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Q4 CEO GUIDE 2023

IoT NOW

HOW TO RUN AN IoT ENABLED BUSINESS

IoT NOW CEO GUIDE TO CES 2024

INTERVIEW

Bosch's Digant Shah explains why DEEPSIGHTS gives organisations the insight they need to create sustainable business value

PLUS: #ShiftHappens - How AIoT is powering net-zero ops • Arm takes minority slice of Raspberry Pi • Infineon unveils sleep quality service • Smart Monitor sweetens blood monitoring with iGlucose Essential • It doesn't matter who let the dogs out anymore thanks to Telenor Tracking Solutions • Why it's hard to love your dishwasher • Sustainability is about taking the maximum from incremental gains • IoT M2M Council chief shares CES Vegas top tips • News, Features and Interviews online at **www.iot-now.com**

IoT M2M COUNCIL

10th ANNIVERSARY

The IoT M2M Council (IMC)

28,000 enterprise users and product makers that deploy IoT technology –
a platform for thought leadership, lead-generation, promotion, and research.

IMC EVENTS COVER...

- Edge-to-Cloud
- Private Networks
- IoT Security/Privacy
- LP-WAN, LEO Satellites
- AI/Machine Learning
- Low-/No-Code Platforms
- Industrial IoT
- Hyperscale Consumer IoT
- IoT Public Policy

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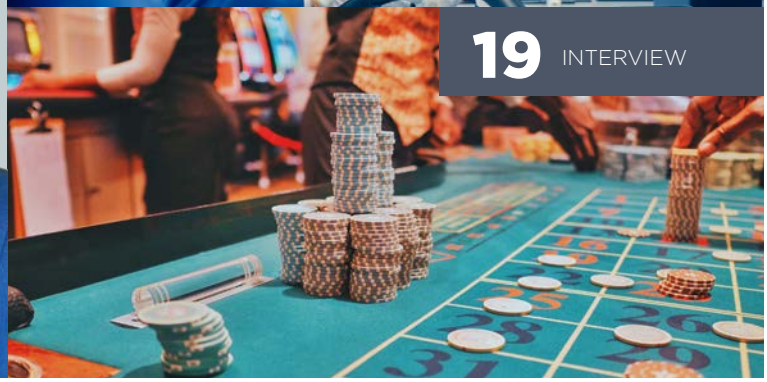


IN THIS ISSUE

I've fallen out of love with my dishwasher

The convergence of consumer electronics and Internet of Things (IoT) has now become so intertwined and unexceptional that it should be no surprise that IoT Now has published a CEO Guide to CES, the consumer electronics show. Projects that seemed to come from the fevered brain of a sci-fi enthusiast now can be bought for a few dollars from your nearest retailer

It doesn't matter what the things are, internet connection has reinvigorated their attractiveness and truly mass-scale use cases are out there from intelligent doorbells to robotic vacuum cleaners and the accurate tracking of pets. We might still be in a world where people are encouraged to own connected products but soon, even this will alter as pay-as-you-go models become the norm for everything from chainsaws to washing machines.

Imagine paying for your washing machine based on the number of washes you run each month, or renting a chainsaw from a local locker point for the number of hours you use it for. This fundamentally changes the business model of product companies, transforming them from product to service companies and moving them from unpredictable one-time sales, to stable recurring revenues. Owners' attitudes to their belongings will shift.

We'll probably still own the stuff we care about but I feel no love for my dishwasher and I'd be quite happy for a company to install it, keep it fed with detergent, service it and, ultimately, replace it – all for a convenient monthly fee. If only I could outsource the loading and unloading as simply. Although, looking at some of the preview material for CES, I'm not entirely sure this won't be a domestic robot assistant's responsibility quite soon.

George Malim, managing editor

It's exciting to see consumer electronics coming together with IoT and I look forward to hearing all the news from CES, which is held on 9-12 January 2024 at the Las Vegas Convention Center, Las Vegas, Nevada, USA.

Enjoy the Guide!

George Malim

MANAGING EDITOR
George Malim
Tel: +44 (0)7930 301 841
g.malim@wkm-global.com

DIGITAL SERVICES DIRECTOR
Nathalie Millar
Tel: +44 (0) 1732 808690
n.millar@wkm-global.com

SALES CONSULTANT
Cherisse Jameson
Tel: +44 (0) 1732 807410
c.jameson@wkm-global.com

DESIGN
Jason Appleby
Ark Design
Tel: +44 (0) 1787 881623

PUBLISHED BY
WeKnow Media Ltd. Suite 138,
80 Churchill Square, Kings Hill,
West Malling, Kent ME19 4YU, UK
Tel: +44 (0) 1732 807410

Arm acquires minority stake in Raspberry Pi for IoT development

Arm Holdings and **Raspberry Pi** have entered into an agreement under which Arm has acquired a minority stake in Raspberry Pi, strengthening the companies' long-standing partnership. Together, the two companies are focused on collaborating to provide solutions for the Internet of Things (IoT) developer community.

With the increasing demand for edge computing driven by IoT and AI applications, Raspberry Pi's guides are empowering individuals and businesses worldwide with affordable and high-performing computing capabilities. This ongoing partnership, established in 2008, has resulted in the release of numerous Arm-based Raspberry Pi products catering to students, enthusiasts and commercial developers.

"Arm and Raspberry Pi share a vision to make computing accessible for all, by lowering barriers to innovation so that anyone, anywhere can learn, experience and create new IoT solutions," said Paul Williamson, the senior vice president and general manager of the Internet of Things business at Arm. "With the rapid growth of edge and endpoint AI applications, platforms like those from Raspberry Pi, built on Arm, are critical to driving the adoption of high-performance IoT devices globally by enabling developers to innovate faster and more easily. This

Eben Upton, Raspberry Pi

strategic investment is further proof of our continued commitment to the developer community and to our partnership with Raspberry Pi."

Eben Upton, the chief executive at Raspberry Pi, added: "Using Arm technology as the foundation of our current and future products offers us access to the compute performance, energy efficiency, and extensive software ecosystem we need, as we continue to remove barriers to entry for everyone, from students and enthusiasts to professional developers deploying commercial IoT systems at scale."

KAIFA and UnaBiz collaborate to bring environmentally friendly IoT solutions to market

KAIFA and **UnaBiz** have announced a partnership aimed at accelerating the global implementation of smart water metering solutions, driven by Sigfox 0G technology. The collaboration also encompasses efforts to introduce **Sigfox** 0G and LoRa dual-mode hybrid solutions to the market, further enhancing the ecosystem of smart metering solutions. UnaBiz and KAIFA's combined global footprint will allow the partners to address the unique needs of diverse markets. The pair will focus on specific regions like Europe, the Middle East, and Central and South America to accelerate and magnify its prevailing success.

"By drawing on UnaBiz's expertise in bespoke IoT solutions and harnessing the potential for energy efficiency enabled by the Sigfox 0G technology, we aim to bring to the market high-quality advanced water metering solutions that are not only accurate and reliable but also cost-competitive, scalable and environmentally friendly to the water metering sector," said Henry Chan, the global sales director of KAIFA.

Loic Barrancourt, the chief commercial officer of UnaBiz Group, added: "We are excited to partner with KAIFA to not only drive efficiency but also promote sustainability, making a positive impact on communities worldwide. KAIFA's quality and UnaBiz's design capabilities are key ingredients to bringing an integrated fit for purpose solution to end customers to enable massive IoT."

News in Brief

AirSuite launches indoor monitor for environmental health

New Zealand company **AirSuite** has launched an indoor monitor designed to detect and record a range of environmental variables that can affect the health and productivity of people in commercial, industrial and domestic settings. Employing a range of sensors, the AirSuite Glance can monitor carbon dioxide (CO2), temperature, humidity, acoustics, lighting, air pressure and volatile organic compounds (VOCs), and then notify users of any potential hazards.

Environmental data is recorded every minute and is depicted on the device's ePaper display using infographics. The data is transmitted to the user's smartphone using the Bluetooth LE connectivity of **Nordic Semiconductor**'s nRF52840 System on Chip (SoC) in near real-time, and to the cloud using the LTE-M or narrowband Internet of Things (NB-IoT) connectivity of the nRF9160 System-in-Package (SiP) at least every fifteen minutes. The AirSuite Glance sensors are designed for use in various settings, including classrooms, offices, warehouses, retail spaces and residential buildings.

"The AirSuite Glance provides one of the highest ranges of measured variables compared to other devices on the market," says Peter Pooran, the chief executive of AirSuite. "These sensors allow AirSuite Glance to indicate invisible factors that contribute to sub-optimal conditions in a user's space and remind users of the unhealthy conditions they may have grown used to. This is important to help users to make informed decisions about how to best maintain their healthy indoor spaces."

News in Brief

Blues expands Notecard offerings for enhanced IoT connectivity

Blues has announced a series of enhanced offerings based on its product, Notecard. The expanded Notecard offerings include Notecard Cell+Wi-Fi, Notecard Wi-Fi, Notecard LoRa and Notecard chips edition options that are claimed to enable additional secure and hybrid connectivity, positioning accuracy and scalable development.

Customer demand for connectivity within a variety of real world environments is driving the need for multiple wireless technologies. While cellular connectivity remains by far the preferred option, the diversity of real-world commercial applications often requires hybrid solutions that also encompass technologies such as Wi-Fi and LoRa. The ability for communications products to readily adapt to multiple radio access technologies such as cellular, Wi-Fi and LoRa is referred to as wireless harmonisation.

"Blues understands that multiple connectivity options are necessary to empower businesses to transform physical products into data-driven intelligent services," said Jim Hassman, Blues' president and chief revenue officer. "With the expansion of our Notecard offerings, companies now have the flexibility to optimise their connection method for sending and receiving information between devices anywhere, at any time. Whether our customers are developing ten devices or vastly scaling operations, or have devices located in fixed, remote or mobile locations, our expanded Notecard offerings are affordable, accessible, and customisable."

Jim Hassman, Blues

Simplify diabetes care with Smart Meter's iGlucose Essential monitors

Smart Meter has introduced its new iGlucose Essential which delivers a US Food and Drug Administration (FDA)-cleared, blood glucose monitor packed with features that make it easier for users to manage their diabetes.

The iGlucose Essential is ergonomically designed for patient comfort, is lightweight and claimed to be simple to use, leading to more frequent and regular testing. In addition, it has a large, easy-to-read display screen combined with one-button operation and automatic shutoff that make this monitor patient-friendly. There is no need to log testing results in a separate journal since the iGlucose Essential is cellular-enabled, so test results are automatically sent to the user's care team. The new glucose monitor also includes on-screen alerts for ketone and hypo conditions, giving users more control in managing their condition.

"When developing the feature criteria for the new iGlucose Essential, we put the patient's needs first," said Casey Pittock, Smart Meter's chief executive. "We know the key to controlling diabetes is for patients to test regularly so both patient and provider understand blood glucose levels. With these many patient-centric features, we feel testing has never been easier."

The iGlucose Essential

Infineon launches privacy-centric sleep quality service for OEMs

Infineon Technologies has announced the launch of a contactless, privacy-centric sleep quality service that can be integrated into original equipment manufacturer (OEM) end devices such as bedside lamps, televisions, smart speakers and air purifiers. Using Infineon's 60GHz Radar, programmable system on a chip (PSoC) and Wi-Fi technologies, the XENSIV Sleep Quality Service is designed to measure and help optimise the user's sleep based on individual needs.

OEMs can now bring their sleep quality enabled end devices to market in up to one-third of the time and focus on functionality that uses their ecosystem to improve users' quality of life. Science shows that lack of healthy sleep can result in significant health risks such as depression and heart disease or accidents caused by drowsy driving. Improving sleep quality and monitoring sleep performance is one of the best ways of enhancing health, decreasing the risk of drowsy driving and boosting learning abilities.

"Our vision of digitalisation is to provide technology on a system level in order to improve people's lives," said Jan-Hendrik Sewing, a senior vice president of radio frequency and sensors at Infineon. "We offer our new XENSIV Sleep Quality Service as a cost-effective solution that helps OEMs rapidly build new products and focus on increasing the quality of their customers' sleep."

Infineon's XENSIV Sleep Quality Service automatically recognises and adapts to a person's natural sleep rhythm to help improve their sleep quality and provide the information necessary for intelligent management of, for example, adaptive lighting, heating, cooling, and air quality.

Tele2 partners with TH1NG to boost smart connectivity solutions

Tele2 has signed a cooperation agreement with **TH1NG** in order to strengthen offerings for smart properties, industries, industries, homes, connected care and sustainability in combination with Tele2's sustainable and cost-effective formula for connectivity. Through this partnership, Tele2 supplements its connected offer with TH1NG's platform and product portfolio.

"More and more companies are getting connected and we have a continuous dialogue with our business customers about how to best find solutions that are smart and that also save time and money," said Sofia Ahlmark Hyvärinen, the sales director for B2B at Tele2. "Therefore, we look forward to our extended collaboration with TH1NG, which further complements our solutions."

Klas Westholm, the chief executive of TH1NG, added: "We can already offer IoT solutions for entire societies today and have taken a position as one of the leading suppliers of IoT platforms in Sweden. It is very exciting that we are now with Tele2 taking another step forward by offering joint solutions which will address new customers and target

Sofia Ahlmark Hyvärinen, Tele2

groups and in the end create customer benefits. We have a very good cooperation already, which we are now developing further."

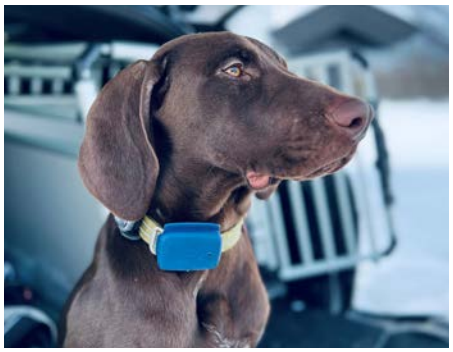
Telenor launches dedicated tracking solutions venture with DyreID

In 2020, **Telenor** launched Mitt Spor, an IoT-based tracking service that provides a comprehensive overview of your pet's location. Now, Telenor is separating the business to focus exclusively on tracking services and is to collaborate in this venture with **DyreID**, owned by the **Norwegian Veterinary Association.**

The new company will be named Telenor Tracking Solutions and will become part of the Telenor Amp portfolio, which currently consists of 16 companies.

"Telenor has a rich history of cultivating successful collaborations and partnerships," said Dan Ouchterlony, the head of Telenor Amp. "Mitt Spor started small, but we see potential for further growth and partnerships. That's why we are now spinning off both the service and the IoT team from Telenor Norway."

In Norway, more than 95% of pet owners use ID tagging, where a chip with a unique ID under the skin is linked to owner information. By integrating DyreID into Mitt Spor, the product will have a



New Telenor collaboration will enhance pet tracking in Norway

database utilised through advanced technology that combines Telenor's mobile network with GPS and motion tracking technology.

Telenor Amp is investing 25 million Norwegian kroner in the new company and will be the majority owner, while DyreID will be a minority owner. The company will be led by Andreas Johnsen, who has extensive experience in Telenor in IoT and business development.

News in Brief

Primax Electronics and Morse Micro to deliver Wi-Fi HaLow smart home doorbell

Primax Electronics has announced it is collaborating with Morse Micro to deliver a smart home doorbell powered by **Morse Micro**'s MM6108 Wi-Fi HaLow SoC (system on chip). The Buzz-HaLow doorbell provides a creative solution for modern home security systems. The Primax Buzz-HaLow doorbell is designed to support a field of view (FOV) of up to 178-degrees, including both vertical and horizontal views.

Equipped with Wi-Fi and Wi-Fi HaLow connectivity, the home security doorbell offers further reach than traditional 2.4 GHz and 5 GHz wireless protocols. The sub-GHz frequency range of Wi-Fi HaLow enables longer range wireless transmission of 1 km and beyond and superior penetration of physical barriers. With Wi-Fi HaLow technology's ultra-low power consumption, the Buzz HaLow doorbell can sustain years of operation on battery power.

"Together with Primax, we're elevating the smart home experience," said Michael De Nil, the co-founder and CEO at Morse Micro. "The Buzz-HaLow doorbell is not just a product, but a testament to our partnership transforming home security and connectivity, seamlessly fusing innovation and design for today's homeowners. Our collaboration builds on the excitement and momentum of Wi-Fi HaLow across the globe as we expand our portfolio and accelerate the use of our technology across a range of applications."

Emerging technologies help organisations extract sustainable business value

As enterprises seek to reduce their environmental impacts, they are looking to optimise resource consumption and apply new technologies to maximise sustainability. Artificial intelligence (AI), advanced data processing and the availability of connected sensors are forming the basis of new tools to deliver the insights enterprises need. Digant Shah, the vice president of Software and Digital Solutions, a Global Business Unit in Bosch, tells IoT Now that organisations are now embracing technology to achieve their sustainability goals and turning to products such as Bosch's DEEPSIGHTS

Globally, SDS boasts a significant footprint, with operational bases in major regions including USA, Canada, Mexico, Europe, United Kingdom, Middle East and Asia Pacific

IoT Now: Can you provide a comprehensive overview of Bosch Software and Digital Solutions and its strategic position within the larger Bosch ecosystem?

Digant Shah: Certainly. **Bosch Software and Digital Solutions (SDS)** is a global business unit within Bosch Group, primarily serving external customers of Bosch on their business transformation for a digitally connected world. SDS specialises in digitalisation and IoT technology services and is recognised as a leading player in this category. The foundation of SDS is built on decades of focus and expertise, primarily aimed at enabling organisations worldwide to make use of emerging technologies in the digital IoT space to unlock sustainable business value in the form of new revenue streams or operational efficiency. What distinguishes SDS is its unwavering commitment to helping its customers to remain resilient in a rapidly changing hyper-connected digital world. This commitment is integral to Bosch's own strategic goal of becoming a high tech, digitally agile and sustainable company. In line with this objective, SDS offers comprehensive solutions in areas of product engineering, Industry 4.0, OT/IT and ET/IT, energy and sustainability.

IoT Now: Specifically, how does SDS operate globally?

DS: Globally, SDS boasts a significant footprint, with operational bases in major regions including USA, Canada, Mexico, Europe, United Kingdom, Middle East and Asia Pacific. This extensive global presence not only amplifies Bosch's reach in digital technologies but also underlines SDS's role in supporting Bosch's broader objectives, such as sustainability and carbon neutrality, especially in Europe, and adapting to the dynamic digital needs in the US market. Through its international operations, SDS plays a crucial role in integrating diverse perspectives and resources, thereby enhancing innovation and reinforcing Bosch's position as a leader in hi-tech, sustainability and digital IoT solutions.

IoT Now: Particularly focusing on its impact and activities in Europe and the United States? How does SDS contribute to Bosch's goals in these regions?

DS: In the US and Europe, its presence is quite substantial. In Europe, SDS draws on Bosch's own dominant position in sustainability and carbon neutrality to help its customers in meeting their own sustainability objectives. In line with the continent's environmental goals, SDS deploys smart and sustainable solutions for customers to unlock green savings in Industry 4.0 and the energy monitoring space as well as building resiliency in the customer's supply chain and operations. In the US, the focus is more on digital innovation, addressing the evolving needs of clients in a connected world. SDS works with customers on new-age AI and IoT tech for digitalisation of product and digitalisation of enterprise to unlock business value in the form of digital revenue streams. ▶

IoT Now: Can you delve deeper into SDS's market-facing portfolio? How would you describe the various offerings it encompasses and the impact they have on businesses?

DS: SDS boasts a diverse market-facing portfolio, which encompasses connected products, connected enterprise, connected factories and industry specific solutions in healthcare, energy and manufacturing. We empower businesses to harness the full potential of digital technologies to enhance efficiency, sustainability and competitiveness. From AI-driven analytics to IoT-enabled process optimisation, our solutions are tailored to meet the unique needs of our clients and drive positive business outcomes.

IoT Now: SDS plays a pivotal role in accelerating digital adoption in today's interconnected world. Could you shed light on how SDS is achieving this, touching on connected products, connected enterprise and connected solutions?

DS: SDS serves as a digital enabler, empowering businesses with cutting-edge solutions. Through connected products, we enhance user experiences, enabling seamless interactions between product and users through AI and IoT technology. Our connected enterprise solutions streamline operations, optimising processes and reducing costs using digitisation technologies. Meanwhile, our industry specific connected solutions tackle complex industry challenges, from predictive maintenance in manufacturing to smart cities' urban planning to improving health outcomes. SDS ensures that businesses remain agile, resilient and sustainable in an increasingly interconnected world.

Digant Shah
Bosch Software
and Digital Solutions

SDS, with its focus on digitalisation and software, offers a range of energy efficient and environmentally friendly technologies

IoT Now: Looking ahead, what does the future growth trajectory of SDS entail?

DS: The future development of SDS is characterised by a firm commitment to innovation, sustainability and global expansion. Our core mission is to develop breakthrough digital solutions that can help our customers in their digitalisation and IoT journeys. Our goal is to maintain our position at the forefront of technological advancement in the AI and IoT space and drive sustainable success for our customers. Having said this - sustainability is a theme that consistently accompanies all our endeavours.

Bosch's approach to long-term growth through sustainability is multifaceted and deeply integrated into its business model. Bosch strongly focuses on energy efficiency, sustainability projects and carbon neutrality. Companies considering energy efficiency improvements and CO2 reduction and recognising Bosch as an innovator and practitioner in these areas, often turn to us for collaboration and advice. This reflects our commitment to sharing our expertise and working with other companies to tackle the pressing challenges of sustainability and environmental responsibility together. Because we embody these values, we can better understand the needs of our customers, making us a natural choice for collaboration in areas related to sustainability and environmental responsibility.

IoT Now: You've now specifically addressed the topic of sustainability. How exactly does Bosch's mission of carbon neutrality look and what is its current status?

DS: Bosch firmly believes that sustainable, ecological and socially responsible action is the foundation for our success in business. This attitude shapes the entire Group and is reflected in our mission. Bosch's mission of carbon neutrality is defined by a comprehensive strategy that encompasses every aspect of its operations. The company is committed to addressing not only its direct emissions, which include all greenhouse gases emitted from sources that are owned or controlled by Bosch, but also its energy-related indirect emissions, which arise from the generation of purchased electricity, steam, heating and cooling consumed by the company.

A key part of this strategy can be seen in action through its key initiatives around e-mobility and electrification; home energy transformation; hydrogen fuel cells and others. Bosch's own production plants exemplify the integration of sustainable practices in manufacturing processes, energy use and overall operational efficiency.

In addition, Bosch's holistic approach extends to its indirect emissions across the entire value chain, known as Scope 3. This includes emissions associated with business travel, procurement, waste and water usage, reflecting Bosch's dedication to reducing its carbon footprint in a broad and all-encompassing manner.

IoT Now: You've mentioned SDS's role in supporting customers' sustainability journeys. What does this look like?

DS: We're deeply committed to aiding our customers in embracing sustainability. This commitment manifests in several ways. Firstly, we engage in direct consultation and knowledge sharing. By using our expertise in sustainable practices, we guide our customers in analysing and reducing their carbon footprints.

SDS, with its focus on digitalisation and software, offers a range of energy efficient and environmentally friendly technologies. These technologies are designed not only to enhance operational efficiency but also to support our customers' sustainability objectives.

For external clients SDS has a solution called DEEPSIGHTS to track and optimise WAGES - water, air, gas, electrical and steam - circuits on factory shop floors to help improve energy savings as well as a solution called Phantom for energy monitoring in retail and commercial buildings. In addition, SDS has provenance platforms for organic farming, pharma supply chain and automotive parts tracing.

IoT Now: What is DEEPSIGHTS?

DS: DEEPSIGHTS is a pivotal component of Bosch's Software and Digital Solutions portfolio and it plays a crucial role in assisting our customers on their path to sustainability. This advanced utility optimisation suite is designed to provide comprehensive insights into a company's carbon footprint, enabling them to understand and analyse their emissions in detail. By implementing DEEPSIGHTS, businesses can pinpoint areas where they can significantly reduce their environmental impact. This is particularly useful in identifying and managing not just direct emissions, but also those in the broader value chain. The beauty of DEEPSIGHTS lies in its ability to tailor sustainability strategies to the unique needs and contexts of different businesses, making it an invaluable asset for companies pursuing environmental stewardship.

IoT Now: Can you explain how DEEPSIGHTS facilitates this process?

DS: Absolutely. This powerful digital solution provides real-time visibility into energy and utilities consumption across the entire value chain. It enables data-driven decision-making, allowing businesses to identify areas where emissions can be reduced. By optimising operations throughout the value chain, companies can reduce their overall carbon footprint, contributing significantly to sustainability efforts. ▶

DEEPSIGHTS consists of a suite of digital tools and analytics, including IoT sensors, industrial data analytics platforms and machine learning algorithms. These tools collect and analyse data related to energy usage, resource consumption and emissions, providing actionable insights for sustainable decision-making in line with asset specific first principles, particularly on energy intensive industrial assets like HVAC, compressors, furnaces, large motors and others.

IoT Now: What specific advantages does a company gain by integrating DEEPSIGHTS into its operations?

DS: The introduction of DEEPSIGHTS offers a multitude of tangible benefits for businesses aiming to bolster their sustainability and operational efficiency. One of the standout advantages is the potential for substantial energy cost savings, with companies experiencing up to a 30% reduction. This is particularly beneficial for sectors where energy consumption is a significant operational cost. Furthermore, DEEPSIGHTS enhances utility productivity by up to 20%, streamlining resource usage and boosting efficiency across the board.

Another key benefit is the extension of asset life. DEEPSIGHTS facilitates condition-based maintenance, which can prolong the useful life of equipment by as much as 30%, delaying the need for capital investments in new machinery. This approach not only saves money but also aligns with sustainable use of resources.

In terms of responsiveness, DEEPSIGHTS dramatically improves utility management reaction times — cutting down from half an hour to just a couple of minutes. This rapid response capability is crucial in reducing plant downtime, which in turn, supports uninterrupted productivity.

DEEPSIGHTS also brings agility to business operations. Its dynamic industrial AI driven control handling capacity allows for quicker and more efficient resolution of operational inefficiencies in focus asset classes, which is essential for maintaining customer satisfaction and adapting to market demands.

Lastly, DEEPSIGHTS is instrumental in accelerating a company's progress towards CO2 neutrality. By providing a detailed framework for analysing and reducing carbon emissions, DEEPSIGHTS aligns with both regulatory expectations and broader environmental objectives. In essence, DEEPSIGHTS is not merely a tool but a comprehensive solution that supports continuous improvement, innovation and a commitment to sustainable business practices.

IoT Now: Could you outline the steps required for an external company to successfully implement DEEPSIGHTS as part of their sustainability efforts?

Implementing DEEPSIGHTS in an external company involves a structured approach. The first step is a thorough assessment of the company's current environmental footprint. This includes a detailed analysis of all emission sources, both direct and indirect. Once this baseline is established, DEEPSIGHTS can then be utilised to identify specific areas where emissions can be reduced.

The next phase involves strategising and planning. Based on the insights provided by DEEPSIGHTS, companies can develop targeted strategies to address their most significant sources of emissions. This could involve changes in energy use, adopting more sustainable manufacturing processes, or rethinking aspects of their supply chain.

The final step is the implementation of these strategies. DEEPSIGHTS supports companies throughout this process, offering continual monitoring and analysis to track progress and make adjustments as needed. This ongoing support is crucial, as it ensures that sustainability efforts are not just effective but also adaptable to changing circumstances and evolving business needs. So far, more than 20,000 tonnes of Scope 2 equivalent CO2 per annum have been reduced by DEEPSIGHTS enabled deployments across seven countries.

Overall, the implementation of DEEPSIGHTS is a comprehensive process that enables companies to take informed, impactful steps towards reducing their environmental impact and achieving their sustainability goals. By bringing optimisation insights out of the dashboard and into live operations, the delay and dependencies that typically stand in between data and business impact are efficiently bridged by DEEPSIGHTS.

www.bosch-softwaretechnologies.com

The introduction of DEEPSIGHTS offers a multitude of tangible benefits for businesses aiming to bolster their sustainability and operational efficiency

#ShiftHappens

– AIoT solutions enable transformation of business operations with higher levels of operational efficiency, resilience, reliability and net-zero operations

Asset reliability and maintenance are significant for operational efficiency and profitability in asset intensive energy and utilities sector. With a substantial amount of capital locked in highly critical assets, they influence several key performance indicators (KPIs) of an organisation including:

Return on capital employed (ROCE): Increased life expectancy of the assets ensures higher return on investment.

Operational efficiency and profitability: Higher operational efficiency necessitates higher fixed costs and thus ensures higher profitability. Optimal replacement and repair cycles of assets ensures lower maintenance costs.

Safe working environment: Fault-free functioning of assets and reduced dependency on human intervention in hazardous working conditions ensures higher worker safety and employee satisfaction.

Net-zero operations: Asset performance management ensures optimal consumption of energy leading to lower carbon emissions.

Enterprises suffer from a disconnect between as-built, as-maintained and as-operated conditions.

A large mid-stream gas processing enterprise based in North America with a disparate and aging asset base embarked on a digital transformation journey to transform its operations and achieve business resilience, operational excellence and higher profitability. With this vision, the company engaged **Bosch Software and Digital Solutions** as an end-to-end transformation partner delivering:

- Digital transformation and advisory consulting to chalk out a strategy and roadmap
- State of the art technology solutions (including Artificial Intelligence IoT (AIoT) platforms)
- A transformation programme including organisation and cultural change management

Bosch partnered to deliver the AIoT solutions to achieve business outcomes as envisioned by the management. The key solutions delivered are briefly described below:

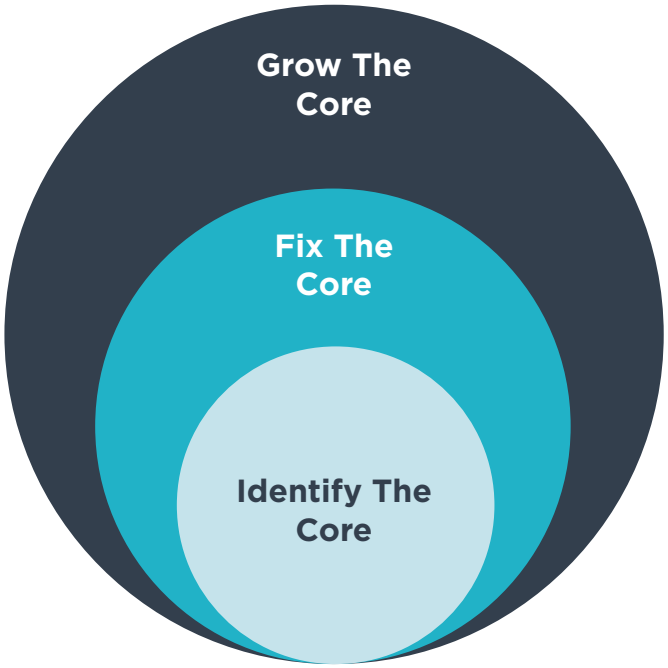
Bosch Digital Twin Solution – Integrated Asset Performance Management

Bosch Digital Twin Solution is a state of art Integrated Asset Performance Management (IAPM) solution that includes several innovative features such as:

- A converged edge system
- Sensor fusion
- Virtual sensors
- Pre-built persona-based insights and dashboards
- Asset models and templates

This enables accelerated implementation of the asset management solution.

SPONSORED CASE STUDY



Identify bottlenecks and remove limitations

STEP 3

- Create Thread 1 - AI, ML, and analytics engine to mine continuous data streams
- Create Thread 2 - Simulation packages for electromechanical and thermal systems
- Create Azure deployable templates for each asset class (will include Azure HCI for future use)
- Create Insights engine for plant operations, support functions and C-Suite to monitor KPIs
- Deploy IAPM in sequence template by template

STEP 2

- Integrate OT data acquisition directly into the enterprise IT system
- Validate latency between acquiring data, analysing it and acting on it
- Prepare workload definition for Edge, cloud & Edge to cloud
- Finalise the requirement for communication infrastructure
- Establish Azure ecosytem - Tenancy creation with enterprise IT

STEP 1

- Identify all relevant telemetry connected with pressure and flow
- Data cleaning and identification of deficient (inconsistent) telemetry
- Classify rotating and static assets based on criticality
- Finalise the fidelity of asset telemetry + Rule set validation
- Finalise assets to deploy IAPM under phase 1, 2 and 3

Sustainable operations

- Energy monitoring and actionable insights
- IoTification of assets - Energy and utilities data
- Greenhouse gas (GHG) emission monitoring
- Energy and utilities cost optimisation through analytical insights

Key benefits and outcomes

Improved availability or OEE **up to 7% - 15%**	First pass quality (FPY) **up by 3% - 8%**
Energy and Utilities cost reduction **by 5% - 20%**	Throughout improvement **by 8% - 12%**
Maintenance cost down **by up to 20%**	Useful lifespan of an asset extension **by up to 30%**

SL#	Business Outcome
1	Reduction in production downtime
2	Increased life expectancy of the asset
3	Optimised replacement and repair cost
4	Increased output with no additional capital infusion
5	Reduced total cost of ownership

#ShiftHappens - Towards net zero operations

Bosch DEEPSIGHTS monitors, manages and optimises energy and utilities consumption using AIoT capabilities and through closed loop delivery capabilities, resulting in overall carbon footprint reduction.

Bosch DEEPSIGHTS was deployed to offer the following capabilities at the mid-stream gas processing enterprise:

Business outcomes delivered

KPI Description	Analysis type	Explanation
Energy consumption - per barrel (BBL) of product fractionated or per inlet volume	KPI	Reduction in amount of energy used to product 1 BBL of end-product per inlet volume
Fuel and electricity consumption	KPI	Reduction in cost of fuel (natural gas or back up power) and electricity consumption to run the plant
GHG emission	KPI	Improved compliance in tracking and reporting. Logic for calculating carbon equivalent.

Industries move beyond headline grabbing to ensure they reap maximum benefits from each incremental gain

Enterprises have moved beyond greenwashing their reputations as they seek to achieve greater sustainability and now are applying technology as a means to hit their targets and achieve compliance with tightening regulation. As added benefits they are also making cost savings and achieving operational efficiencies, writes George Malim

Businesses across the globe now recognise their profitability and their appeal to customers is inextricably linked with minimising the environmental impact of their operations. Customers want to buy from responsible companies, talent wants to work for organisations with good environmental reputations and shareholders want to invest in responsible companies. In many markets, compliance with regulations has driven efforts but increasingly, organisations are acting on their own initiatives to run more efficiently and cleanly. Advances in technology are seen as key enablers of this and the means by which organisations will achieve sustainability cost effectively.

It has now become clear that a package of incremental gains can deliver cost savings and reduced environmental impact alongside headline grabbing strategies such as switching to renewable energy or targeting a zero waste strategy. As such, this cuts across all aspects of operations. The efficient cooling of servers in a data centre can be a significant contributor alongside electrifying vehicle fleets or adopting solar energy in office blocks. Running cleaner and leaner is the target and there is scope for improvement in almost every aspect of business operations.

In industrial organisations in particular there are numerous fertile grounds for achieving significant improvements. Among these, cloud sustainability, carbon footprint measurement and advanced grid management software are three emerging environmental sustainability technologies that will reach early mainstream adoption within one to three years, reports analyst firm **Gartner**. These technologies are in effect horizontal infrastructure that is in use by large numbers of companies.

The firm predicts that in the period 2022-2025, cloud providers will come under increasing pressure to have a transparent climate strategy and clear roadmap and by 2025, the carbon emissions of hyperscale cloud services will be a top three criterion in cloud purchase decisions. With the increasing reliance on data processing and storage both at the edge and in the cloud, the electricity consumption and cooling needs of cloud cannot be overlooked. Organisations are therefore looking to ensure their impact is not increased by the operations of their suppliers and deeper analysis of this is being undertaken to ensure improvements are made. This willingness to look beyond internal operations and into those of suppliers signals a new maturity and appetite to achieve measurable advances.

Allied to this, Gartner also sees carbon footprint measurement gaining greater management attention. The carbon footprint of a given technology product or service encompasses three emission scopes:

- **Scope 1:** Direct emissions from owned or controlled sources
- **Scope 2:** Indirect emissions from the generation of purchased energy
- **Scope 3:** All indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions

Scope 3 emissions are the most challenging to measure - because they are often external to the company and require access to systems and data - but they can account for more than 95% of total emissions at some companies. Gartner expects carbon footprint measurement technologies to see significant adoption as ▶

In industrial organisations in particular there are numerous fertile grounds for achieving significant improvements

The EY survey addressed this concern and uncovered that 74% of respondents believe the environmental impact of new technologies is an important consideration in their organisation's digital transformation plans

organisations broaden their focus to all three emission types and increase reporting transparency. The growth of such tools will be supported by the proliferation of IoT-enabled environmental sensors that increase quantity, quality and timeliness of data collection. The extent to which companies will open their systems to third parties is a significant challenge but increased reporting to industry standards should enable customer organisations to access data from suppliers that they need to fulfil their commitments and demonstrate the efforts they are taking to reduce their environmental impacts.

A third area that Gartner has identified is grid management. Gartner estimates that around 5-20% of organisations have already invested in advanced grid management software today, and that percentage will grow substantially over the next one to three years. By 2026, the firm estimates, more than 60% of the capital programmes of the largest energy companies will focus on low-risk renewables investments.

Exemplifying the growing appetite for environmentally-friendly operations and the technologies and initiatives that help to achieve this, **ABI Research** has analysed the sustainability activities of ten of the world's largest industrial manufacturing conglomerates. A key finding was the importance of Scope 3 activities, particularly the robustness of data collection and reporting tools, for achieving industrial firms' sustainability objectives. According to the **Carbon Disclosure Project** (CDP), Scope 3 emissions typically account for more than 75% of total emissions, with the share often being greater than 90% for companies in the industrial sector.

As regulation regarding the disclosure of environmental data becomes more prevalent, companies should prepare by establishing a robust framework for measuring and managing emissions data. As a starting point, industrials with a high proportion of Scope 3 emissions should look to identify all relevant Scope 3 emission categories. After that, supplier engagement is vital, and industrial firms should seek support from third-party organisations, such as **CDP Supply Chain** and **EcoVadis**, in requesting and managing supplier emissions data, says the firm. Companies may also tie requirements to provide environmental data into supplier contracts and set targets for reducing supply chain emissions.

Scope 3 emissions and how to control them are far from the only area of focus. Growing awareness of sustainability and the threat of a worldwide 1.5°C temperature increase is prompting strategic shifts in government and organisations. Many will have to run even to stand still. Companies are adopting carbon management tools to address the potential 18% GDP loss from climate change by 2050, reports ABI Research. These tools, used to calculate, manage, monitor and report emissions, help measure operational emissions throughout the supply chain. In support of this, the carbon management software market is projected to grow at a CAGR of 19.7%, reaching US$5.5 billion by 2032, the firm says.

Technology to the rescue

Many organisations see the time pressure to achieve results intensifying are now looking to new technologies to address these challenges in a shorter timeframe. This is borne out by a recent survey from **EY**, which uncovered that 76% of respondents believe emerging technologies can play a critical role in reducing their organisation's carbon emissions. However, there's a flipside to this because technologies often have their own environmental impacts. For example, and in addition to the energy consumption of servers, new technologies can rely on components or batteries that contain environmentally sensitive materials or they can also involve manufacturing processes that are environmentally damaging. Technology decisions must therefore be carefully balanced between the expected reward and environmental cost of roll-out.

The EY survey addressed this concern and uncovered that 74% of respondents believe the environmental impact of new technologies is an important consideration in their organisation's digital transformation plans. More than half (54%) of those surveyed stated that emerging technologies can play a vital role in accelerating their business's progress on sustainability.

Respondents see emerging technologies as enabling positive contributions to long-term sustainability. Reduced energy consumption tops the list, followed by improved measurement and planning, and reduced production of waste. The shift to virtual services and workforce tools also features prominently and 55% of businesses currently investing in 5G and IoT say they're helping to improve sustainability planning and forecasting. In addition, 48% cite the productivity benefits of 5G and IoT, against just 22% for emerging technologies more broadly. ▶

When respondents were asked for their perceptions of the sustainability benefits of emerging technologies, there were substantial differences in the responses received from sector-to-sector

Figure 1: Perceived benefits of emerging techologies on sustainable strategies: Industry split

How can the adoption of emerging technologies (e.g., AI, automation, 5G, IoT) benefit your organisation's long-term sustainability strategy?

Reduce energy consumption

Percentage of respondents who believe that emerging technologies can play a vital or largely positive role in sustainability (n-1259)

When respondents were asked for their perceptions of the sustainability benefits of emerging technologies, there were substantial differences in the responses received from sector-to-sector. While reduced energy consumption topped the list across all industries, the proportion citing this benefit, detailed in **Figure 1,** ranges from 54% in automotive to only 38% in healthcare. Similarly, reduced waste production was highlighted by 50% of executives in manufacturing but only 35% in government organisations.

5G and IoT are far from the only technological enablers of sustainability with other technologies including but not limited to artificial intelligence (AI), edge computing, robotics and additive manufacturing all contributing to advances, according to **Transforma Insights**. The firm's analysts have grouped these technologies, plus IoT, under the digital transformation banner and assessed the potential impact of them on areas of environmental concern. The firm has found that transformation technologies such as AI and IoT will save approaching 1.8 PWh of electricity in 2030, and an additional 3.5 PWh of (hydrocarbon) fuel use, resulting in total savings of 5.3 PWh of energy. Offset against this benefit is 653TWh of electricity consumption required to power solutions deployed using new technologies.

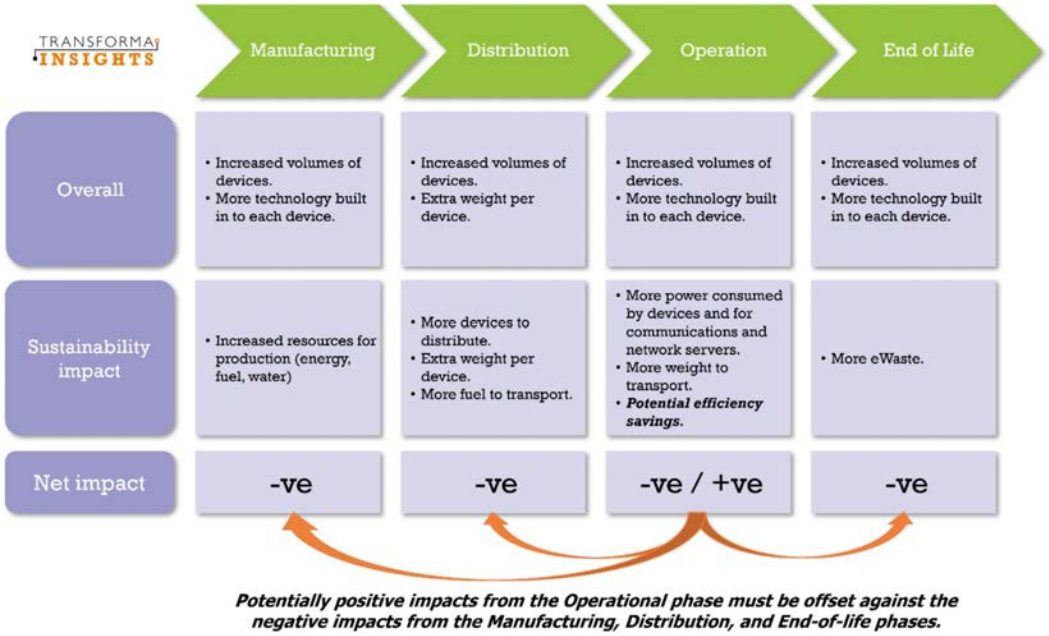
For comparison, the total electricity consumption of the global ICT industry is forecast to increase to around 8 PWh by 2030, meaning that together new technologies will generate energy savings equal to around 58% of the total power consumption of the ICT industry.

The vast bulk of the savings that will be achieved through the deployment of new emerging and digitally transformative technologies that are related to IoT-enabled applications, which together account for more than 95% of both electricity and fuel saved. This is due to the fact that IoT represents the interface of new technological environments to the real world, and it is in the real world where most energy is used and most savings can be made. The automation potential is significant and so is the eradication of traditional burdens such as truck roll when remote or predictive maintenance can keep devices running.

The relationship between new technology and sustainability is complex, with certain products such as IoT-enabled televisions contributing to eWaste and power consumption while other offerings such as road vehicle fleet management and heating, ventilation and air-conditioning (HVAC) systems also have associated benefits in terms of reduced fuel and/or electricity consumption. This ▶

Figure 2: The sustainability impact of technology

Source: Transforma Insights, 2021



It is clear that IoT is increasingly seen as an essential technology for improving sustainability and CEOs are now focusing intently on solutions that address the challenges

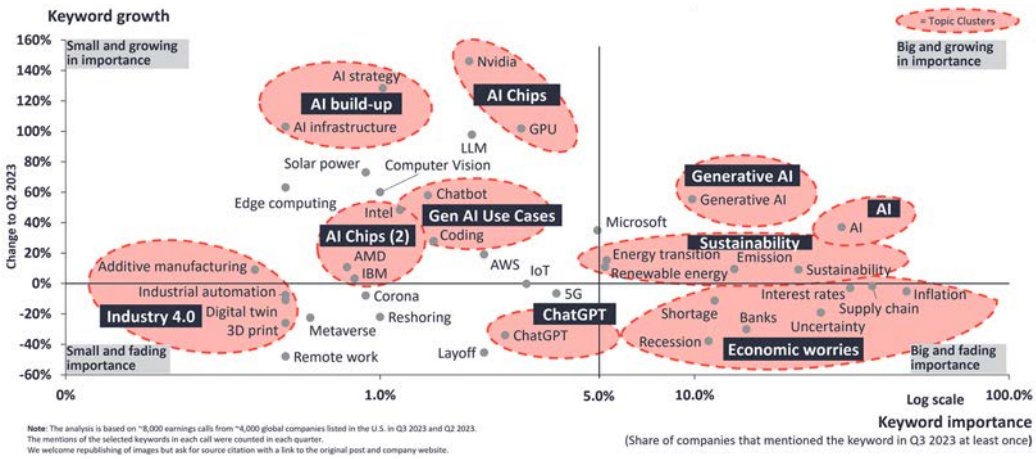
relationship, illustrated in **Figure 2**, is, with few exceptions, consistent across all new technology deployments: Transforma Insights concludes that the net impact of new technologies in manufacturing, distribution and end-of-life phases is generally negative (with some exceptions, such as shared car schemes reducing the total number of cars manufactured), while many solutions generate a net benefit during live operations.

It is clear that IoT is increasingly seen as an essential technology for improving sustainability and CEOs are now focusing intently on solutions that address the challenges. Analyst firm **IoT Analytics** details in **Figure 3** the priorities of CEOs and finds that in Q3 2023, mentions of sustainability, energy transition and renewable energy slightly rebounded in comparison to Q2 to 21.4% (+9.2% QoQ), 5.3% (+15.4% QoQ), and 5.2% (+10.9% QoQ), respectively. These topics are lower than their peaks in Q1 2022; however, since Q3 2022, each topic has remained generally consistent in its percentage of earnings call mentions.

For industrial organisations to meet and even exceed their environmental targets this level of board level attention is necessary and the momentum must be maintained not only on a single project basis or for a short period of time but relentlessly over a long period. Doing so will achieve that amalgamation of incremental gains that builds up to radically reduced waste, power consumption and pollution. Encouragingly IoT and data technologies are at the heart of advances, and they are being adopted in considered ways to ensure maximised benefits.

Figure 3: What CEOs talked about in Q3/2023 (vs. Q2/2023)

Source: Transforma Insights, 2021

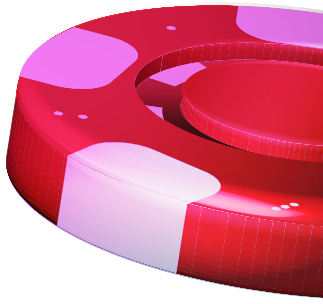


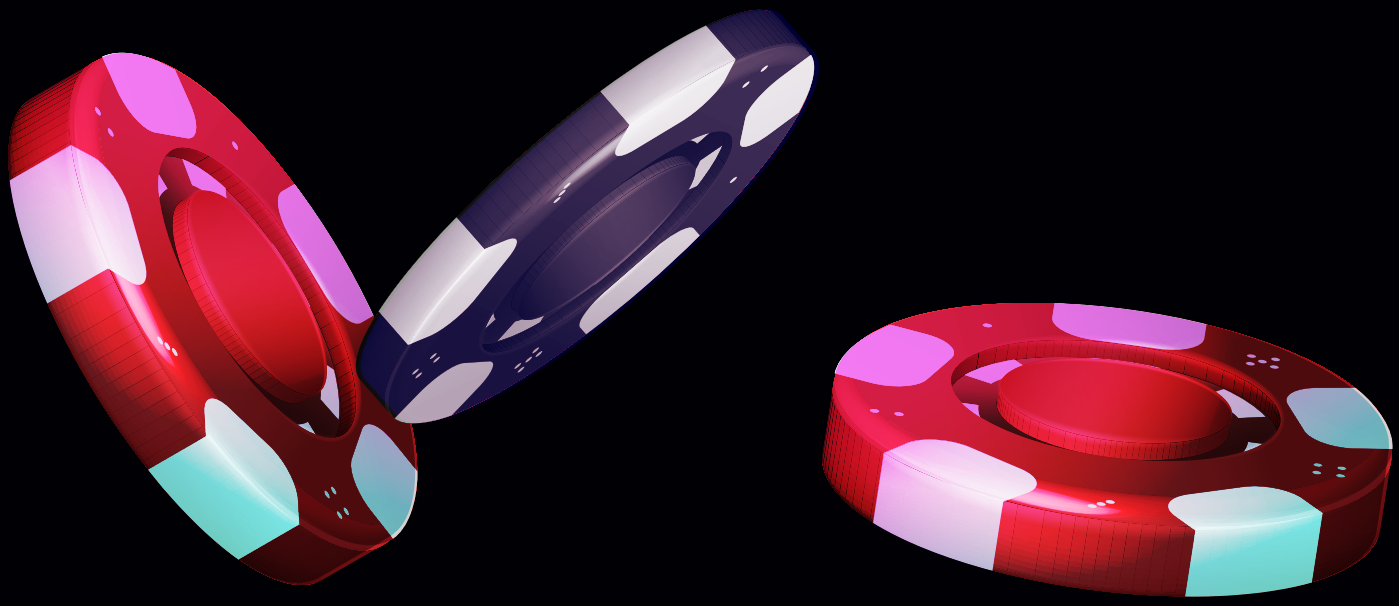
As CES heads for Vegas, don't forget to plan your visit

With the Las Vegas Convention Center once again welcoming CES, Keith Kreisher, the executive director of the IoT M2M Council, tells IoT Now what he expects to see and shares his insider knowledge to ensure visitors maximise their experience at the show

IoT Now: CES provides a great opportunity to take stock of what has happened in the last 12 months. What have been your highlights?

Keith Kreisher: The IoT ecosystem continues to evolve in interesting ways. I'm not sure it's a highlight, but I would say that one of the most significant movements in the last year, maybe 18 months, is what I would call the retreat of the hyperscalers. Let me stress that my opinion here is anecdotal, but we've seen retrenchment away from vertically integrated IoT platforms on the part of **Microsoft**, **AWS**, **Google**, **IBM, Ericsson** and more in the last year or so. While the pandemic may have ▶





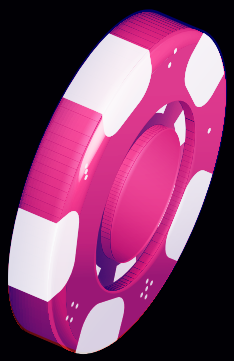
One move that the IMC has made within the last year that we hope will enhance our role as an industry accelerator would be our blossoming partnership with the embedded world exhibition

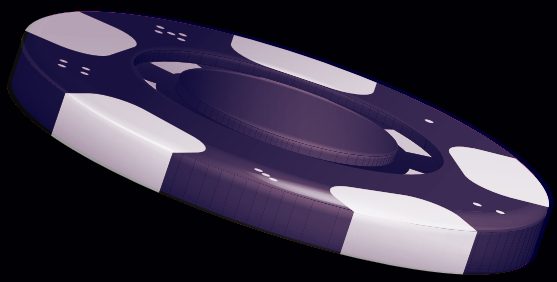
actually accelerated IoT in certain markets, I do believe that it froze some other, more immediate applications for IoT technology.

These big companies just weren't seeing the scale to justify their investments and realised that they lacked the specific expertise required to make IoT deployments work in vertical markets. Just two examples would be **Ericsson** selling many of its IoT assets to **Aeris**, an IMC Sustaining company, and **Twilio** being acquired by **KORE**, another IMC Sustainer. You could say that KORE and Aeris are 'IoT originals' – two of the very largest MVNOs extant, with decades of experience in connected devices. Two years ago, we were afraid that Azure, AWS and Google would dominate the market and that every IoT application would have to fit within their frameworks. I don't hear anybody talking like that now.

IoT Now: What have been the key developments for the IoT M2M Council in 2023? How do these set the industry up for 2024 and beyond?

KK: One move that the IMC has made within the last year that we hope will enhance our role as an industry accelerator would be our blossoming partnership with the embedded world exhibition. The big embedded world exhibition takes place in Nuremburg, Germany in April and, for the first time, the show will also be held in Austin, Texas, USA in October of 2024. The IMC is very highly interested in the synergy between embedded markets and IoT – we've done original, quantitative research to show that embedded engineers are sourcing connectivity in ways that we didn't think probable, even just a couple of years ago. Roughly 40 of 100 engineers that we interviewed in 2022 said that they were sourcing data plans at the same time that they ▶





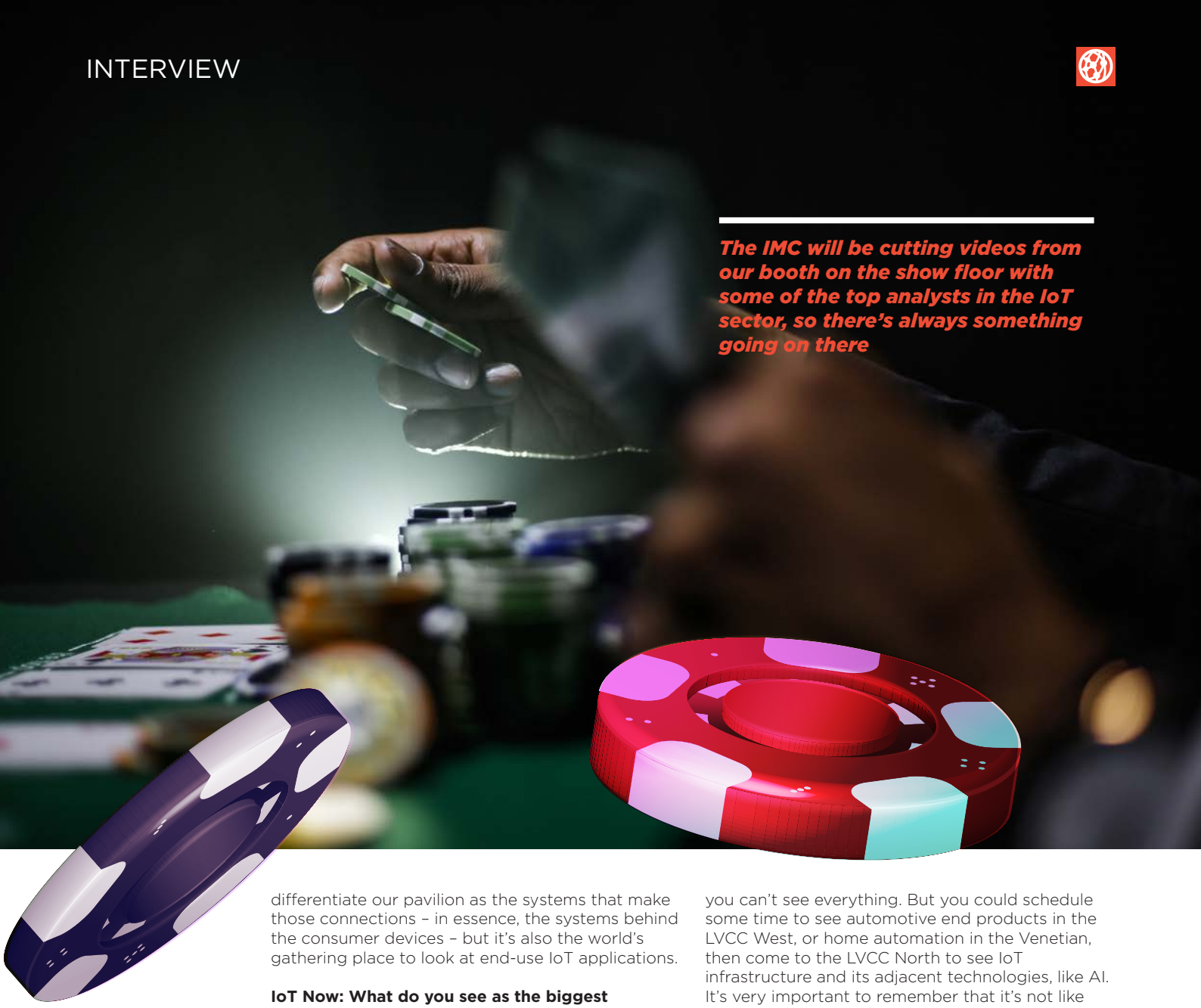
Keith Kreisher
IoT M2M Council

were choosing hardware. This was a revelation. Clearly, anyone providing IoT connectivity needs to be reaching out to embedded engineers.

And it's not a small community. We estimate that roughly two-thirds of the IMC's 27,000 rank-and-file Adopter Members – all qualified IoT buyers – describe themselves as product makers, designers, OEMs or apps developers. At the IMC, we define these personas as people who are embedding connectivity into products that they in turn sell, or that configure connectivity for specific applications. You've got to believe that many of them have an embedded background, and if you project that out onto the entire breadth of IoT-using communities, it's really quite impressive. We definitely see our nascent partnership with embedded world as a new avenue for easing IoT deployments and helping our Sustaining Member companies reach their objectives.

IoT Now: What are your expectations at this year's event? What balance will be struck between future gazing and the real deal of massive IoT deployments?

KK: The future is here at CES. It's already become the largest automotive technology show in the world and attendees will be flocking to the new West Hall at the Las Vegas Convention Center (LVCC) to take a look at that. Right next door in the LVCC North, where – in addition to our own IoT Infrastructure Pavilion – you'll be able to take a look at the latest developments in AI, smart cities and healthcare technology. There is simply no bigger venue for mass, consumer IoT applications. The words consumer and mass are inextricable – virtually everything at the show is connected. We ▶



The IMC will be cutting videos from our booth on the show floor with some of the top analysts in the IoT sector, so there's always something going on there

differentiate our pavilion as the systems that make those connections – in essence, the systems behind the consumer devices – but it's also the world's gathering place to look at end-use IoT applications.

IoT Now: What do you see as the biggest challenges IoT faces and what is the IoTM2M Council's role in helping to address these?

KK: I think you put your finger on it with your reference to mass IoT – how do we get IoT technology deployed at scale in very broad applications? It's not a technical issue and hasn't been for some time. I think the IMC's role is in bridging the gaps between different constituencies of IoT users – we serve enterprise users that deploy the technology in their day-to-day operations for things like supply chain management, as well as product makers and apps developers that I talked about earlier. All of these personas comprise our Adopter Membership of 27,000 and we don't talk to them about technology, per se, but rather about problems that IoT can solve in the language of their particular business. The IMC provides a platform for IoT solutions providers to reach these people.

IoT Now: Do you have any advice or recommendations for people coming to the show?

KK: I would advise them to both see technologies that are connecting devices, but also to see the end products that make use of that technology. It's arguably the largest trade show in the world and you can't see everything. But you could schedule some time to see automotive end products in the LVCC West, or home automation in the Venetian, then come to the LVCC North to see IoT infrastructure and its adjacent technologies, like AI. It's very important to remember that it's not like most trade shows that take place in a self-contained convention centre – CES takes up all of Las Vegas. You need to plan your time and movements accordingly.

IoT Now: Please can you tell us about IoTM2M Council's activities at CES?

KK: Well, there's the IoT Infrastructure Pavilion, of course, at the LVCC. The IMC will be cutting videos from our booth on the show floor with some of the top analysts in the IoT sector, so there's always something going on there. That includes a networking reception to be held at the IMC booth late in the afternoon of Wednesday 10 January 2024 – please stop in to meet some of the most influential players in the global IoT sector. We also assist our partners at the Consumer Technology Association (CTA) with the prestigious conference programme at the show – in 2024, we've organised panel discussions on AI in IoT Security and IoT in Global Disaster Relief. Finally, more than a third of our IMC Sustaining companies will also exhibit at CES, and they'll be organising their own events for the press, customers and channel partners. Hey, it's **IoT Week @ CES** – show visitors won't be able to avoid us.

www.iotm2mcouncil.org

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Roughly 40% of product makers, designers, and OEMs source their device connectivity services at the same time they source their hardware. That projection comes from a 2022 survey of 100 Adopter Members of the IoT M2M Council (IMC) – all qualified IoT buyers.

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For more information, contact alanna.morreale@iotm2mcouncil.org or +1 781.228.9989

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CES puts it all together for 2024 event

When CES sets down on the Strip again on 9-12 January 2024 in Las Vegas, Nevada, USA, over 130,000 attendees will be poised to explore the latest innovations. IoT Now shares its preview of the event

This year's them is 'All together. All on' and the event is set to consolidate the return to in-person events following the pandemic. It's clear that everyone enjoys the warmth of face-to-face participation in large scale events and the opportunity to bring a crowd together is too strong an attraction to miss. The importance of giant events such as CES is underscored by the early announcement of keynote speakers and the fact that the West Hall of venue Las Vegas Convention Center (LVCC) is sold out for exhibitors. The organisers expect that CES 2024 will be the largest in-person, independently audited tech event in the world. Scheduled January 9-12 in Las Vegas, registration for CES 2024 is now open.

Anticipated Numbers for CES 2024
- 130K+ attendees
- 1,000+ startups within Eureka Park
- 3,500+ exhibitors

"CES 2024 is growing," said Gary Shapiro, the president and chief executive of event organiser, **CTA**. "The show is on track to surpass the CES 2023 exhibit space, with global companies debuting innovation that will solve our most pressing global challenges. From healthcare to transportation, smart home solutions, AI advancements and beyond, CES 2024 will shine a light on tech innovation that will change our world for the better."

The top technology categories expected at CES 2024 include AI, sustainability, startups, digital health and transportation and mobility. These will exhibit across Las Vegas, including at the fully-booked LVCC West Hall featuring more than 300 companies. The West Plaza will be filled with self-driving demonstrations and EVTOL exhibits. Global brands exhibiting at CES 2024 include **Amazon**, **BMW**, **Bosch**, **Caterpillar**, **Google**, **Honda**, **Hyundai**, **Intel**, **John Deere**, **LG Electronics**, **L'Oreal**, **Mercedes-Benz**, **Panasonic**, **Qualcomm**, **Samsung**, **Sony**, **Stellantis** and **Vizio**.

Among the keynote presenters will be Cristiano Amon, the president and chief executive of ▶

Qualcomm who will be joined by **FOX Business Network** anchor Liz Claman for the keynote conversation on 10 January 2024. Amon plans to talk about how we will interact with our devices in the AI age.

"We're entering the age of generative AI, and on-device generative AI has the potential to profoundly impact how we interact with our devices," said Amon. "Running AI pervasively and continually on the device will transform our user experience, making it more natural, intuitive, relevant and personal, with increased immediacy, privacy and security. I'm excited to share more about how our devices will be seamlessly integrated into our lives at CES."

Attend because you're worth it

Other keynote sessions include the chief executive for L'Oréal, Nicolas Hieronimus, who will share how the company's ongoing technology transformation ensures that it remains prepared for a future of its business that is at once physical, digital and virtual.

L'Oréal's keynote will showcase the role that sustainable, accessible and inclusive beauty tech plays in driving positive impact at an individual and collective level, from a sustainable showerhead that uses rocket technology to conserve water and AI-powered mobile applications that provide skincare guidance to augmented reality makeup try-ons and new codes and forms of beauty expression in virtual environments. L'Oréal knows that technology, powered by advanced data and AI capabilities, is an essential tool for creating powerful new connections and experiences for its consumers by solving their long-standing beauty challenges and offering them limitless tools for discovery, self-expression and personalisation.

"Beauty is a timeless pursuit and technology adds to its enjoyment while unlocking a world of possibilities," said Hieronimus. "The first wave of beauty tech changed how people discover, evaluate and buy beauty products. More recently, we've seen how it can better serve the underserved, by democratising skin health and increasing access to self-expression through innovations like HAPTA for people with limited arm mobility. This is just the beginning. L'Oréal envisions a future where no one feels left out by beauty trends, because they will have the power to create their own trends – whenever, wherever – with products and tools inspired by their own stories, experiences and identity."

Walmart chief executive, Doug Mc Millon, will also present an opening day keynote. The retail giant has led retail innovation for decades from popularising use of the now ubiquitous UPC product barcode to building one of the first private satellite communication systems at scale. McMillon will bring Walmart's people-led, tech-powered vision to life, highlighting how Walmart improves lives, communities and the planet. He also will offer a view of what's next for Walmart as the company uses technology, combined with deep retail and human insights, to exceed customer expectations as they move across platforms and places to discover goods and get inspired.

"Great tech disappears behind great experiences," said Dan Bartlett, the executive vice president of Corporate Affairs at Walmart. "As the world becomes more digital, we are thinking ahead on how we design and build technology that will usher in the next generation of retail. Doug's keynote, plus compelling experiences on the CES show floor, will show how we're using technology to make our customers' lives easier, enable our associates to build satisfying careers and make our business even stronger."

Nasdaq chair and chief executive Adena Friedman will deliver a keynote address discussing how the private sector - and the financial industry specifically - is using technology to solve major societal issues including the global fight against financial crime and human trafficking.

Other confirmed keynotes include sessions from **HD Hyundai**, the world's largest shipbuilder, **Elevance Health** and **Siemens**, as well as the chief executives of **Best Buy** and **Fortune** who will headline the CES 2024 Leaders in Technology dinner.

Beyond the keynotes and the packed exhibition floors, CES will host the CES 2024 Innovation Awards, which will recognise 36 products as the year's 'Best of Innovation'.

To learn more, register and plan your trip, visit: **www.ces.tech**

"Beauty is a timeless pursuit and technology adds to its enjoyment while unlocking a world of possibilities"

Our pick of IoT industry's upcoming events

Enlit Europe 2023
28-30 November 2023
Paris, France
https://www.iot-now.com/event/enlite-europe-2023/

London EV Show
28-30 November 2023
London, UK
https://www.iot-now.com/event/london-ev-show/

Smart Cities Connect
28-30 November 2023
Washington DC, USA
https://www.iot-now.com/event/smart-cities-connect/

IoT Talks 2023
29 November 2023
digital event
https://www.iot-now.com/event/iot-talks-2023-through-the-iot-looking-glass/

Cyber Security & Cloud Global
30 November – 1 December 2023
London, UK
https://www.iot-now.com/event/cyber-security-cloud-global/

AI & Big Data Expo
30 November – 1 December 2023
London, UK
https://www.iot-now.com/event/ai-big-data-expo/

Global OPEX and Business Transformation Summit
30 November – 1 December 2023
Berlin, Germany
https://www.iot-now.com/event/global-opex-and-business-transformation-summit/

Global Digital Transformation & Customer Experience Summit
30 November – 1 December 2023
Berlin, Germany
https://www.iot-now.com/event/the-global-digital-transformation-customer-experience-summit/

GIANT Health Event
4-5 December 2023
London, UK
https://www.iot-now.com/event/giant-health-event/

Chief Data & Analytics Officer, APEX West
5-6 December 2023
Scottsdale, Arizona, USA
https://www.iot-now.com/event/chief-data-analytics-officer-apex-west/

Consumer IoT Summit – CES 2024 Online Preview
6-7 December 2023
digital event
https://www.iot-now.com/event/consumer-iot-summit-ces-2024-online-preview/

Geo Week 2024
11-13 February 2024
Denver, Colorado, USA
https://www.iot-now.com/event/geo-week-2024/

London PropTech Show
27-28 February 2024
London, UK
https://www.iot-now.com/event/london-proptech-show/

Bosch Connected World 2024
28-29 February 2024
Berlin, Germany or online
https://www.iot-now.com/event/bosch-connected-world-2024/

Improving the success rate of IoT projects is crucial to business operations.

beecham research

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