industrial switches, media converters, and wireless routers must feature robust, DoD-compliant layer two and layer three security that helps manage network traffic at scale. And why your NAT routers should be able to conceal the identity of an IP address block being used on a network. The device manufacturer you work with should give administrators the tools they need to build on existing security policies and company standards, such as an Authentication, Authorization, and Accounting mechanism that can track user activities while limiting essential controls to employees who require them. **EP&T**  
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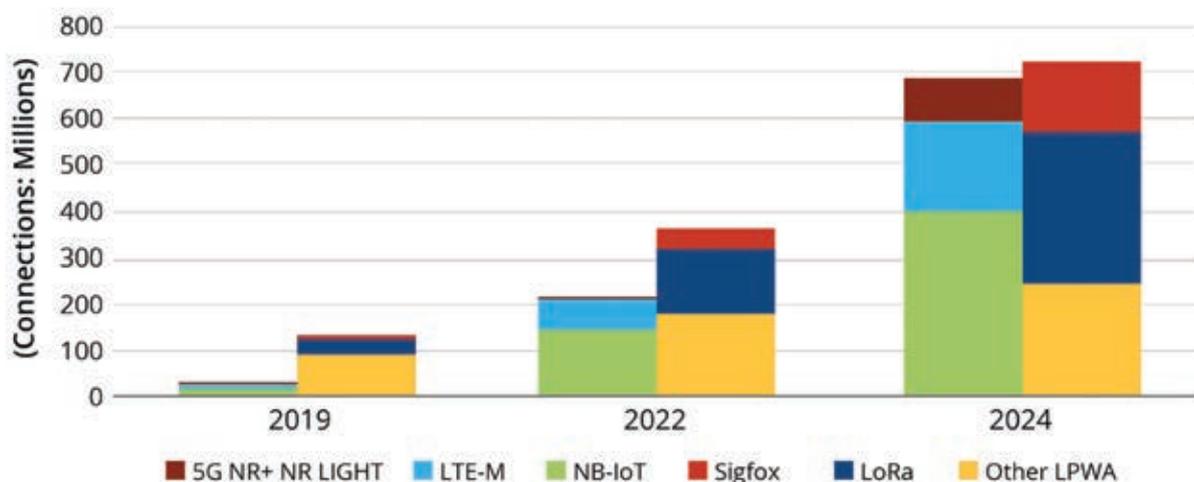


Photo: Antaira Technologies

# LoCreating global supply chain connectivity with multi-radio IoT

BY MARC PÉGULU, VICE PRESIDENT IOT STRATEGY AND PRODUCTS AT SEMTECH

Chart 1  
LPWA  
Connections by  
Technology  
World Market  
  
(Source: ABI Research)



➔ For tracking assets around the world or within facilities, smart sensors with tracking and tracing capabilities offer the global coverage needed to enable efficient and reliable monitoring.

As goods travel around the world, having visibility into their journey is important. But getting that visibility is not always easy. When cargo travels across land, sea, and sky, it also moves through different kinds of connectivity – and sometimes through hard to reach areas with no connection at all. When is the last time you tried to get a cellular signal in the middle of the ocean?

This is why multi-radio technologies are a game changer for asset tracking applications: they bring the interoperability needed to provide full transparency to the global supply chain. With advancements in asset management and geolocation technology, companies are now in a better position to harness smart solutions to improve their logistics management – knowing precisely the product lifecycle.

### The world of massive IoT

The global Internet of Things (IoT) is made up of more than 14 billion connected devices, according to IoT Analytics. And that’s all types of connectivity. ABI Research estimates that the subset of IoT connected devices based on cellular IoT will reach 3

**Long range, low power sensors and location data such as GNSS and network geolocation, trackers can be used in track and trace applications for data transmission frequency that ranges from every hour to less than every few minutes**

billion connections by 2026. Each of those devices represents a set of sensors that communicate over a set connectivity protocol.

Each protocol is chosen based on the best-fit solution for that particular device. This includes short-range radios like Wi-Fi and Bluetooth, long range Low Power Wide Area Networks (LPWANs), and cellular technology like 5G. There are pros and cons to each connectivity solution: smart home devices often work on Wi-Fi and Bluetooth since they are typically affixed to a single location without the need for long-range or penetrating communication. This is in contrast to an application like equipping a commercial building with sensors, where an LPWAN can better penetrate through dense materials.

### License-exempt LoRaWAN

However, what some might not recognize is the way these networks can complement each other. Working in tandem, these networks fill connectivity gaps left between each connection’s strengths. For example, the open LoRaWAN network is license-exempt, setting it up to support massive IoT verticals like building automation, industrial metering, and asset tracking. Because of its low power nature, high bandwidth cellular networks complement LoRaWAN – providing the low latency needed to backhaul data.

Multi-radio integration on individual

devices means choosing the best attributes of multiple connectivity solutions all in one. By integrating more than one connectivity protocol onto a single device, multi-radio sensors are bridging previously disparate networks. For example, a multi-radio sensor brings together the low power, long range capabilities of an LPWAN and short-range wireless connectivity like Wi-Fi – enabling a device to communicate in more than one protocol.

When it comes to asset-tracking, multi-radio offers the opportunity to seamlessly track goods as they travel through geographies and settings. Specifically, with long range, low-power sensors and location data such as GNSS and network geolocation, trackers can be used in track and trace applications for data transmission frequency that ranges from every hour to less than every few minutes.

### Sensors transforming tracking

Device-to-cloud geolocation services further reduce device hardware costs and optimize battery consumption, as they do not require an additional power source.

With these capabilities, sensors are transforming the way industries handle asset tracking, adding unparalleled value.

Implementing sensors into the supply chain allows assets to be tracked

throughout all points of the journey. Regardless of whether they are indoor or outdoor, on land or in the sky, the corresponding connectivity protocol picks up on location to provide visibility across the entire chain of custody. Global geolocation services transform intercontinental supply chains. For example, imagine a car manufacturer in Europe is shipping new vehicles to North America. Before the shipment even leaves the continent, often it will travel through multiple service areas, requiring individual licenses to maintain connectivity. Then, once the shipment is loaded onto a cargo ship to travel across the ocean, all terrestrial network coverage is lost.

By combining a terrestrial LPWA network with a satellite network, the entire journey is tracked with no loss of connectivity – all enabled by using more than one radio protocol.

### Increased efficiency

Traditional asset tracking approaches can be difficult to use. It is often complicated to set up and time-intensive to deploy, as it requires workers to physically monitor each asset onsite with little

## GPS

With geolocation and GPS technologies, managers can improve the asset tracking process for workers - making supply chain more predictable.

support. Implementing IoT solutions to monitor sensors remotely enables users to quickly locate and provide updates on the status of assets. This removes the manual labor required to find each asset in person, saving time, fuel, equipment, and resources.

Implementing multi-radio protocols can also save on deployment costs. Different kinds of network have a lot of variability in the cost it takes to establish the infrastructure. By using the more expensive connectivity networks only where necessary, and using widespread low-cost connectivity to cover the majority of ground, companies can largely offset infrastructure costs.

Sensors can also streamline their operations. With geolocation and GPS technologies, logistics managers can notably improve the asset tracking process for workers. The supply chain is more predictable since managers have visibility into progress, reducing the scramble for information. When an update on a shipment is needed, the information is already available. By eliminating random “fire drill” tasks, workers are able to work more productively and efficiently.

### A more connected future

IoT sensors matched with reliable connectivity platforms provide accurate, real-time data visibility into asset tracking around the world. Including multi-band connectivity options on a single device, extends the simplicity and low-power advantages to more of the available wireless spectrum, thus improving the worldwide availability and coverage for IoT deployments.

For a global connectivity to be possible, interoperability across technology is key. Multi-band connectivity options support a future with ubiquitous, affordable and simplified IoT by providing the flexibility that the world needs to accelerate pervasive IoT adoption. **EP&T**  
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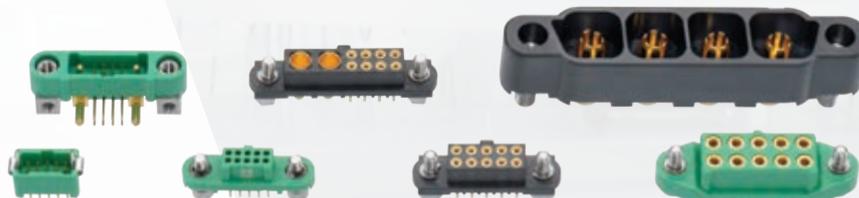
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# The case for SPE in industrial applications

BY GUADALUPE CHALAS, SENIOR PRODUCT MARKETING SPECIALIST, FIELD DEVICE CONNECTORS, PHOENIX CONTACT USA



While Single Pair Ethernet (SPE) promises to revolutionize industrial applications with speeds up to 1 Gbps over a single pair, there are still questions surrounding standardization and the benefits of SPE when compared to industrial RJ45 and other standard products.

SPE enables 10Mbps, 100Mbps and 1 Gbps transmission speeds using a single pair of wires and allows for both point-to-point and multi-point communications. At 10Mbps over long distances (up to 1000m), SPE brings the Internet Protocol (IP) to field devices, thus enabling full duplex communication and power up to 50W over a single wire pair with existing M8 and M12 interfaces. At 1 Gbps over shorter distances (up to 40m), SPE is a miniaturized solution for high-speed performance. Because SPE uses a single pair for data transmission and can deliver enough power to field devices without the need for specialized cables, it is a cost-effective and compact alternative for implementing industrial Ethernet in the field and that allows for field termination with the use of field wireable connectors.

Moreover, SPE represents an upgrade from existing industrial protocols, such as fieldbuses, as it enables full-duplex communications at higher speeds and over longer distances where some traditional communication technologies only allow for half-duplex communications at much lower speeds and shorter distances. As we look at the industrial rated SPE proposals defined in the standards and compare them with 2 and 4-pair industrial ethernet and other industrial protocols, it is evident that SPE is the future-proof solution that enables high-speed communication from the field to the cloud.

## Single pair Ethernet specs

The International Electrotechnical Commission (IEC) has published



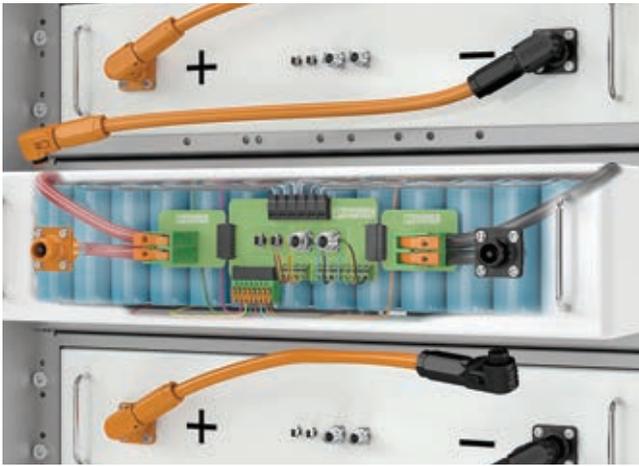
various standards for shielded and unshielded Single Pair Ethernet connectors under IEC 63171. Each of these standards addresses a specific application area for Single Pair Ethernet based on solutions proposed by industry manufacturers and intended to address a specific market segment. As such, there are seven different specifications derived from the basic standard IEC 63171 and cover circular or rectangular connectors for balanced single-pair data and power transmission. The specifications, denoted with a 'dash' symbol and a number after 'IEC 63171', may differ in ingress protection (IP) rating, port density, end application, etc., as defined by IEC. For simplicity, we will refer to the variants as 'Type 1' through 'Type 7'.

Type 2, type 5, type 6, and type 7 have been identified as suitable for industrial applications, with type 2, type 5, and type 7 (Figure 2) meeting requirements for mechanical robustness, vibration, EMC compatibility and various pollution degrees. Among the connector features that differentiate the connector variants it is worth mentioning that Type 2 and type 5 connectors are the only ones within the list of specifications to feature a consistent mating face that is intermateable and interoperable for IP20 (unsealed applications) and IP67 (harsh environment applications). This allows for the square type

**Energy Storage System (above):** Typical energy storage system design - from the storage module in a rack through to the entire system with its external interfaces

2 connector to mate into a circular connector in instances where testing or verification of the circular interface is required. Type 2 connectors are approximately 50% more compact than RJ45 mating faces and approximately 38% more compact than type 6 connectors deeming Type 2 connectors the smallest interface available for IP20 industrial SPE applications (Figure 3).

The Institute of Electrical Engineers (IEEE) is also working on specifications for Single Pair Ethernet and unlike IEC who defines requirements for connectors and cabling, the IEEE only defines the requirements for ethernet transmission and does not specify the connector interface (Figure 4). The scope of IEEE standards for single pair ethernet, as described in the IEEE website, is to specify the physical layer and management parameters as well as associated power delivery over a single twisted-pair copper cable, published under IEEE 802.3cg for 10Mbps (10Base-T1), IEEE 802.3bw for 100Mbps (100Base-T1) and IEEE 802.3bp for 1 Gbps (1000Base-T1). Currently, IEEE is working on enhancing the 10Base-T1S specification for multidrop applications through working group IEEE 802.3da with the purpose of defining larger topologies as many industrial applications begin to transition from legacy non-ethernet networks to ethernet. Additionally, other working groups are looking to



address the reach of 100Mbps and 1Gbps standards by extending the lengths from 100m to 500m in the case of 100Base-T1 and from 40m to 100m in the case of 1000Base-T1 as part of the working group IEEE 802.3dg.

As non-ethernet networks using legacy connectors and protocols start to migrate into ethernet networks, IEEE has also worked to address two different configurations for 10Mbps SPE; 10Base-T1L addresses longer distances, up to 1000m, and 10Base-T1S addresses shorter distances, up to 25m and potentially 16 multidrop nodes. These specifications also address Power over Data Line (PoDL) requirements for both long- and short-range applications with multiple power classes up to 50W.

### **SPE vs RJ45: What are the differences?**

Standard Ethernet solutions currently available in the market can support 10Mbps, 100Mbps and 1Gbps often using the RJ45 interface, known as 10Base-T (legacy), 100Base-TX, and 1000Base-T. The

**Battery Storage Module (above):** Overview of a storage module with battery packs, BMS pcb, and internal and external interfaces

**Screw Battery connectors (below):** With screw connections, there is an increased risk of high temperature rises due to increased contact resistances.

RJ45 interface consists of either 4 or 8 poles (contacts) used for full duplex communication. With 10Mbps and 100Mbps variants, known as Fast Ethernet, 2 pairs are used: one pair is used for transmitting and another pair is used for receiving. 1Gbps variants, known as Gbit Ethernet, use all 4 pairs, and each pair is used for transmitting and receiving. Additionally, Single Pair Ethernet extends the reach of traditional ethernet from 100 meters to 1000m over a single twisted pair (Figure 5).

Industrial Single Pair Ethernet solutions like type 2 and type 5 can also support 10Mbps, 100Mbps and 1Gbps ethernet, but unlike Fast and Gigabit ethernet, it can do so with a single pair configuration. Type 5 connectors are available in either a M8 or a M12 housing with Ingress Protection (IP) rating IP67 and have been designed with the mechanical robustness and reliability required for industrial applications, also known as M3I3C3E3. While there are ethernet solutions on the market for fast and gigabit ethernet within the M12 interface and fast ethernet on M8 housings, SPE is the first solution to enable fast and gigabit ethernet on both M8 and M12 housings.

SPE is a much more compact solution for both Fast and Gigabit Ethernet and utilizes less cabling than standards solutions for both speeds which can translate into cost savings and shorter termination times. In addition, the SPE Industrial interface is also specified for slower speeds (10Mbps) which is ideal for devices that do not require fast ethernet speeds but could benefit from switching over to the Internet Protocol.

### **Upgrading existing applications**

Besides standard Industrial Ethernet solutions on the market, other protocols for industrial applications can also benefit from SPE deployment. I/O Link and PROFINET are both communication standards for connecting digital field devices to controllers in industrial applications. I/O Link works over an unshielded 3-wire cable and features speeds up to 321Kbps over no more than 20 meters using M5, M8 and M12 connectors. PROFINET, on the other hand, is an implementation of 100Base-TX featuring two pairs for data transmission and reaching up to 100Mbps over distances up to 100m. Figure 5 shows a comparison between I/O Link, PROFINET and SPE cables featuring a M8 housing.

With a wide range of speeds supported within a single connector solution, SPE can be the ideal upgrade to both I/O Link, PROFINET, and other industrial communication standards. 10Mbps SPE could become the logical progression from I/O Link and other lower speed standards by enabling increased data transfer over much longer distances (up to 1km) and less cabling (two wires). Likewise, 1Gbps SPE has the potential to upgrade 100Base-TX PROFINET by delivering much higher transmission speeds going from 100Mbps to 1Gbps over half the amount of cable.

As application areas begin to transition to ethernet protocols and field devices continue to require increased transmission capacities, SPE has the advantage to deliver both fast and gigabit ethernet combined with power over a simple two-wire interface, making it easier to implement ethernet from the field to the cloud.

We already see end-users, vendors, system integrators and component manufacturers come together to publish specifications (IEC, IEEE) that address SPE implementation for their specific market areas. Such collaborations and partnerships highlight the importance of Single Pair Ethernet for industrial applications. SPE has the advantage to enable high speed communications over a single pair and allows for the use of standard industrial grade housings proven to withstand the harshest environments, making it a suitable upgrade for both low speed and high-speed protocols with a single connector interface. **EP&T**  
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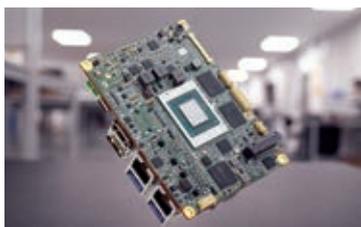
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Italtronic plastic enclosures for electronics combine function, design and high tech. From standard solutions and the smallest container to the most complex panels and fully customized enclosures, and from small productions to the supply of millions of components, products can serve most design requirements. Firm manages every stage of custom production, leveraging its efficient and flexible production process that combines technical reliability and personalized finishing touches, and extensive experience in the field of plastic processing.

➤ <https://s-pintl.com/featured-manufacturer-italtronic/>

### EMBEDDED PROCESSOR PERFORMS IN COMPACT PICO-ITX SINGLE BOARD COMPUTER

#### AAEON TECHNOLOGY



PICO-V2K4 Pico-ITX single board computer provides a small form factor that features the AMD V2000 series Ryzen V2000 embedded processor family. The compact board measures 3.94" x 2.84" and delivers rich I/O features and expansion options in a low TDP package, which provides improved performance per watt. This combination is suitable for true embedded applications such as medical imaging, industrial automation, machine building and digital

signage. Products feature AMD's Zen2 architecture, with the 7nm die being half the size used in the Ryzen Embedded V1000 series.

➤ <https://www.aaeon.com/en/p/pico-itx-boards-amd-ryzen-v2000-pico-v2k4>

### HALF-BRIDGE GAN ICS DELIVER MHZ PERFORMANCE, REDUCE FOOTPRINT

#### NAVITAS SEMICONDUCTOR



GaNSense half-bridge power ICs enable a new level of MHz switching frequencies, while reducing the system cost and complexity compared to existing discrete solutions. ICs integrate two GaN FETs with drive, control, sensing, autonomous protection, and level-shift isolation, to create a fundamental power-stage building block for power electronics. The single-package solution reduces component count and footprint by more than 60% compared to existing discretes, which cuts system cost, size, weight, and complexity.

➤ <https://navitassemi.com/>

### ULTRA-LOW VISCOSITY, BIOCOMPATIBLE EPOXY BOOSTS OPTICAL CLARITY

#### MASTER BOND

EP4CL-80Med one part, optically clear epoxy for use in medical device

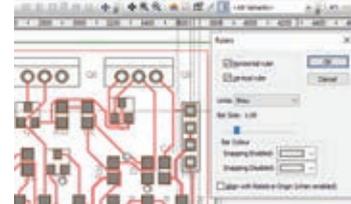


assembly applications. Product withstands repeated sterilization cycles and passes ISO 10993-5 testing for non-cytotoxicity. Product cures at moderate temperatures between 80-85°C within 60 to 90 minutes and faster at slightly higher temperatures. Product contains no solvents and has an 'unlimited' working life at room temperature. Suitable for bonding, sealing, impregnating and coating, it provides a high glass transition temperature of 155-160°C and has an extremely low viscosity of 50-150 cps at 25°C.

➤ <https://www.masterbond.com>

### PCB DESIGN SUITE INCORPORATES IPC-2581

#### NUMBER ONE SYSTEMS



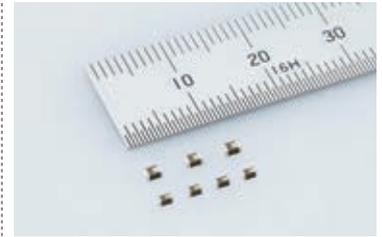
Easy-PC version version 26 incorporates an IPC-2581 export capability, along with more than 25 other new technology features based on user requests from professional pcb designers. IPC-2581 is an intelligent standard for printed circuit board and assembly manufacturing description data and transfer methodology. Product incorporates a number of new and enhanced design rules checks (DRC) and design for manufacturing (DFM) options in both schematic capture and pcb design. New checks, minimum solder mask width, solder mask to track and minimum text size aid manufacturability and prevent costly mistakes.

➤ <https://www.numberone.com/latest-version>

### AUTOMOTIVE 150°C POWER INDUCTOR DELIVERS COMPACT SIZE, LARGE CURRENT

#### TAIYO YUDEN

MCOIL LCCN series multilayer metal power inductors are AEC-Q200 qualified, including the LCCNF1608K-KTR24MAD (1.6x0.8x1mm, height is



the maximum value). Product is designed for use as a choke coil in power supply circuits for automotive body and information systems. Device has a wider operating temperature range of -55 to +150°C than firm's existing product, the LCCNF1608KKTR24MA (-40 to +125°C). Product simultaneously features industry-leading dc superposition characteristics (saturation current at 3.2A) and low dc resistance (35 milliohm) (both are the maximum values).

➤ <http://www.ty-top.com>

### THERMAL TRANSFER PRINTER IS STAND-ALONE

#### WAGO

258-5001 thermal transfer Smart-PRINTER is stand-alone and provides increased productivity without supplementary marking material. Product's versatility simplifies the overall marking process, helping minimize wiring errors and decreasing wiring time. Unit is capable of printing on a large variety of materials including continuous marking strips, WMB Inline markers, adhesive labels and wire markers. Device is wipe and scratch proof, easy to set up and comes with multiple interface options.

➤ <https://www.wago.com/ca-en/>

### 4:1 INPUT 40W, 60W DC-DC CONVERTERS HAVE A 2"x1" FOOTPRINT

#### TDK-LAMBDA AMERICAS

PXD series 40W and 60W rated 2"x1" dc-dc converters are capable of operating from a wide input voltage of 9 to 36Vdc or 18 to 75Vdc. Devices have a copper case providing six-sided shielding for reduced EMI, simplifying system compliance. Industrial control, telecom/datacom, test, measurement and battery-operated equipment are some of the many applications for the PXD. Products comprise of 3.3, 5, 12, 15, 24 and 48Vdc single outputs, and ±12, ±15 and ±24Vdc dual output voltages.

➤ <https://www.us.lambda.tdk.com>

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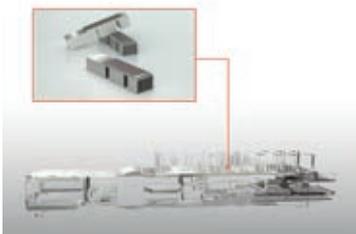


Industrial workbenches, workstations, lab benches provide ergonomics, modularity, adjustability and durability that cannot be duplicated in ordinary office furniture. Products improve the organization, function and atmosphere of production and assembly work areas, inspection stations, and research laboratories. Products are available in a large variety of configurations including 4-leg workbenches, packaging stations, adjustable height workbenches, multitask benches and more. Some of these benches have a 2-3-week lead times or less.

➤ [www.iac.com](http://www.iac.com)

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Bergquist microTIM mTIM 1028 (1000 series) micro-thermal interface coating portfolio introduces a new formulation, providing reductions in functional heat experienced by optical transceivers, addressing the thermal challenges of 400, 600 and 800 Gb pluggable optical modules (POMs). Product delivers a more robust solution, providing enduring thermal control for high bandwidth density POMs. Compared to alternatives, product can withstand as many as 500 pulls and insertions without performance degradation and reduces operational temperatures per POM by as much as 0.18°C/W.

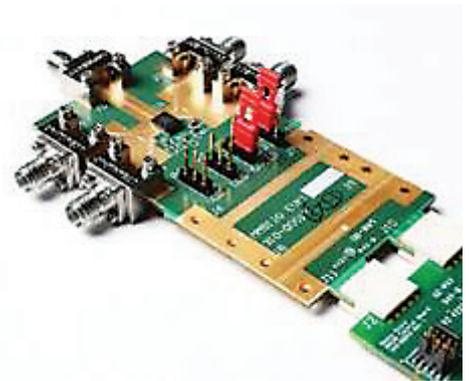
➤ <https://www.henkel-adhesives>.

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25W POWER HANDLING**

MENLO MICRO

MM5120 single-pole/four-throw (SP4T) DC-to-18 GHz switch and MM5140 DC-to-6 GHz SP4T switch provide enhanced high performance, reliability and integration for RF switching applications, 5G network infrastructure, and test and measurement equipment. Built on firm's Ideal Switch technology, devices deliver 25W power handling, ultra-low insertion loss and the industry's highest linearity, significantly outperforming electromechanical relays (EMRs) and conventional solid-state switches. Devices feature an integrated charge pump and driver circuit with SPI and GPIO interface control options.

➤ <https://menlomicro.com/products/rf>



**Schleuniger**



**Strip Series B300**



[schleuniger.com](http://schleuniger.com)  
905-827-1166

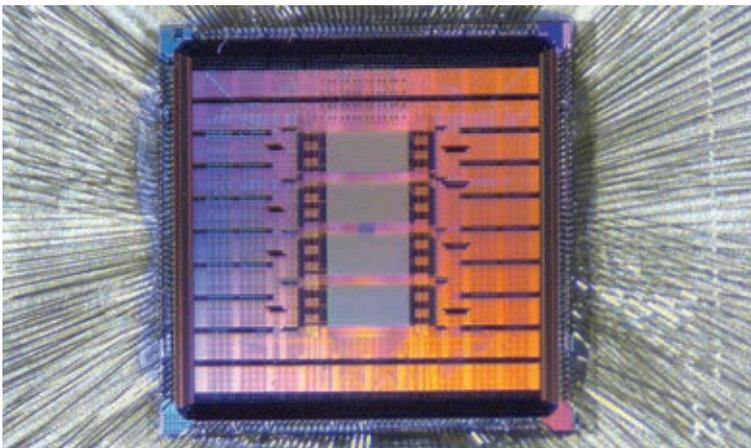
**Powerful, Efficient, and Intuitive  
Stripping Machine**

The B300 opens up new possibilities for fast and reliable stripping of wires with cross-sections from 0.03 to 8 mm<sup>2</sup>. Repeat accuracy, mechanical precision and short process cycles ensure high productivity in common strip applications. And the new ergonomic machine design and reimagined user interface offers unrivaled ease of use.

- Compact modular design
- High-resolution 5" color touch screen
- LED lighting for clear view of work area
- Highly sensitive trigger mechanism
- High process reliability

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**NIST and Google have signed a cooperative research and development agreement to produce a new suite of chips for measuring the performance of devices used in a range of advanced applications.**  
Source: B. Hoskins/NIST

## SEMICONDUCTORS

### NIST & GOOGLE TO SUPPLY CHIPS TO R&D, START-UPS

The U.S. Department of Commerce's National Institute of Standards and Technology (NIST) has signed a cooperative research and development agreement with Google to develop and produce chips that researchers can use to develop new nanotechnology and semiconductor devices.

The chips will be manufactured by SkyWater Technology at its Bloomington, Minnesota, semiconductor foundry. Google will pay the initial cost of setting up production and will subsidize the first production run. NIST, with university research partners, will design the circuitry for the chips. The circuit designs will be open source, allowing academic and small business researchers to use the chips without restriction or licensing fees.

### MICRON BREAKS GROUND ON LEADING-EDGE IDAHO FAB

Micron Technology, Inc., one of the world's largest semiconductor companies and the only U.S.-based manufacturer of memory, has broken ground on its leading-edge memory manufacturing fab in Boise, Idaho. This will be the first new memory manufacturing fab in the USA in 20 years. "With this facility, Micron will closely couple R&D and manufacturing, providing synergies that will enable us to accelerate the production ramp of advanced

memory technology," says aid Micron president and CEO Sanjay Mehrotra.

### SEMTECH TO ACQUIRE SIERRA WIRELESS

Semtech Corp., Camarillo CA, a leading global supplier of high-performance analog and mixed-signal semiconductors and advanced algorithms, announced a definitive agreement to acquire Vancouver-based Sierra Wireless Inc., a global provider of Internet of Things (IoT) solutions.

The acquisition will significantly expand Semtech's addressable market and is expected to approximately double the firm's annual revenue and create a strong and diverse portfolio of connectivity solutions for the growing IoT market, making it easier for customers to find innovative end to end solutions for any segment.

### RENESAS TO ACQUIRE STERADIAN

Renesas Electronics Corp. has agreed to acquire Steradian Semiconductors Private Ltd., a fabless semiconductor company based in Bengaluru, India, that provides 4D imaging radar solutions, in an all-cash transaction. The acquisition is expected to close by the end of 2022, subject to customary closing conditions. The acquisition of Steradian's radar technology will enable Renesas to extend its reach in the radar market and boost its automotive and industrial sensing solution offerings.

With the advancements of ADAS (Advanced Driver

Assistance Systems) in the automotive market, automotive sensor fusion demand is growing to allow precise and accurate object detection of vehicles' surroundings by combining data from multiple sensors, such as cameras, radar and LiDAR (Light Detection and Ranging).

### CMOS IMAGE SENSORS STALL IN 'PERFECT STORM'

Optoelectronics' biggest product category is expected to suffer its first sales decline in 13 years because of a smartphone slump, low camera growth in handsets, and weak global economy, says a report from IC Insights.

For most of the last two decades strong growth in CMOS image sensors pushed this product category to the top of the optoelectronics market, in terms of sales volume, generating over 40% of total opto-semiconductor annual revenues.

In 2022, however, the CMOS image sensor market category is on track to suffer its first decline in 13 years with sales expected to fall 7% to \$18.6 billion and unit shipments projected to drop 11% to 6.1 billion worldwide, according to IC Insights' August 3Q report.

## SOFTWARE

### TASKING ACQUIRES ISYSTEM

TASKING, a leading provider of embedded software development tools headquartered in Munich, Germany, has announced its acquisition of iSYSTEM, a provider of software tools supporting embedded software development and testing.

iSYSTEM develops and manufactures embedded software development tools ranging from simple debuggers to advanced software analysis tools.

## DISTRIBUTION

### MOUSER EXPANDS ITS GLOBAL DISTRIBUTION CENTRE

Mouser Electronics Inc., electronic component distributor recently broke ground on a 416,000-square-foot (38,647-square-meter), three-story building that will

expand its global distribution centre, located south of Dallas-Fort Worth, Texas.

"The tools and systems we've put in place offer another way we can help shorten our customers' time to market," says Pete Shopp, Mouser's senior VP of business operations.



Upon completion of the new construction, Mouser's 78-acre global headquarters will consist of almost 1.5 million-square-foot (370.66 square meters) to accommodate Mouser's vast inventory of 1-million unique SKUs for products and technologies from over 1,200 electronic component manufacturers. The new building will feature a triple-mezzanine floorplan, advanced automation, and a skybridge connector to the existing distribution center building.

### DIGI-KEY EXPANDS DISTY CENTRE

Digi-Key Electronics, recently unveiled its Product Distribution Centre expansion (PDCe) in Thief River Fall MN, expanding the firm's HQ footprint by 2.2-million-square-foot for a combined total of more than three-million-square-foot. The new facility allows Digi-Key to pick, pack and ship nearly three times the previous daily average of 27,000 packages to customers in more than 180 countries around the world.

"This is a significant milestone for all Digi-Key employees and our community," said Dave Doherty, president of Digi-Key. "This expansion will help us continue to deliver excellence to our customers for many years to come. As exciting as this expansion is for us, our hope is that our customers truly don't notice a difference – the transition for them should be seamless, and if anything, result in an even better customer service experience than they are already accustomed to," says firm president Dave Doherty.

# PRODUCT SOURCE GUIDE

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# TEARDOWN

## Beyer Dynamic DT280/DT290 Microphone

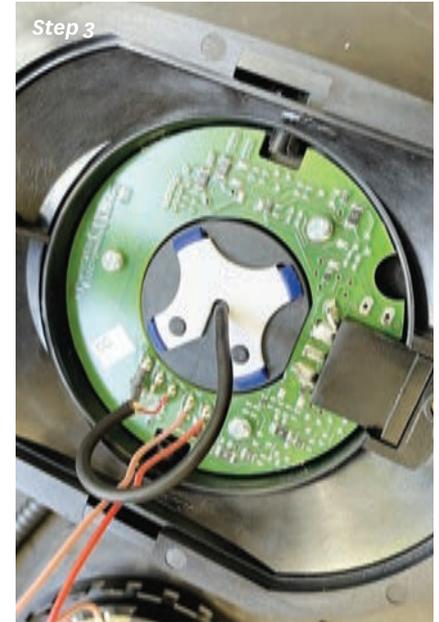
BY IFIXIT



These findings are from iFixit, the open source repair guide. The popular online site teaches people how to fix just about any electronic device and sells the parts and tools to make it possible.

For this teardown, the engineers at iFixit tackle Beyer Dynamic DT280/DT290 Microphone.

This teardown will briefly explain how it can be done, but mostly intended to show what parts are inside the device for reference if doing self-repairs. Let's open our ears to what was discovered in this review.



### ➔ Step 1 Remove the Ear Pad

The ear pad is held to the ear piece by 4 plastic clips. Gently pull the ear pad away from the ear piece to remove.

### ➔ Step 2 Remove the Speaker

Remove the speaker driver by removing the screws above and below.

### ➔ Step 3 - Remove white plastic clip

Remove the white plastic clip with a plastic prying tool. It's likely that it is stuck down with some low tack adhesive.

### ➔ Step 4 - Remove Blue Clip

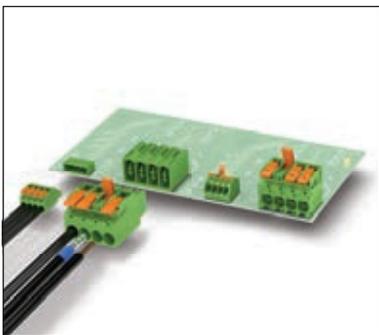
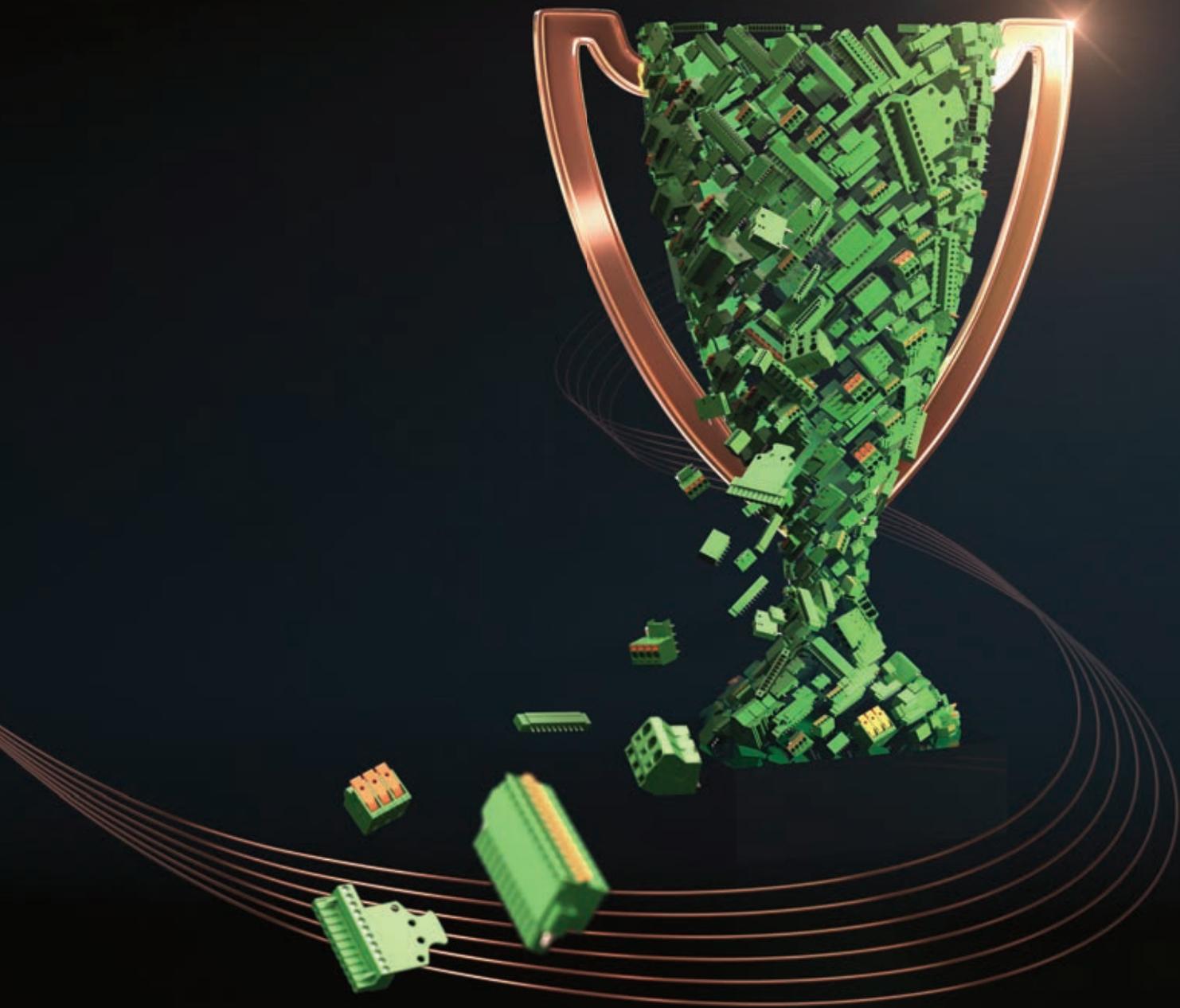
By pushing the blue clips towards the centre with a prying tool or something similar, the microphone boom arm is then released from the body of the ear piece.

### ➔ Step 5 - Remove the boom arm

To remove the boom arm, it must be de-soldered from the pcb.

*These findings are from iFixit, the open source repair guide. The popular site teaches people how to fix just about any electronic device, and sells the parts and tools to make it possible. Anyone can create a repair manual for a device or edit the existing guides to improve them. iFixit empowers individuals to share their technical knowledge and teach the rest of the world how to fix their stuff. <https://canada.ifixit.com>*

Photos: iFixit



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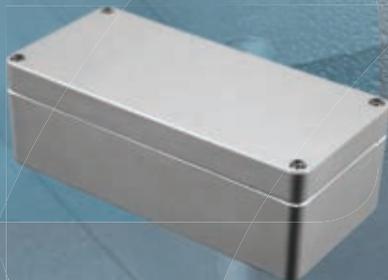
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