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The Edge Outlook

The Now, the New and
the Next of edge computing

Introduction

Companies today are facing a mammoth task. The world in which they operate in is changing – at a rate exacerbated by a disruptive pandemic, the climate crisis, and rising social and political tensions – and they are being asked to step up to help society meet these new challenges. At the same time, our reliance on technology has increased and data is growing exponentially, which in turn has accelerated digital transformation and driven pervasive demand for computing power.

We are entering a revolutionary era of distributed intelligence, and there is a key technology inflection that will allow businesses to keep up with this unprecedented pace of change. Edge computing. Putting compute closer to data sources at the edge – i.e., all the data endpoints that exist outside the data centre, from smartphones and PCs to IoT devices and sensors – is the only way to manage the volume of data now being generated. Edge computing will also play a pivotal role in enabling businesses to realize the advantages of emerging technology, like 5G and AI. Put simply, the edge is where businesses can turn ambitious ideas into reality.

Edge computing is already transforming entire companies, from the way they operate to the products and services they deliver. CIOs cannot afford to ignore the edge any longer.

This report will provide predictions on the now, new, and next of edge computing to help businesses achieve real business outcomes, such as driving operational efficiencies to creating new products and opening new revenue streams. It also includes real use cases from Intel customers, offering insight into how companies across key industries have successfully leveraged this technology, and practical advice from Digital Pioneer and AI Scientist, Inma Martinez. At Intel we believe now is the time to quickly accelerate the move to edge computing to deliver the best business outcomes.

1) Now: CIOs are realizing that the edge is the key to unleashing innovative opportunities

First, we had the PC era. Then came the “post-PC” era, defined by the portability and connectivity of mobile devices and the Cloud. Now, we have officially entered a new era of computing: distributed intelligence. IDC predicts that by 2025, every connected person in the world will have at least one digital data interaction every 18 seconds—likely from one of the billions of IoT devices, which are expected to generate over 90 ZB of data in 2025.

This era brings with it a number of fast-growing opportunities, such as automation and hyper-personalisation. But capitalizing on these opportunities requires that data be tapped for value – a task that is becoming increasingly harder as the amount of data explodes, particularly with COVID-19 accelerating the growth of remote environments and connected.

During the first lockdown, broadband data usage increased by 47%, Zoom’s measurement of “annualized meeting minutes” jumped 20-fold, from 100 billion at the end of January to over two trillion in April, while Microsoft Teams set a record of 2.7 billion total meeting minutes in a single day. Sending all this data back to the cloud for processing would be impractical, not only because of the latency, but because of the sheer volume of data involved.

Enter the edge.

Enter the edge. According to IDC, spending on edge computing will hit \$250 billion by 2024, led by a future of ‘extraordinary value and opportunity.’

CIOs know that data strategy must be a top priority, with recent research from HPE Aruba demonstrating that they are recognizing that analyzing real-time data nearer to the Edge yields greater efficiencies and insights, which enhances business outcomes. According to the global study, 72% of IT leaders are already using Edge technologies to deliver new outcomes.

While barriers to adoption remain – a recent IDG poll found that identifying clear use cases, security, lack of internal skills and cost concerns are among the top considerations – this suggests that CIOs are beginning to understand the value of the edge. They recognise that the edge means working towards a future where data is no longer stored where it has no value. Instead, companies who adopt edge technologies can move, process and extract value from this data in real time – the key to innovation.

This creates a new urgency for companies. With numerous examples of edge deployments already generating real business value across multiple industries, companies wanting to stay competitive must act now.

76%

stated that identifying “the ideal location” for data analysis was **challenging forward progress**

2) New: Companies will bring the edge to life, fuelling innovation and optimisation across every industry

Edge computing is already bringing digital services to the next frontier working in synergy with critical technologies like AI and 5G.

Among Intel customers alone, there is over 24,000 edge deployments generating real business value and helping companies grow and innovate in the distributed intelligence era. In this next section, we have used these customer stories to show how the edge is transforming four key industries: retail, industrial, healthcare and telecommunications.

1. Retail: Transforming shopping and inventory management.

The retail sector understands the increased demand for technology to help ease current challenges, with retailers forced to accelerate their digital transformation in response to COVID-19. The edge, with its capacity to deliver competitive advantages like increased efficiency and enhanced customer experiences, will be fundamental to helping retailers thrive in the future of retail – a future shaped by unprecedented levels of engagement, personalisation, and convenience.

The opportunities for retail companies at the edge fall primarily into two categories.

First, insights generated by the edge are correcting massive amounts of inventory distortion while making supply chains and product development incredibly efficient. Thanks to the edge, retailers are using machine vision to address this challenge by enabling predictive inventory and supply chain control – ensuring that critical materials are in the hands of those who need them most.

Secondly, the edge is providing real-time consumer behaviour analysis, empowering retailers to deliver increased convenience and more engaging, personalised experiences.

Today's digital signs and interactive kiosks are connected, intelligent, and responsive, with smart sensors and cameras making it possible for kiosks to recognize products, respond to touchless gestures, and even address loss prevention. Vision capabilities for AI-powered analytics also let retailers know when a message is truly effective.

For instance, Intel customer Wonderstore, an Italian luxury computer vision boutique, uses visual sensors and real-time analysis powered by edge technologies to customise store experiences based on customers' fashion choices, sentiment, and dwell time. Not only has Wonderstore's shop window conversion rate improved by nearly 17%, they have also been able to optimise personnel management and create seamless omnichannel experiences that extend the customer journey beyond the physical store.

Another use case is autonomous stores, which allow contactless convenience and safety. Data flowing from supermarket shelves, conveying important information on inventory, traffic flow, purchase frequency and linger time, can be combined with sensors, computer vision, and robotics to deliver automated checkouts and "just walk out" purchase experiences at point of sale.



Finally, Edge-powered video analytics and AI that can identify potential criminal behaviour in real-time mean that criminal activity like shoplifting and label switching, whether an autonomous store or otherwise, saving stores money and enabling a safer shopping environment.

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2. Industrial:

Driving transformative results for Industry 4.0

Edge technologies are driving the fourth industrial revolution, which brings digital and physical technologies together – AI and IoT, additive manufacturing robotics, and cloud computing – to create more flexible, responsive, and interconnected enterprises that make better decisions, fast.

Its great potential to transform industrial processes is largely due to the amounts of raw data generated by machines. One such use case is condition-based monitoring and predictive maintenance. Hyperconverged edge data centres perform analytics and filter data locally for faster asset condition assessment, opening up the possibility of maintenance contracts based on actual machine health.

Edge computing is also working to remove human error and limitations from manufacturing. With the help of machine learning, edge computing collects, aggregates, and filters data from multiple machines, processes, and systems to adapt the manufacturing process in real-time and deliver precision monitoring and control.

Additionally, AI-based robotic process automation (RPA) systems are being used to perform repetitive and potentially hazardous tasks with greater speed and accuracy than humans, and machine vision is being used to validate features and check for defects, helping to deliver the highest-quality product possible.

These edge deployments helped Intel customer Audi boost weld inspections by 100 times with 18ms latency and reduce labour costs by 30 to 50 percent at their Neckarsulm plant in Germany, one of the company's two principal assembly plants.

Increasing automation and efficiency is not about replacing workers. These innovations reduce risk, create new opportunities and enable new knowledge and skills. Edge computing is even enhancing employee experience by powering wearable and handheld augmented reality (AR) devices that speed on-the-job safety training, provide hands free complex assembly instructions, and display equipment stats like temperature and vibration to assist maintenance.

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Healthcare has undergone a **digital transformation**, with COVID-19 highlighting the imperative for new digital solutions

3. Healthcare: Revolutionising patient outcomes

The edge's full potential as world-changing technology that enriches the lives of every person on Earth will be clearly demonstrated in the healthcare sector.

Like retail, healthcare has undergone a digital transformation, with COVID-19 highlighting the imperative for new digital solutions. Not only did the pandemic expose the lack of efficiency, accuracy, and speed, it also challenged healthcare providers to find a new way to see and treat their patients. Telemedicine helped solve this problem by keeping patients connected to their providers – and now that it has proven its value, it is here to stay.

Pushing compute to the edge allows the healthcare industry to unlock even more benefits of telemedicine. In addition to enabling safer, remote environments for patients and providers, telemedicine offers greater, more reliable access for rural and underserved communities and patients with limited mobility.

It also delivers a higher quality of care and clinical efficiencies by enabling frequent patient monitoring and data collection, integration with electronic health records, and AI-powered patient data analysis. There are already multiple examples of machine and deep learning inference being used in image-based diagnostics to speed the detection of health issues and save lives, such as Philips, who managed to speed CT scan imaging by 188 times without adding accelerators.

Another use case is robotics – edge computing is enabling robots to function more autonomously supporting health workers, enhancing patient care and providing operational efficiencies and risk reduction.

One autonomous robot prototype, developed by the Irish start-up Akara, uses motion sensors and UV light to disinfect contaminated surfaces, aiding in the fight against COVID-19 by creating safer environments for employees and reducing long downtimes caused by the traditional disinfection process.

These healthcare use cases prove that the edge is about more than just business outcomes – it is also about empowering companies to create real-world impact. Edge computing is already helping to deliver more accessible healthcare and better patient outcomes, but as AI and robotics technology become more sophisticated and the use of wearables and other connected medical devices grow, the ability to utilise data in real-time will prove life-changing.



4. Telecommunications: Driving network and operational efficiency

As the telecommunications industry prepares for 5G, it is important to consider the fundamental role that the edge will also play in helping them deliver services. The volume and complexity of 5G services will surge at the edge, and pushing computing closer to data is the only way to achieve the ultra-low latency that 5G use cases require. The commercialization of 5G, the rise of AI and the growth of the edge creates a multiplier effect that makes each more impactful than it would be on its own. Machine learning can help telecom operators increase network and operational efficiency to meet rising service level expectations while simultaneously reducing costs. With AI and analytics-based engines, operators gain the ability to intelligently manage 5G networks to achieve key network KPIs, network automation, energy savings and operational flexibility in order to serve a wide variety of 5G and Edge use cases.

We recently helped Japan's Rakuten Mobile develop the world's first container-based, fully cloud-native network, which dramatically reduced their reliance on dedicated hardware and legacy infrastructure. They are also using edge data centres to provide rapid response times for applications and rich media content – enabling their mobile network to support immersive, multi-sensory experiences for customers.

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3) Next: Companies who employ siloed approaches and do not embrace collaboration will fail to extract value from the edge

In truth, 5G and edge technologies are inextricably linked. The rise of 5G is critical to the future of the edge – it is the promise of a world of new 5G-enabled use cases that makes investing in the next-generation network a smart financial decision.

Its ultra-reliable low-latency capabilities make the shorter connection between the device and the edge even more efficient, allowing enterprises to capitalise on massive amounts of data.


But this future is impossible without collaboration. Leading AI expert Inma Martinez urges CIOs to remember that “Deploying on the edge, and extracting its benefits are only possible when you have solid alliances and partnerships with every member of your ecosystem.”

The edge is also the key to maximising the benefits of what Martinez calls “a magical world of connected devices.” It is this connectivity that Martinez considers most exciting, not just for enterprises, but for society as a whole.

“Data has always been a cornerstone of civilisation, even going back to the Bronze Age,” she says. “The edge makes possible a world where all of a sudden, every single object has the potentiality for information – information that can be extracted and used in real-time.”

Consider the incredible opportunities that this will open up for sectors such as healthcare. Integrated wearables will be able to track patient vitals throughout the day and transmit data for easy, ongoing evaluation and to inform treatment. This level of monitoring can help patients with chronic conditions, such as cardiovascular disease, diabetes, and asthma, better manage their own health and may even help prevent urgent care and emergency department visits. It will also make possible fully automated image-based diagnosis with zero human error.

With this unprecedented amount of information, the edge can – and will – change the way we communicate, move, work, shop. The edge will ultimately change the way we work and live. In all industries, enterprises will be able to better predict events, track performance, gain better understanding of customers and build innovative products and services.



The edge makes possible a world where all of a sudden, **every single object has the potentiality for information** – information that can be extracted and used in real-time.

With the edge set to transform every area of life and business, CIOs must embrace collaboration and leverage ecosystems that allow them to capitalize on all its opportunities. Siloed approaches will fail. Fragmented strategies will hinder their ability to extract value from the edge and leave them lagging behind as their industry – and society – evolves around them.

To learn more about best practices at the Edge, **visit here.**



About Inma Martinez (report contributor)

Inma Martinez is an industry recognised technologist for having pioneered A.I. personalisation and creating other disruptive digital technologies since the 1990s. In 2021 she was appointed an expert member to the Global Partnership on AI (GPAI), a multi-nations initiative empowered by the OECD and G7 which aims to bridge the gap between theory and practice on AI by supporting cutting-edge research and applied activities on AI-related priorities. Fortune and TIME have defined Inma as one of the best talents in human digital behaviour and FastCompany has labelled her a “firestarter” for her cutting edge work in innovation ranging from wearable technologies to connected cars and smart cities to video and music streaming.