Living life on the edge

Exploring the potential of a
managed edge computing solution

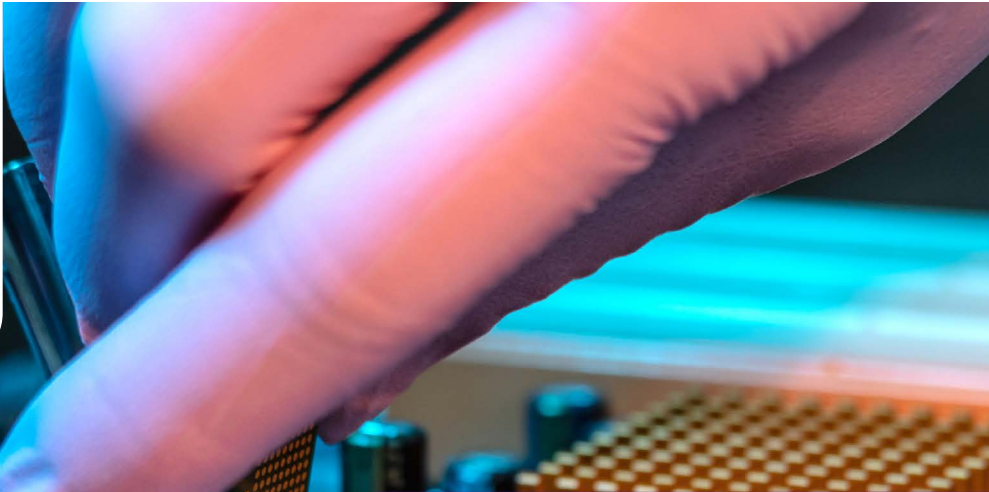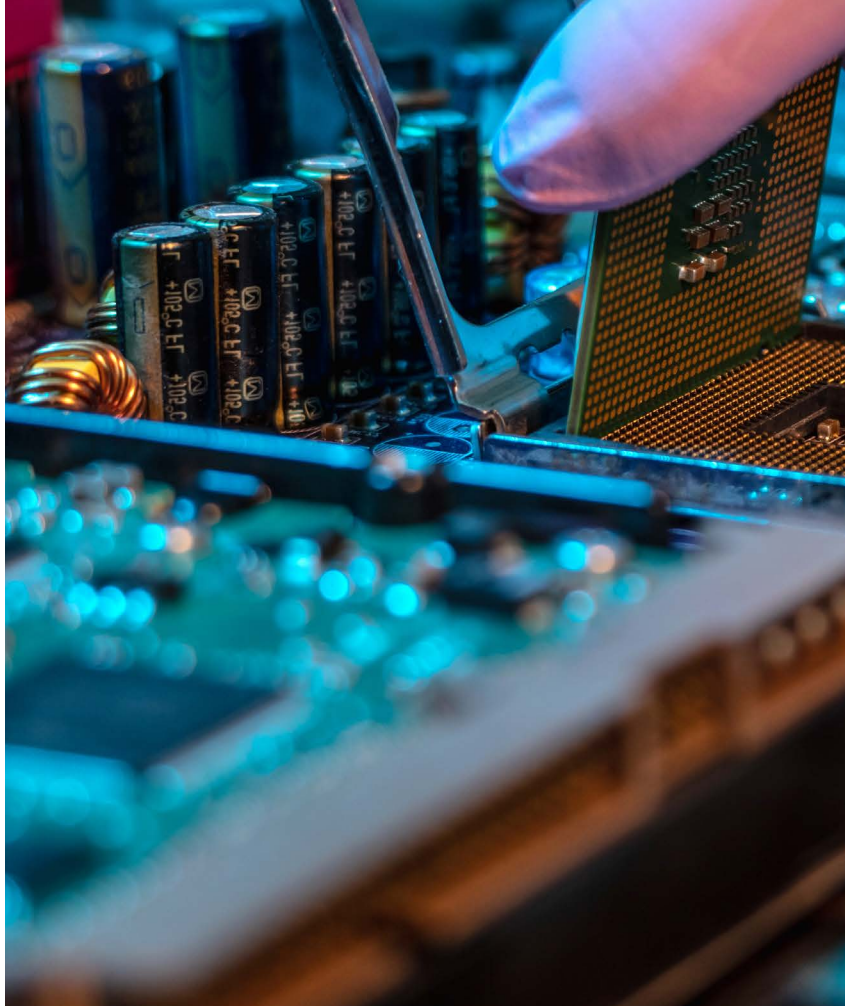**DELL**Technologies

PLATINUM PARTNER

Executive summary

Edge computing helps solve the challenges of real-time data analysis by moving data, computing and workloads closer to where they're needed. It also helps reduce the amount of data that has to travel to central clouds and data centres for processing, reducing latency as well as data and operational costs.

This ultra-low latency is particularly critical to the rapid analysis and decision-making that Internet of Things (IoT) technologies need. Keeping computing ability close to its origin can also deliver practical solutions to remote commercial locations lacking cloud connectivity, or where access to connectivity via satellite is limited and bandwidth is prohibitively expensive.

Edge computing is increasingly being used as an innovative way to improve sustainability, supporting both local data collection and the Artificial Intelligence (AI) powered algorithms that optimise energy use and reduce carbon emissions across a whole range of industries.

In a world of multi-cloud, edge computing is a key enabler for customers, extending the power of the cloud locally when latency, survivability, data sovereignty and security are critical.

This ebook covers:

This icon represents a hyperlink throughout the ebook ⚭

Data is at the heart of digitalisation

Every new capability, innovative app, or operational advance is driven by data so, not only are we generating more of it, but business success is increasingly dependent on it too. The volumes involved are astonishing; at the end of 2020 it was estimated that the entire digital universe was made up of 44 trillion gigabytes. Just imagine where we are today.

There's more data, and an increasing need to analyse it faster to support the real-time decision-making and the outstanding experiences consumers expect. At the same time, there's pressure from within large organisations for every team, no matter what their location, to have the same digital capabilities as those closer to the enterprise's core data centres and clouds. Should it matter if they're on an oil rig or based at a remote, rural site?

This assumption that digital transformation brings equal access to data and computing power for everyone is breaking down traditional operational silos. Across industries, IT and Operational Technology (OT) need to converge, and within all digital industries data must flow freely and securely. What's more, as organisations adopt private 5G technologies and IoT devices, ultra-low latency and resilient connectivity to computing power also become essential.

But this growing imperative to share and analyse large volumes of data in real-time isn't happening in isolation. It's taking place in an environment of tightening regulation and increasing emphasis on sustainability. Organisations must carefully observe data privacy regulations that define where data can be stored. And they must evolve their businesses to embrace sustainability, to meet the bold net zero targets consumers expect. Every new development needs to be screened for its potential to help reduce carbon emissions and, if it can't make a contribution to sustainability targets, it's time to think seriously about whether it's a valid investment.

Is your organisation ready for this data explosion?

More data means more data to transfer around, and many organisations going digital are finding this expensive. As data traffic grows, the costs of the bandwidth to support it are spiralling upwards, with no sign of stopping.

Many others are experiencing data overload, with their data centre links getting overwhelmed with traffic, again, with no end in sight. There's a real risk that they won't be able to support the real-time data analysis their organisation needs to thrive.

The answer is to get clever with how you handle data and to look hard at how technology can help.

- Why does all data processing have to happen at the core?

- Why are your systems dependent on costly data traffic routes?

Edge Compute from BT is a proven, effective solution that answers these questions by pushing processing power closer to the 'edge', where the decisions are being made.

Take a look.
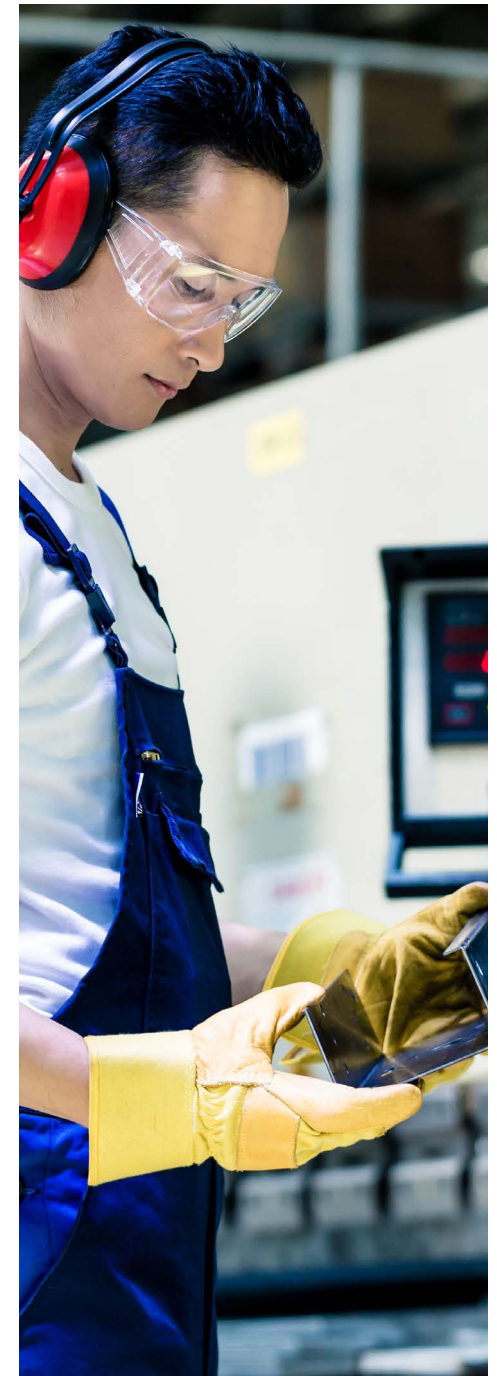
Edge computing explained

Edge computing solves the challenges of real-time data analysis by moving data, computing and workloads to where they're needed. It's the key to turning data into better insights, actions and results, and to doing it faster.

What was once difficult, becomes easier. Edge computing is an effective way to get computing power into places it's traditionally been hard to service, either because it's too expensive or too remote. It's also a route to creating a clearer view of the organisation. Organisations want to know more about their sites, so are adding in sensors. Edge computing connects these sensors to the wider network so they can link out to the data centre or cloud.

It's a technology that's set to boom. Dell Technologies estimates that more than $700 billion in capex will be spent within the decade on edge infrastructure. Whereas 10% of data is processed outside the data centre today, 75% of data will be processed outside a traditional data centre or cloud by 2025. ⊙

75%

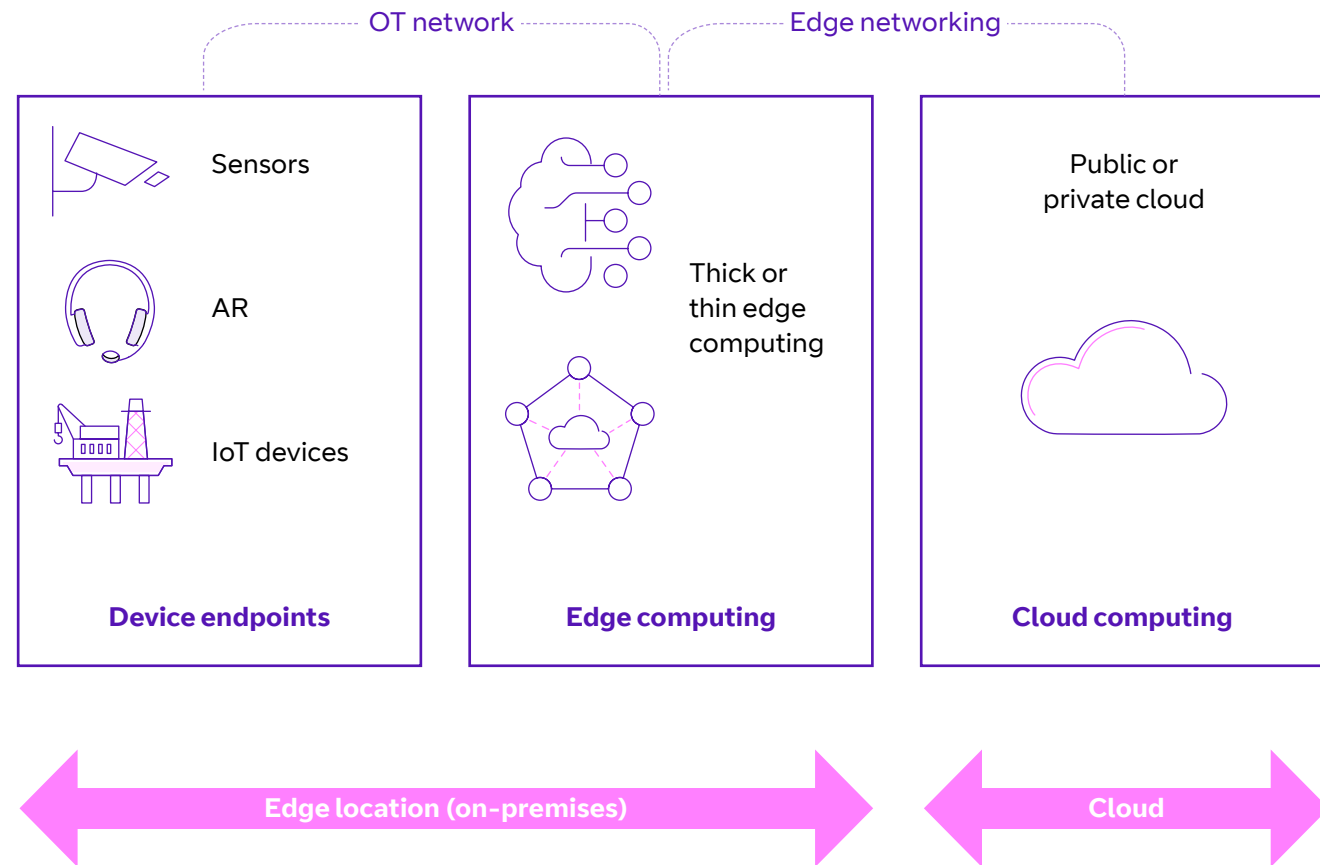of data will be processed at the edge by 2025. ⊙
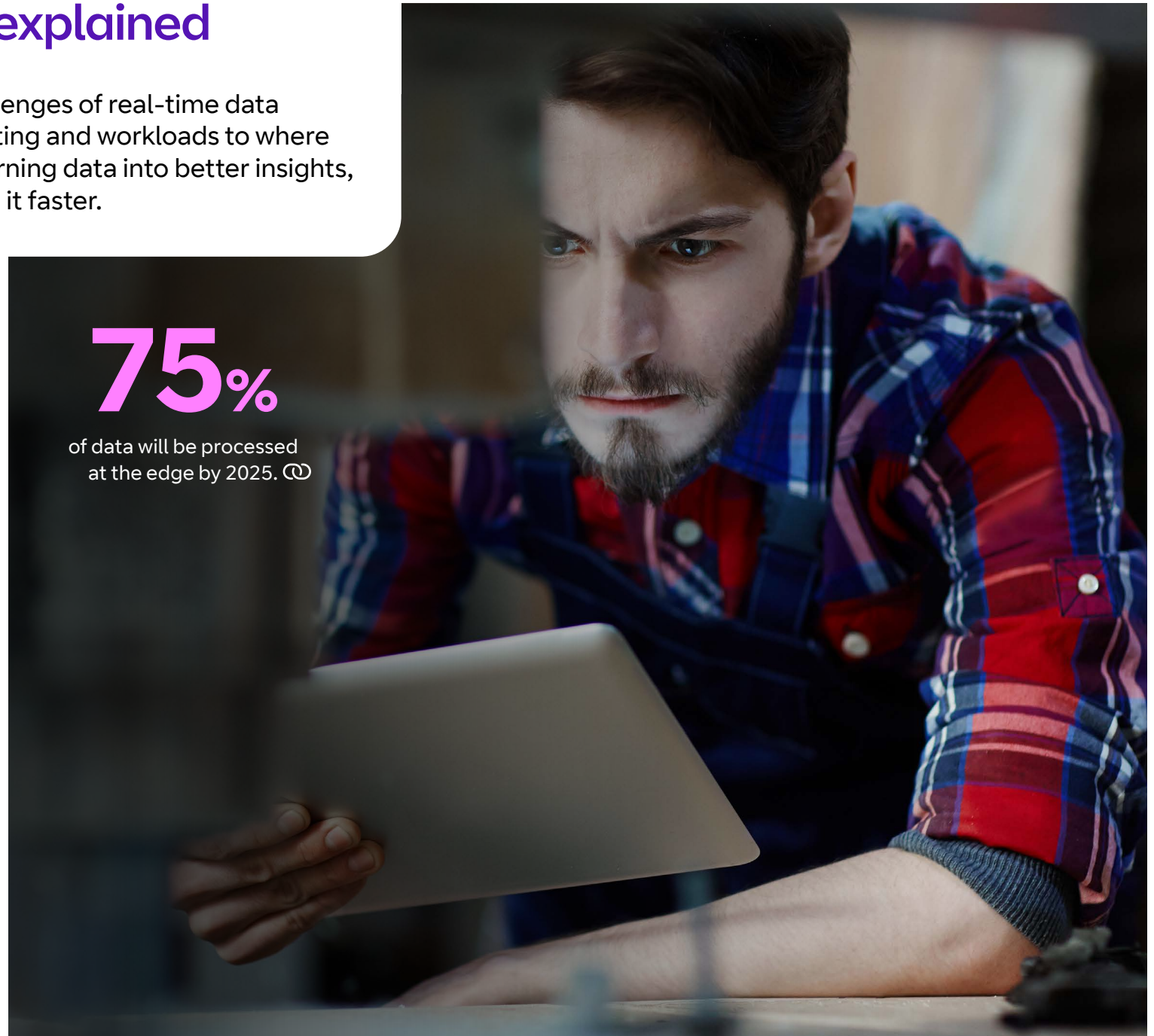
Decoding edge computing terminology

Broadly speaking, the edge is everything that's in between physical endpoints like sensors or industrial machinery, and the core. The core is made up of the organisation's data and computing assets, sitting in the cloud and / or in data centres.

The edge isn't a case of one-size-fits-all. Different layers of the edge need different levels of power and have different levels of computing capability.

There are four types of edge :

- **thin (or light) edge**
  low-power computing platforms like laptops running specific functions and simple analytics

- **thick (or heavy) edge**
  heavier power-using computing platforms that run heavy computation and data storage for enterprise-grade systems

- **device edge**
  some devices have edge computing capability built into them e.g., routers or CCTV cameras

- **network edge**
  this is the perimeter that separates a corporate owned and operated network from where it connects to public networks.

OT network

Edge networking

Sensors

AR

IoT devices

Device endpoints

Thick or thin edge computing

Edge computing

Public or private cloud

Cloud computing

Edge location (on-premises)

Cloud

Overcoming the limitations of centralised computing

Edge computing means you do as much processing as you can locally before sending out the 'highlights' of the data over the network to the core. It's about only sending what you need to send to the right people at the right time.

Moving the processing closer to the source of data generation and users bypasses the seven main difficulties created by keeping computing at the core.

1. **Latency**
   Data isn't making a roundtrip to the core to be processed, so latency improves, reaching the levels needed to support real-time analysis and decision-making.

2. **Bandwidth**
   Keeping data processing local reduces pressure on bandwidth between edge sites and the core.

3. **Data privacy**
   Edge computing simplifies compliance with regulations by keeping data in its region of origin.

4. **Autonomy**
   Data processing at the edge gives sites greater independence over their decision-making, supporting site autonomy.
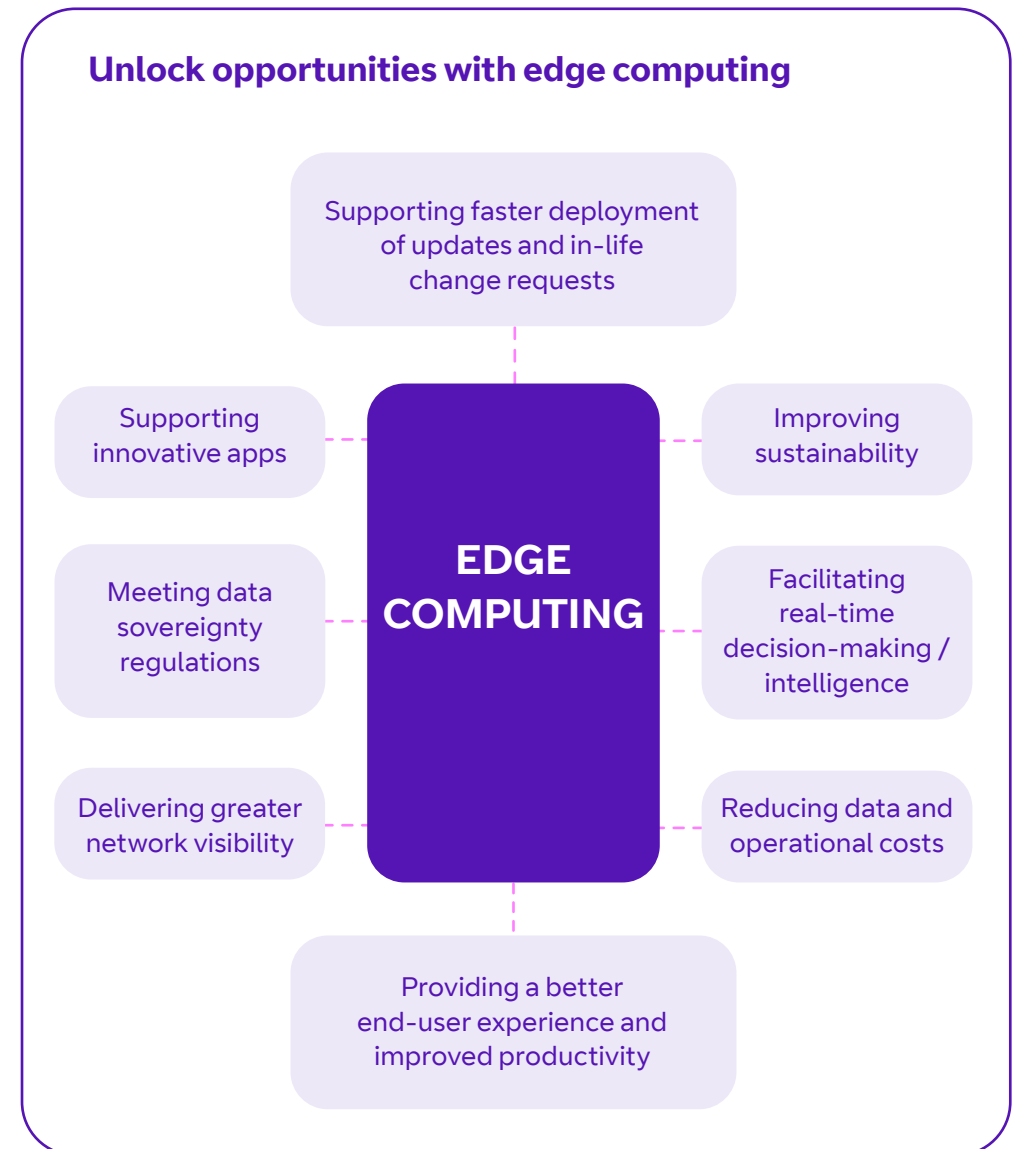
5. **Security**
   Security and privacy risks are reduced when data flows are limited between the point of collection and the core infrastructure, especially when those flows happen over the public internet.

6. **Reliability and availability**
   An edge solution supports a smooth operation without disruption in remote areas, even when edge devices are offline, or internet connectivity is intermittent. Reliability increases because edge computing solutions are less exposed to external / off site interruptions and so have a correspondingly lower failure risk. Plus, using centralised, remote configuration ensures consistency by reducing the chance of missing software patches.

7. **Data sovereignty**
   Some countries require data to be hosted and processed in the same country - which removes cloud computing as an option – but a local edge computing solution meets these criteria.

Unlock opportunities with edge computing

- Supporting faster deployment of updates and in-life change requests
- Supporting innovative apps
- Improving sustainability
- Meeting data sovereignty regulations
- **EDGE COMPUTING**
- Facilitating real-time decision-making / intelligence
- Delivering greater network visibility
- Reducing data and operational costs
- Providing a better end-user experience and improved productivity

Transforming sustainability with edge computing

Leading organisations are putting sustainability at the heart of every business decision. This is in response to growing consumer activism and ambitious government commitments that mean around 90% of the world is now covered by net zero targets. Investors and consumers are moving away from organisations perceived to be part of the climate change problem, rather than part of the solution. 88% of consumers would rethink purchasing from companies that aren't ethically or environmentally sustainable. ⊘

The pressure is on for organisations to prove they're taking considerable steps to protect the environment, whether that's through ethical sourcing, reducing their carbon footprint, or seeking out renewable energy sources.

A catalyst for sustainability

Edge computing is an innovative way to improve sustainability, shifting the organisation towards more effective ways of operating that optimise energy use and reduce carbon emissions.
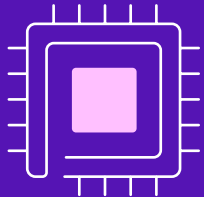
Reducing data centre capacity

Edge computing reduces the amount of data centre capacity you need. By keeping processing at the edge, you significantly reduce the volume of data that's sent to the data centre for processing and storage. This new approach to managing data can, potentially, open the way for data centre consolidation, reducing energy consumption and accelerating decarbonisation.

Enabling technologies that support lower-carbon ways of working

A Multi-access Edge Computing (MEC) approach is critical to supporting emerging technologies such as Augmented Reality (AR). MEC moves data processing, analysis and storage closer to the end user, rather than sending it to some distant cloud or data centre, significantly reducing latency. Distributed data centres or clouds sit at the edge, often at the customer's premises, creating a platform that can process content rapidly, essential to enabling the real-time enterprise.

Combining MEC with a private 5G network backs up the edge computing abilities with the reliability, coverage, security and performance of mobile 5G wireless. Factories that previously had wireless coverage issues, shipping ports and docks with performance and interference issues or hospitals with wired tethered diagnostic equipment can benefit from a MEC service made up of on-premises edge computing and a 5G network.

Together, they enable new applications that were previously technically or operationally infeasible – like AR.

AR means you don't need human experts to visit sites in person. Instead, operatives can carry out guided maintenance and operations with the remote support of experts who can guide them on unfamiliar equipment or configurations. This brings considerable reductions in travel, cutting carbon emissions.
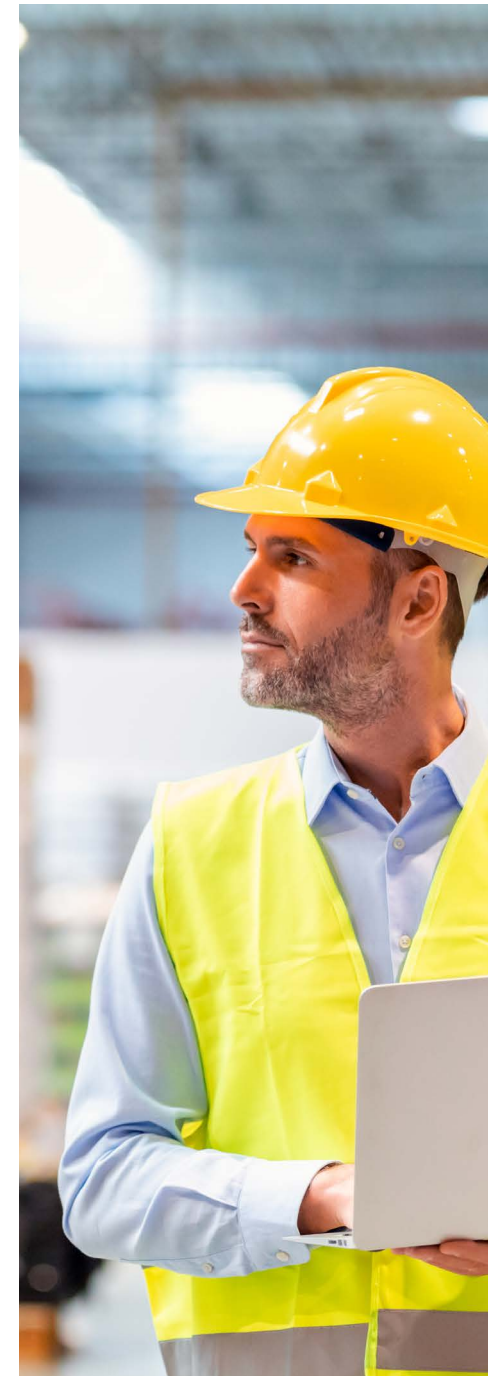
Enabling AI and machine learning tools that identify energy efficiencies

Computing capability at the edge supports our sustainability app that's designed to help you optimise your operations.

With our partner, QiO Technologies, we now offer a new approach to managing your operational assets over their lifetime. Our sustainability app is a straightforward, effective way to make a step change in how you manage your energy usage and carbon emissions.

> Our sustainability app creates a dynamic AI model that looks at previous performance and the energy used, and then starts to model the best scenarios and outcomes, providing guidance towards optimisation. This technology, supported by edge computing is the key to reducing your energy costs by between 5-15% within a few months. And as your energy use falls, your sustainability increases.

In a manufacturing context, the app brings together real-time data from sensors and edge devices, machinery control settings, databases, external data and energy bills to identify the variables that impact your energy consumption before plotting an Energy Efficiency Index (EEI).

In a data centre context, our sustainability app learns the energy consumption pattern at the rack, rack Power Distribution Unit (PDU) and rack component or U level, creating an aggregated Energy Efficiency Index (EEI) for the entire data centre.

The sustainability app then makes recommendations that enable you to consistently achieve your operational sweet spot. The key term here is 'dynamic' – the algorithms within the sustainability app can review its recommendations every few hours or every day, depending on your needs, so you're always optimising the variables that impact your energy consumption.

The algorithm we use has been proven across a range of international industry sectors and can be quickly calibrated to assess the parameters that determine your energy effectiveness.

Explore the possibilities of edge computing

Edge computing is powering innovation, with use cases in one industry often inspiring new uses in another. Where could these scenarios take your organisation?

Edge computing can provide practical solutions to remote commercial locations lacking cloud connectivity, or where access to connectivity via satellite is limited and bandwidth is prohibitively expensive.

Edge computing as a challenge-buster

Across the full range of industries, edge computing is increasingly the smartest answer to key challenges.
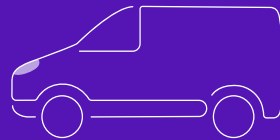
Life sciences asks…
How can we capture, analyse and act upon all the data from the sensors along our production lines, in real time?
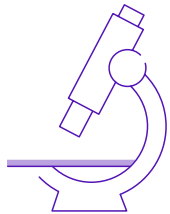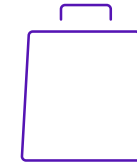
Logistics asks…
How can we streamline our warehouse equipment usage, pallet matrix, vehicle routes, fleet usage and inputs' consumption?
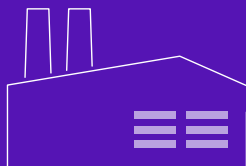
Consumer goods asks…
How can we get the best returns on our work optimising our production scheduling, inventory, product quality, consumption and factory equipment?

Manufacturing asks…
How can we optimise our consumption of inputs, factory equipment, production scheduling, product quality and inventory procedures?

Energy asks…
How can we optimise our up-stream operations from drilling or from green energy farming?

Retail asks…
How can we shape and deliver a contextual customer experience in real time?
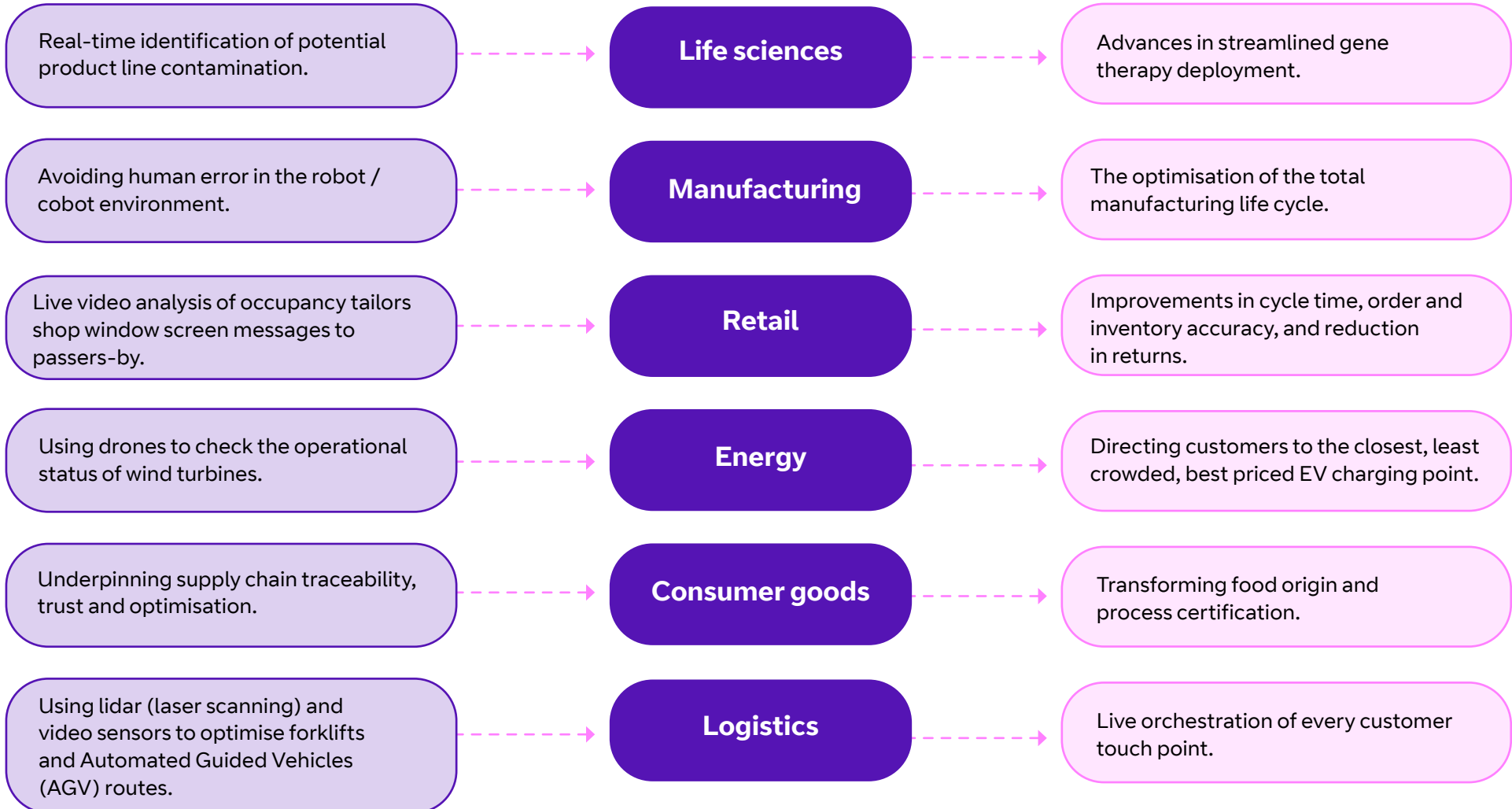
The answer is edge computing.

Edge computing in action

Edge computing today

Edge computing tomorrow

Edge computing today	Industry	Edge computing tomorrow
Real-time identification of potential product line contamination.	**Life sciences**	Advances in streamlined gene therapy deployment.
Avoiding human error in the robot / cobot environment.	**Manufacturing**	The optimisation of the total manufacturing life cycle.
Live video analysis of occupancy tailors shop window screen messages to passers-by.	**Retail**	Improvements in cycle time, order and inventory accuracy, and reduction in returns.
Using drones to check the operational status of wind turbines.	**Energy**	Directing customers to the closest, least crowded, best priced EV charging point.
Underpinning supply chain traceability, trust and optimisation.	**Consumer goods**	Transforming food origin and process certification.
Using lidar (laser scanning) and video sensors to optimise forklifts and Automated Guided Vehicles (AGV) routes.	**Logistics**	Live orchestration of every customer touch point.

Inspiring change in retail

With **81% of sales still taking place in store**, the physical retail experience remains critical to business success. Retailers have to satisfy both the grab-and-go shopper and the browser who's looking to enjoy the experience, and wants to be persuaded into purchasing. We know that retail experiences can be a make-or-break issue: **41% of consumers have stopped using two or more brands due to poor experience.** ∞

Digital signage powered by edge computing is an effective way to enhance the in-store experience for all types of shoppers. It's controlled centrally, which enables consistency over the experience you provide and means you can change all your stores' displays at the touch of a button. The messaging you can share and the impact it has can significantly improve your operational efficiency.

Edge computing in action for EE

Edge technology has transformed the in-store experience across 700 EE stores in the UK, creating an interactive, immersive and experimental environment.

Highlights include:

- a digital tool to empower the salesforce

- an interactive network checker on touch screens

- smart digital shelves with promotional and educational contents

- plus, the ability to update, support and analyse content.

Attract and convert more customers

Window display digital signage is a proven way to draw customers in: 8 out of 10 customers admit they've entered a store because a digital sign has caught their attention and 44% said digital signage convinces them to buy an advertised product over one they originally had in mind. And once inside, strategically placed digital signage can draw attention to key items and give further information about them to sway decision-making. Managers can change displays to reflect what stock is available or even in response to the weather. If it starts to rain, then switch from beachwear to raincoats.

Keep customers coming back

Clear digital signage empowers customers to determine their own experience. It helps them find what they need and signposts key areas such as pay and information points. It can also streamline the in-store experience in ways that encourage customers to return. From promoting offers or discounts, to explaining the refund policy, signposting through the click-and-collect process and a simple thank you for purchasing – it makes the visit hassle-free and enjoyable.

Edge computing can power:

- video walls for windows or focal impact in store

- welcome video screens that reflect the demographic of the customer walking in

- interactive touchscreens for check-in for loyalty coupons and promotions

- lift and learn interactive displays linked to product movement

- interactive displays to encourage sales and sales of complementary products.

80%
of brands experienced an increase of up to 33% in additional sales through the use of digital signage. ⬭

# Clear messaging in the workplace

Digital signage is an effective communication tool for connecting with workforces, too, in multiple industries. From break rooms to warehouse areas, to strategically placed impact points around the corporate environment – edge computing powered digital signage is an eye-catching way to deliver consistent, centrally controlled messages.

Take care of important admin

Screens in rest areas give employees a chance to absorb important HR updates, performance tracking, job opportunities, new product information and employee recognition. They can also be used for interactive employee surveys. Screens in communal areas allow employees to take in key messages to share with customers, mission statements and current business focuses.

Supply key information when it's needed

In warehouse environments, screens linked to management and operational systems can do everything from flagging out of stock items and expected shipment times, to reinforcing workplace health and safety information.
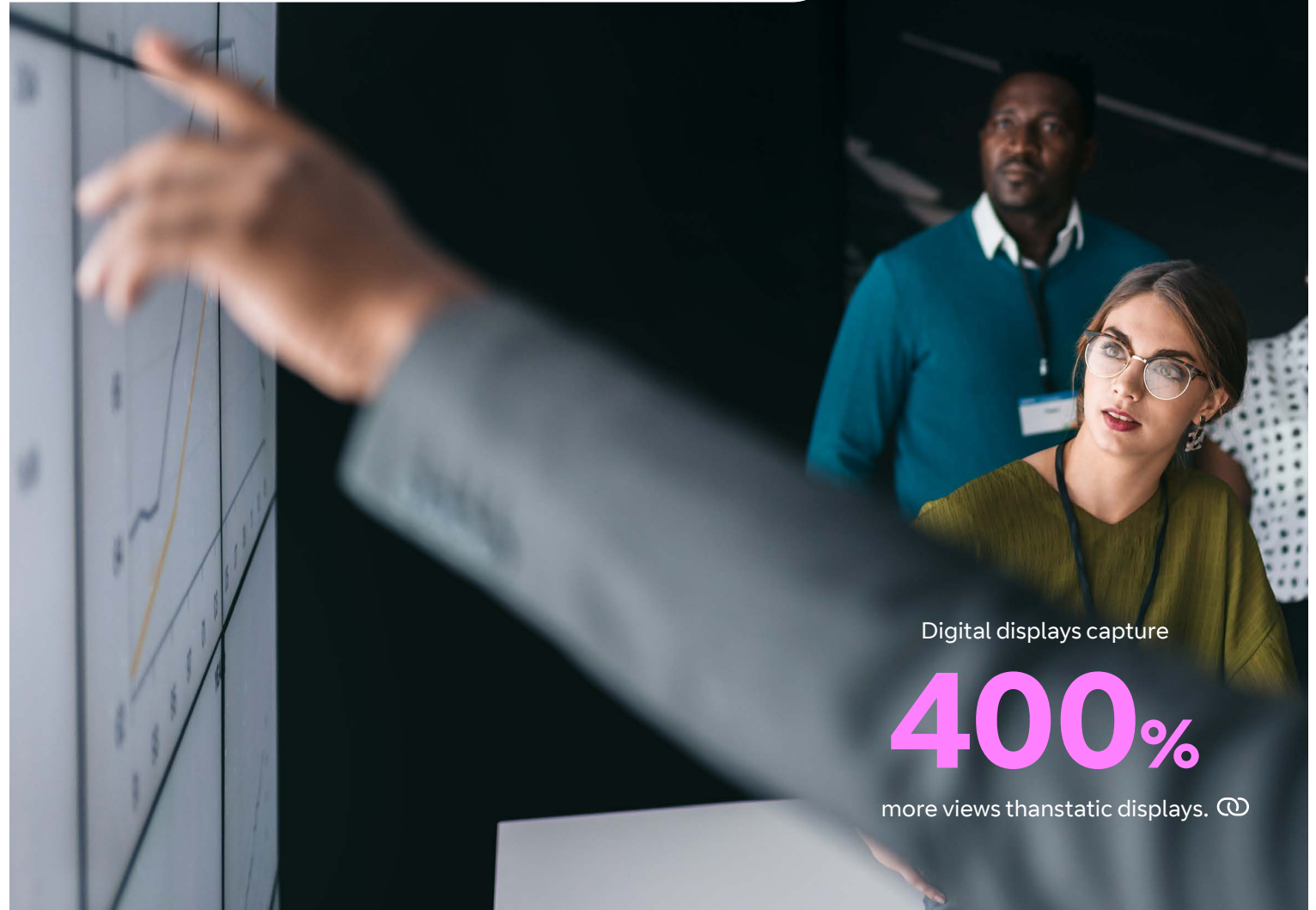
Digital displays capture

400%

more views thanstatic displays. ⬦

Supporting digital advances in manufacturing

If we define digital manufacturing as the bringing together of people, machines and things, then the edge is the important arena where so much of that interaction takes place. As a starting point, the edge is where the Industrial Internet of Things (IIoT) enters the picture, opening the door to the integration of AI and robotics. It's also where new technologies like private 5G come into play.

Boosting efficiency with edge computing

Introducing the ability to process data at the edge in manufacturing opens up new, more efficient and sustainable ways of operating such as:

- **improving sustainability –** processing data at the edge usually involves less duplication, comes with lower network energy costs, and gives the user greater control in terms of the use of clean energy, not always possible when using cloud data.

- **automation –** edge-supported technology, rather than individuals, can monitor individual systems and processes, analyse the results in real-time and feed them into the decision-making that makes automation possible.

- **reducing costs –** with the right configuration, edge computing can reduce the need to store multiple copies of the same data, saving capacity and expense.

- **self-monitoring equipment –** AI capabilities at the edge deliver real-time monitoring that can pick up anomalies that could signal the beginnings of a problem. This triggers maintenance that can prevent a halt in production and can extend the life of equipment.

- **supply chain optimisation –** edge computing supports the inter-connection of different suppliers' networks with links to a multi-cloud hub. This creates a supply chain ecosystem that enables easy and secure insight sharing and coordination, optimising the supply chain with end-to-end visibility.

- **improving safety –** cameras linked to an edge computing supported app can monitor humans in the manufacturing environment in real time. Alerts can be flashed up locally in the OT area, and can also be notified to a central policy engine.

- **facilitating private 5G networks –** low latency private 5G networks depend on the rapid processing of edge computing, allowing AR headsets, Autonomous Guided Vehicles (AGVs) and co-robotics (cobots) to enhance operations, increasing safety and productivity.

Boosting sustainability in manufacturing

Our sustainability app, powered by QiO technology, uses a repeatable algorithm that can identify energy efficiency savings. It optimises energy use and carbon emissions, alongside production throughput and quality. It then delivers predictive and prescriptive insights to maintain optimal Overall Equipment Effectiveness (OEE), extending the life of assets.

Highlights include:

- at a steel production plant - 6% energy savings per year and a carbon reduction of 41,600 tonnes at the trial plant

- at a process manufacturing operation - an eight-fold return on investment within six weeks by identifying energy savings of $840,000 per site per year.

Promoting better healthcare experiences

Technology is leading the way in the drive to a more patient-centred experience of healthcare. In many cases, this means bringing data processing, analytics and storage closer to the source of data – the patient. Increasingly, edge computing, linked with wearable health monitors or mobile patient devices, is facilitating real-time decision making that's making care more individualised.

This is happening as part of a general increase in the number of medical devices in healthcare environments that need localised computing to support rapid responses and AI capabilities. Plus, speeding up localised decision-making is improving clinician workflows.

Moving computing power to the edge is also unlocking the cost savings that come from cutting data traffic and reducing data centre capacity. Our sustainability app that sits on edge computing technology has already helped a UK National Health Service acute hospital to achieve a 5% energy saving across boilers, Combined Heat and Power systems (CHPs), Heating, Ventilation and Air Conditioning systems (HVACs) and a wind turbine, delivering a carbon reduction of over 100 tonnes.
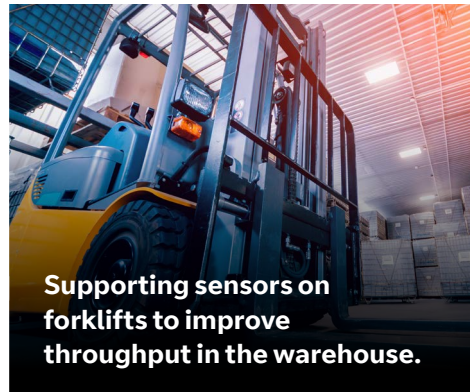
Live life on the edge

Edge computing is flexible, with a domino effect where one industry inspires another.
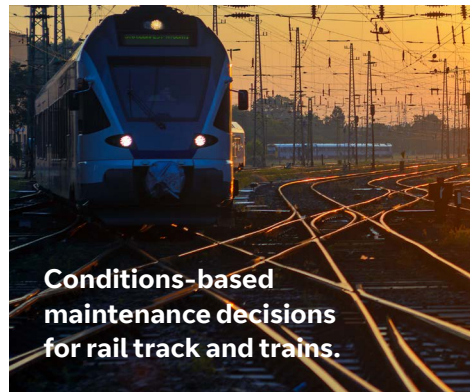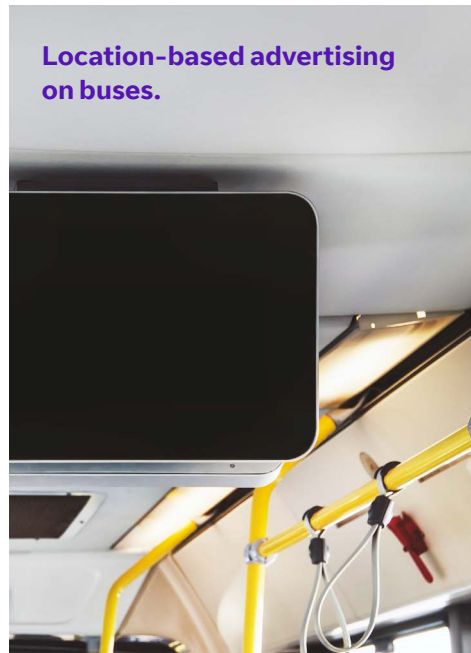
Ask us what edge computing could do for your industry.

Supporting sensors on forklifts to improve throughput in the warehouse.

Active drug tracking in hospitals.

Location-based advertising on buses.

Real-time tracking of workplace safety on a construction site.

Conditions-based maintenance decisions for rail track and trains.

Analysing drilling data on remote platforms in real time.

Rapid credential checking at secure sites.

Advanced car systems with driver profiles that follow the driver from vehicle to vehicle.

Water quality monitoring across a pipe network.
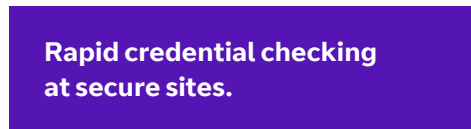
Smart parking meters delivering dynamic pricing.

**Effective branch offices in remote, difficult locations.**

The smoothest route to edge computing

There's a widespread tendency amongst organisations to develop edge computing as the need arises. This makes it more likely to be an in-house solution that's adopted on a single site and then, perhaps, upscaled to more sites across the organisation in a patchwork fashion.

We've noticed a pattern of difficulties arising from this DIY approach:

- **significant expense –** ad hoc implementation takes intensive, specialist effort, and this brings extra costs

- **uneven, problematic scaling -** when edge computing is added site by site as locally led projects, the implementations are idiosyncratic with no overall consistency

- **governance difficulties –** a patchwork development presents problems for a central governance approach that needs consistency. It makes plug-and-play edge computing and universal updates extremely difficult

- **cybersecurity vulnerabilities –** a DIY case-by-case installation approach means each use case has to be assessed individually from a security point of view. This is time consuming, and increases the likelihood that a vulnerability will be overlooked.

Overall, working on individual use cases with dedicated edge platforms brings complexity, fragmentation and holds back proliferation. A better, more cost-effective and easy way is to consolidate your multiple sites into one edge computing solution that is easier to control, easier to monitor and easier to secure.
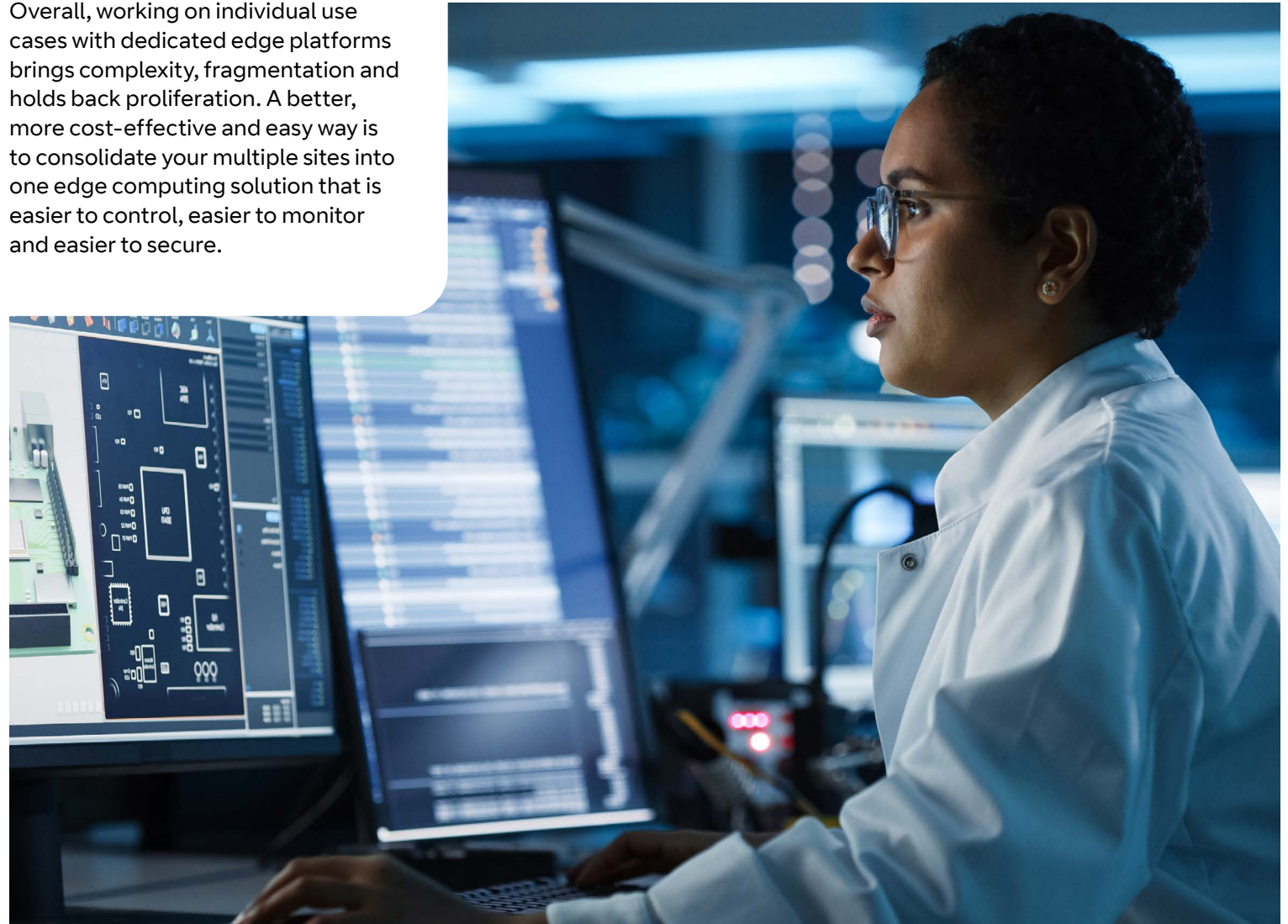
Discover Edge Compute from BT

Edge Compute is a solution that brings intelligent data processing closer to where it's created and helps avoid network congestion. It also supports sustainability by enabling data analysis that identifies more energy efficient ways of operating.

We collaborate with world class partners like Dell Technologies to implement leading edge computing platforms. Once we've fitted the hardware products and connected them to your systems, our edge services offer a managed service environment where we'll support your installed solution to give you visibility and control over your domain.

A straightforward roadmap to Edge Compute
Drawing on our wide, multi-industry experience, we've created a simple route to Edge Compute implementation.

Stage one: workshops

It's important that you have a clear picture of what's involved in a managed Edge Compute solution. Through a series of detailed consultancy-led workshops with our partners, we'll lead you through the decision-making journey from concept to end solution.

This will include:

- thoroughly exploring the potential of Edge Compute and how it can future proof your infrastructure. We'll look beyond particular use cases to how Edge Compute can benefit your organisation as a whole

- exploring how Edge Compute affects your security and networking – and how you can address any vulnerabilities that it could create

- agreeing key metrics with you to ensure you have visibility about the return on investment you'll achieve.

Stage two: deployment

We'll design and agree your Edge Compute solution with you, and work out a programme of delivery globally, using our comprehensive partnership ecosystem.

Stage three: handover

At this point, your Edge Compute solution goes live, we hand it over to in-life operations and you start to unlock its benefits.

Stage four: ongoing benefits

Your cross-organisation Edge Compute solution is up and running. We continue to maintain and manage it, building in continuous improvement. We treat your solution as a live entity – something that we will add to as innovations accelerate, improving it and increasing its cost efficiency.

Why BT for Edge Compute

Our global reach

We have a global network of trusted suppliers that can fit and manage the sensors Edge Compute depends on wherever you need them. We take care of every aspect of your solution with a full-service wrap that gives you peace of mind; you can reap the benefits of Edge Compute and we'll take care of the day-to-day management. Plus, we can supply any additional services, such as firewalls or private 5G, that you need to uplift your existing infrastructure to make your whole edge solution repeatable and consistent.

We're security specialists

Our experience and expertise in protecting governments, nation states, critical national infrastructure and large global corporations from over 6,500 cyberattacks each day gives us a ringside seat on the complex security threat landscape. We use this unique position to support organisations to detect and respond to threats in a Zero Trust world with real time visibility and monitoring, drawing on the expertise of our 3,000 security experts and 350 consultants based in our security operations centres around the globe.

## Our extensive and experienced partner ecosystem

We offer an ecosystem of partnerships to transform the way you run your operations. We have years of extensive multi-cloud expertise. Our links with leading public cloud providers delivers flexible connectivity into hyperscalers and regional data centres. And, through leading industry partnerships, we blend the latest specialist technologies into what we offer.

Dell Technologies is one of our leading Edge Compute partners. Dell provides end-to-end edge computing technology solutions that accelerate digital transformation. Dell's commitment is that everybody should have easy access to the best technology anywhere in the world, and it has been providing technologies that create new opportunities for organisations to gain insights and deliver value for over 35 years. We work symbiotically with Dell to create and provide edge computing solutions that enable organisations to establish competitive advantage.

Alongside Dell, we have developed a flexible, practical approach to delivering Edge Compute solutions for a range of multi-sector, multi-national organisations.

This approach features a combination of the benefits of hardware standardisation, along with the universality and inclusiveness that comes with being cloud agnostic.

Many international organisations have developed solutions on a localised, ad hoc basis. The flexible combination of ubiquitous Dell hardware and our services provides edge computing solutions which dovetail with existing corporate infrastructure across the globe, while standardising the edge computing component. Being cloud agnostic allows us to implement edge computing solutions which work effectively with a vast array of existing and future corporate cloud solutions.
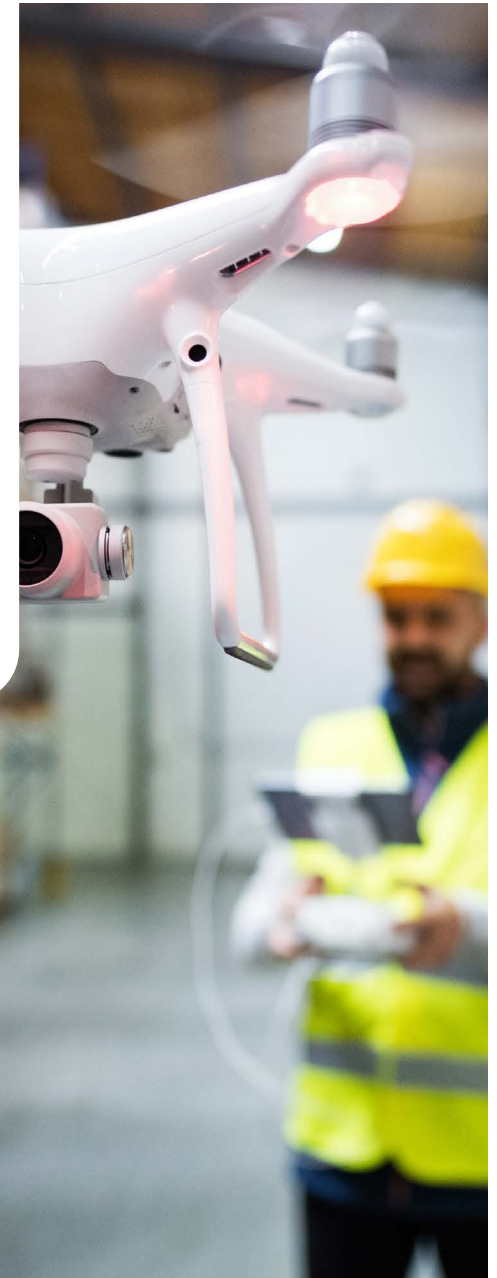
Why BT for Edge Compute

We are neutral

It's estimated that 82% of large enterprises have already adopted a multi-cloud infrastructure, either through design or by accident, for example as a result of mergers and acquisitions. Consequently, they need a neutral edge that works with multiple cloud providers. Our solution with Dell has been designed to work with all of the cloud providers and their applications. It's also designed to work with a range of private 5G solutions, which tend to go hand-in-hand with edge computing, due to the need to process data at the end of the RAN in a multi-access edge computing solution.

Our long-standing commitment to sustainability

We've been on a climate action journey for over 25 years, since setting our first carbon reduction target in 1992. Since 2016/17 we've reduced the carbon emissions intensity of our operations by 57% and have reduced carbon emissions by 19% in our supply chain over the same timeframe. We've pledged to be a net zero and circular business by 2030, and 2040 for our supply chain and customers. We hold a platinum EcoVadis rating, reflecting our comprehensive sustainability approach.

Our flexible, customer-focused approach

We understand there's no one-size-fits-all approach and always centre our solution in helping you meet your business goals. We carefully put together the right partnerships from our ecosystem to deliver a bespoke solution. Our approach enables your choices - if you have a preferred supplier, we have the flexibility to incorporate them into your project.

Step up to the edge

Edge Compute is ready to support your next steps in adopting new technologies, transforming operational effectiveness and boosting sustainability.

Start your Edge Compute journey with some inspiration. Explore the cross-industry possibilities to see how edge computing could benefit your organisation.

Visit our webpage today:
bt.com/edge-compute

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