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2023 Edge Advantage Report

Secure, grow, excel with Edge as a Service



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Introduction

Enterprises around the world are discovering the edge advantage. They are benefitting from digital technologies that accelerate data-driven decision making, secure physical and virtual assets, and control sustainably resilient operations.

During Q2 2023 NTT and Omdia spoke to an exclusive group of 621 current enterprise investors in edge solutions. The investigation spanned five major industry groups and 17 countries. The resulting evidence was powerful and globally consistent:

- **80%** say their edge investment is delivering on its promise
- **88%** cite 5G as an important enabler, and those combining private 5G and edge report the highest benefits
- **94%** are working with partners to make edge a success, but want a single edge partner that could help them with all their evolving needs

Now we want you to learn from these trailblazers.

Real edge users and real benefits – right now

In this landmark report you will find direction to make powerful outcomes your business as usual.

- **Discover how 600 enterprises across the world have invested in edge solutions:** Explore how peers in manufacturing, healthcare, transportation and logistics, energy and utilities, and financial services are using edge services.
- **Learn from real edge deployers' ongoing journeys and find your own pathway to the edge:** Follow four signposted journeys to the edge focusing on sustainable resilience, operational security, customer experience, and employee empowerment.
- **Understand how to partner effectively:** Realize why nine out of 10 successful edge deployers proceed with expert assistance, and why there is a growing need for edge 'as a service'.



What is the Edge advantage?

The edge advantage is anchored in a familiar technology concept: bringing critical intelligence and digital resources closer to where they are needed. This may sound like distributed computing, but that's an oversimplification of what's on offer. Today, the edge advantage is emerging from a powerful amalgamation of technologies, services and capabilities (see Figure 1).

Critical solution elements

- Edge computing places the cloud's processing power at the edge of the enterprise network;
- Low-latency connectivity supports local-area and wide-area networks through technologies including 5G;
- Edge-optimized applications take advantage of low latency and high bandwidth for real-time data collection to perform according to industry-specific needs;
- Connected devices collect, assess and distribute data from IoT sensors, 360-degree surveillance cameras, and augmented reality headsets;

- Robust security keeps real-time interactions and insights safe.

Top complexities

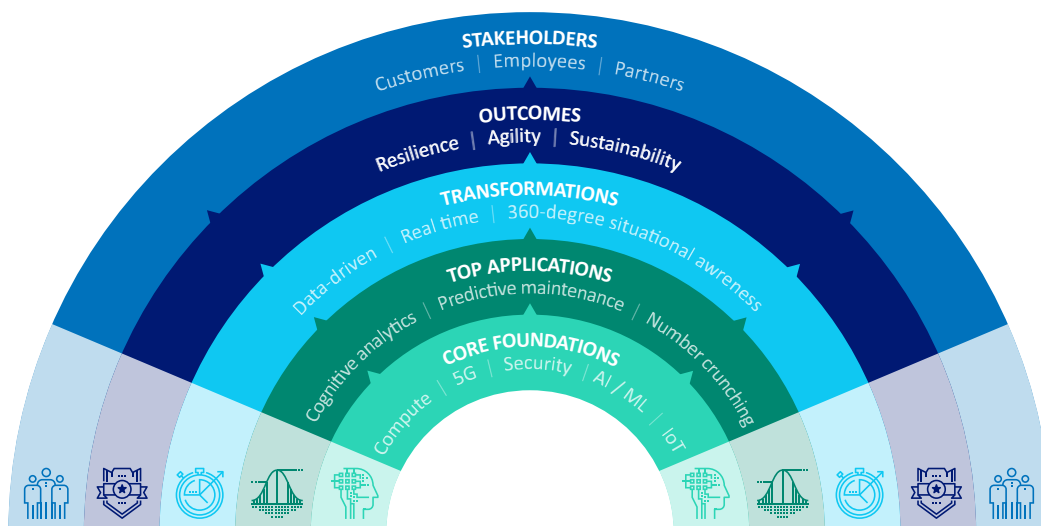
Edge takes many shapes and forms, but according to organizations that have already deployed the top reasons to invest are to automate and add AI in business processes, and to gain real-time access to data.

Achieving these objectives is a formidable challenge because they require:

- Tight orchestration of hardware, platforms, systems and devices;
- Consistent operational performance without compromising security;
- Overcoming legacy infrastructure and technical debt.

As this year's report details, these requirements are driving new behaviors and defining emerging best practices: In 2023 and beyond, achieving the edge advantage will require end-to-end solutions with holistic management and uncompromising accountability.

Figure 1: The Edge Advantage



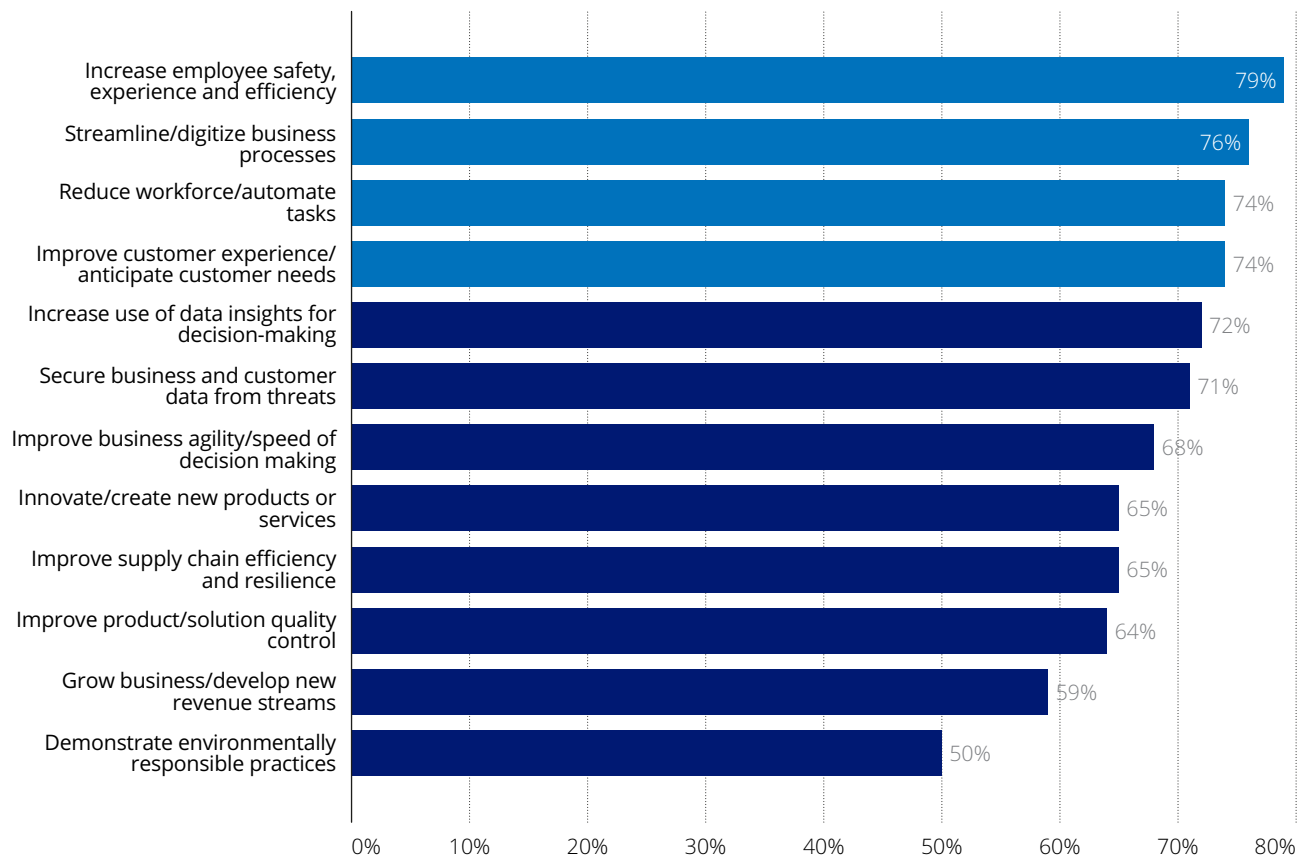
State of the Edge

Why do enterprises invest in edge?

More than two-thirds of enterprises invest in edge to address urgent business challenges (see Figure 2). But edge is not static: Enterprises evolve their edge usage with time and experience. Organizations start with anchor business challenges and find opportunities to address other business issues over time.

Top reasons to invest are to automate, add AI and gain real-time data

Figure 2: Share of edge investments directly linked to key business priorities



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Source: 2023 Omdia NTT Edge Advantage Survey

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What drives edge investments?

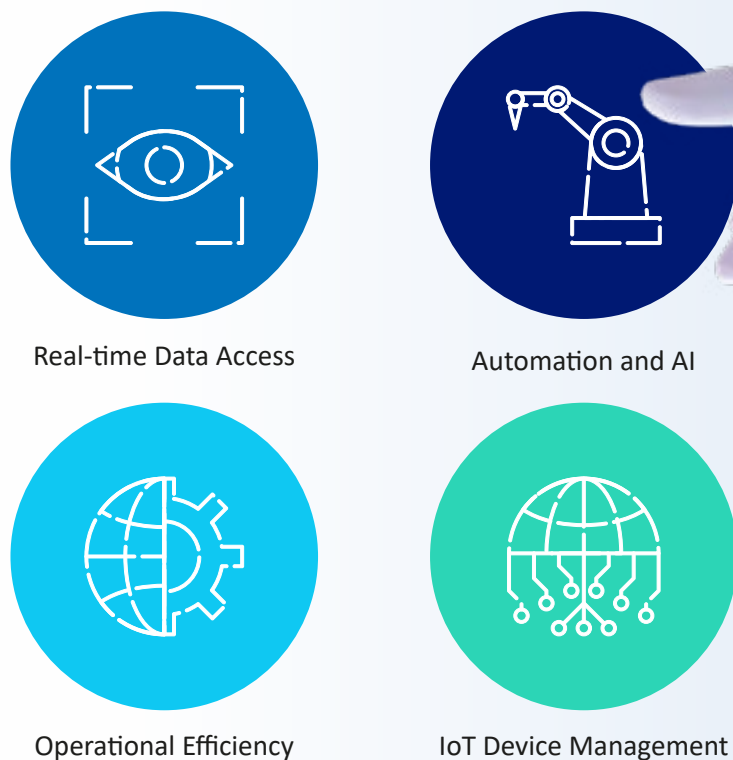
An industry-specific view reveals nuanced functional triggers for edge investment (see Figure 3):

- **Real-time data access** is the number one critical priority for financial services, transportation and logistics firms, while automation and AI comes in close second. These industries depend on their networked endpoints to satisfy their customers' needs.
- **Automation and AI** is the top motivator for edge among energy and utilities firms, while real-time data access comes second. These organizations must meet dynamic changes in demand in an environmentally responsible way, managing geographically distributed locations.
- **Operational efficiency** is the top-ranked edge investment driver among manufacturing firms with data security second. Manufacturing firms are striving to be just-in-time organizations that meet and even anticipate market needs, turning data into competitive advantage.

- **Managing IoT device growth** is an in-your-face challenge for healthcare organizations while the use of automation and AI is a near second. Healthcare is reaching beyond the hospital into the community and aims for better outcomes by being more predictive.

It is essential to scope edge use cases and optimal networks

Figure 3: Top technology drivers for edge services



What benefits does edge deliver?

Edge is exceeding expectations. More than 80% of enterprise edge adopters state that their investment expectations were met or exceeded. The top three edge applications underpinning these stellar results are cognitive analytics, IoT tracking and automation and high-performance number crunching. Satisfaction varies depending on the edge adopters' main objectives: If the edge's purpose is to make the supply chain more efficient, to meet ESG compliance, or to improve customer experiences, enterprises are often delighted. They are more critical when they use edge for complex systemic challenges such

as reducing the workforce, migrating to digital processes, or cybersecurity. Nevertheless, across industries, more organizations are finding edge helps address top business challenges and priorities (see Figure 4).

8 out of 10 users say edge is meeting or exceeding expectations

Figure 4: Priority outcomes achieved by edge deployers



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How is edge deployed?

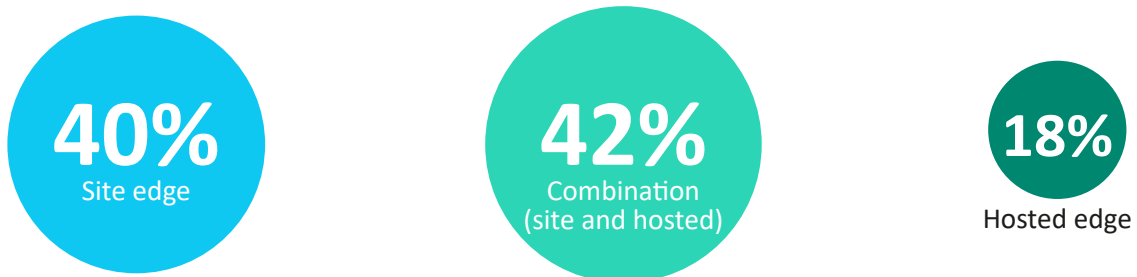
Enterprise decision makers partner for edge services as a strategic choice – 94% of enterprises surveyed use partners to help manage or co-manage functions of their edge.

External management is highly popular because deploying and operating an edge is complex. A managed services model can also insulate enterprises against infrastructure obsolescence. Areas for external management include: edge endpoint and device management (62%), security elements (61%), and compute elements (55%).

Nearly 60% of edge users rely on off-site hosted edge; many hosted edge adopters also mix in site edge (see Figure 5).

94% of enterprises partner for edge expertise

Figure 5: Enterprise use of site edge vs. hosted edge solutions



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Who pays for edge services?

No one department is a consistent key stakeholder for edge investment. This reflects the appeal for edge solutions across the business, but in practice may silo deployments and limit the ability to achieve wider organizational benefits:

- Close to half of organizations (47%) classify edge investments as part of their network/connectivity budget, while almost a fifth (16%) view edge as part of their cloud budget;

- Fewer than a third (28%) possess a wider vision, embedding edge investments within their digital transformation budget.

The network bias is not surprising: enterprises interviewed as part of the research stress the criticality of getting their wide area network infrastructure in order before exploiting the full potential of edge. Once the WAN is upgraded, many organizations then overhaul their campus networks to achieve maximum edge benefits.

What comes with edge?

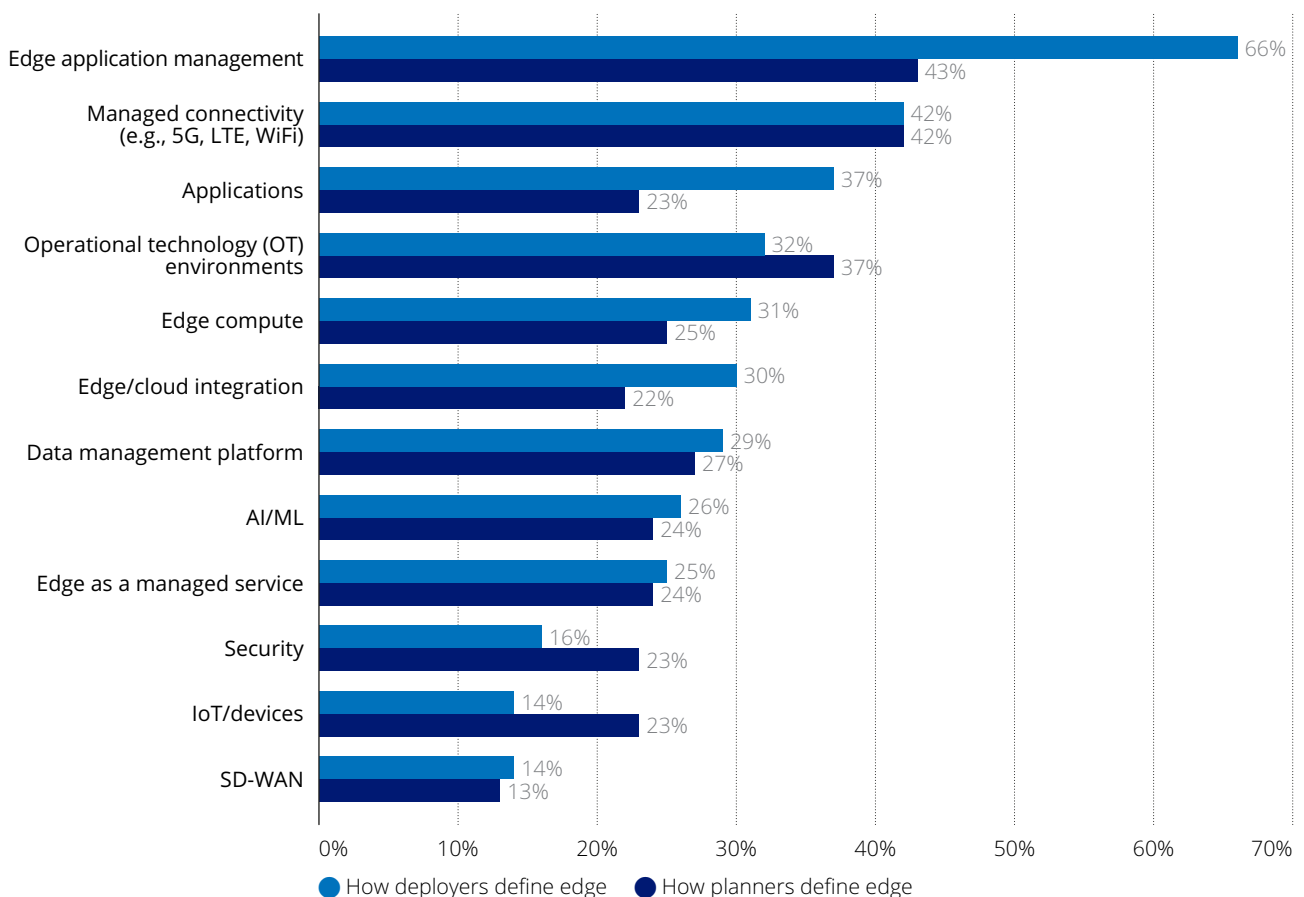
What counts as an edge 'site' can be very large, such as a container port, but also very small, such as an ATM. Equally, edge sites can be in an urban location, such as a medical complex or a more remote area, such as water pumping station. Irrespective, these sites require secure, failsafe connectivity and compute to deliver consistent data insights to on-site and remote stakeholders.

Among enterprise adopters, definitions of what 'edge' should include remain fluid. Deployers and those budgeted to deploy don't necessarily agree (see Figure 6).

An edge 'site' can be a large container port or a small ATM

But why should enterprises have to decide what elements are in or out of their edge strategy? It would be easier to focus on the outcomes they are seeking and build fit-for-purpose solutions on the fly. Instead of having their ambitions limited by the extent of their inhouse skills, enterprises should seek expert assistance to help define and deploy their edge advantage.

Figure 6: Strategic components enterprises define within edge



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The future: The rise of Edge as a Service

Enterprises need wider expertise

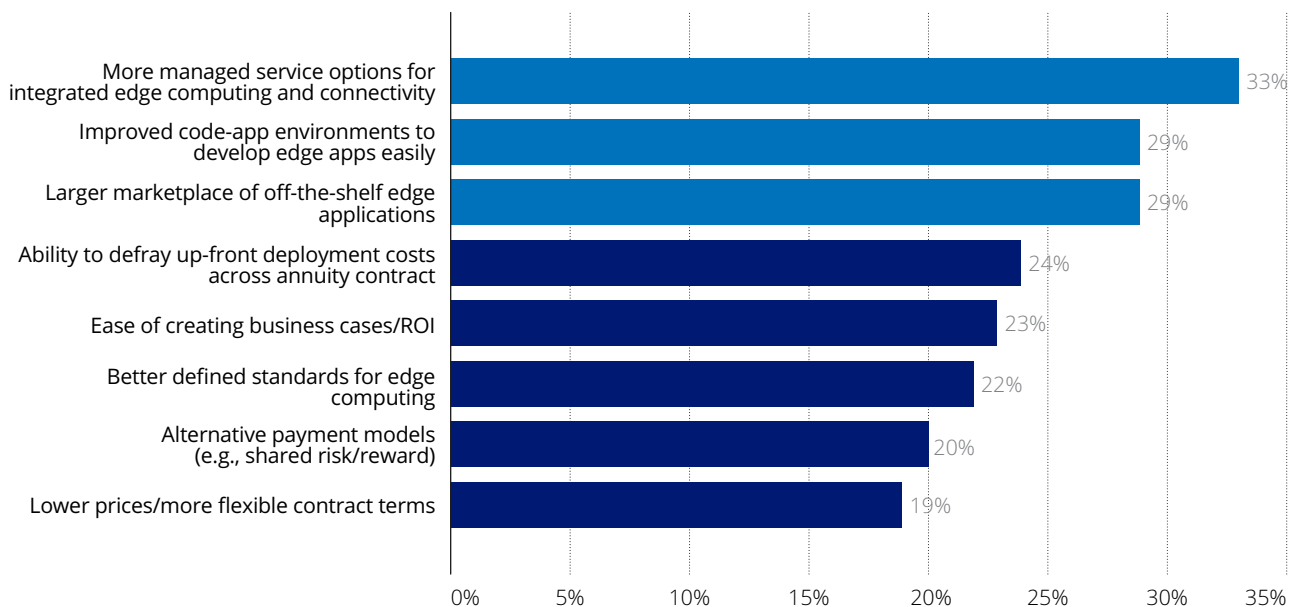
Eight out of 10 enterprises expect their dependency on third-party edge services to grow over the next two years. In part this is because they need help to ensure their legacy systems and protocols don't get in the way as they orchestrate more complex solutions. Beyond the design and implementation stage enterprises are keen on wider assistance (see Figure 7). Enterprise edge adopters also indicate:

- Access to more diverse managed edge services is top ranked;
- Most (90%) ideally would like to consume these diverse services from a single partner;
- IoT platforms, edge solution design and management, including edge server selection are top areas where they lack internal expertise.

These views provide important learnings for future edge adopters: Current edge adopters see the drawbacks of fragmented management for compute, connectivity, or IoT devices. Chief among these is unclear accountability for management blind spots that could potentially put data security at risk.

90% want a single edge partner that can do it all

Figure 7: What would make edge consumption easier?



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A DIY edge may not scale

Do-it-yourself edge implementations can only go so far. To go further, most organizations need outside help. The research shows that almost 40% of enterprises planning to deploy edge services are concerned that their current infrastructure cannot support a future spike in connected devices or applications. Most concerned are transportation and logistics firms. Therefore, two-thirds of enterprises that already deployed edge have coordinated a wide area network refresh.

Also worth highlighting is assistance required around applications – not just the management of apps, but also accessing simple tools to design edge-native applications or selecting apps from an edge solutions marketplace.

Network connectivity cannot be an afterthought

Ensuring consistent and secure edge application performance has a critical dependency: underlying network connectivity. Application data – in some cases petabytes of data – requires a low-latency network environment whether across a campus LAN or the wide area.

Future edge deployments strongly correlate to a campus network overhaul. The research shows that almost 40% of enterprises plan to upgrade

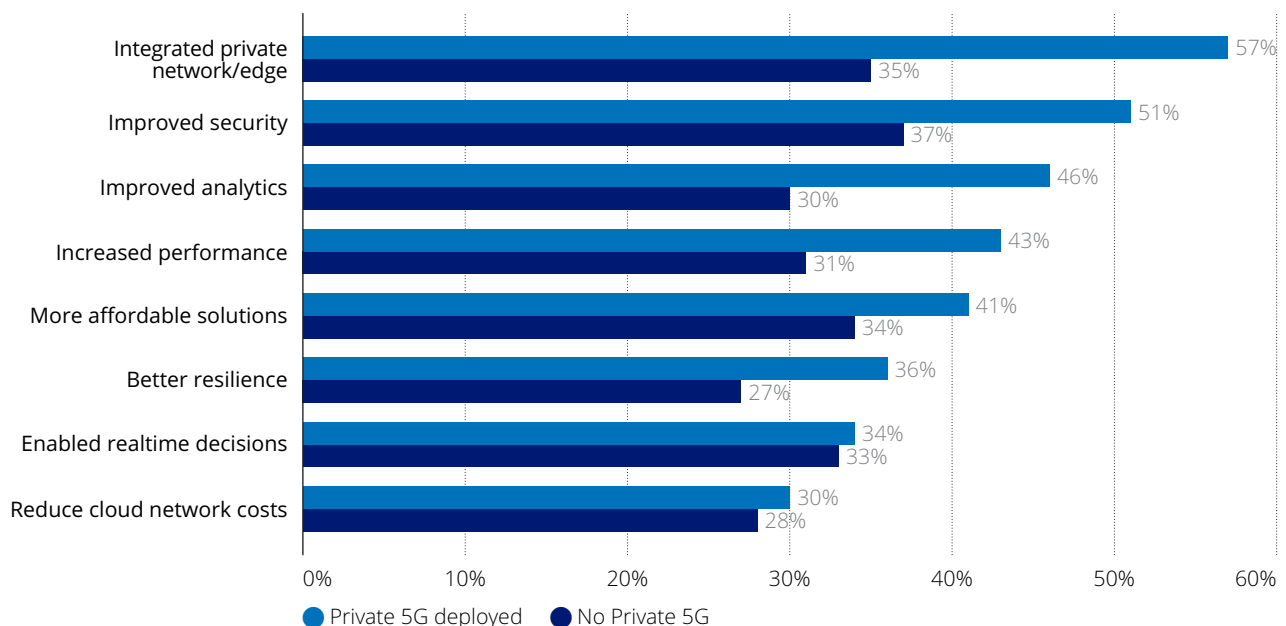
their network in time, and 88% cite 5G as an important enabler.

Nevertheless it is private network usage – notably favoring 5G – that is set to grow as enterprises gain greater experience around deployment options. The investment balance is changing: only a fifth of enterprises deploying edge within the next 12 months plan to use private 4G/LTE, compared to one-third budgeted to invest in private 5G.

While they are a small cohort today, current private 5G users tend to record better outcomes than enterprises using older LTE private networks with edge, or no private networks at all (see Figure 8). They report achieving more benefits including integration of network with edge (57% vs. 35%), better security with localization (51% vs. 37%), better analytics (46% vs. 30%), and better applications performance (43% vs. 31%). These are highly promising results that others will want to replicate or exceed.

88% highlight the importance of 5G for edge

Figure 8: Enterprises investing in edge and private networks achieve better outcomes



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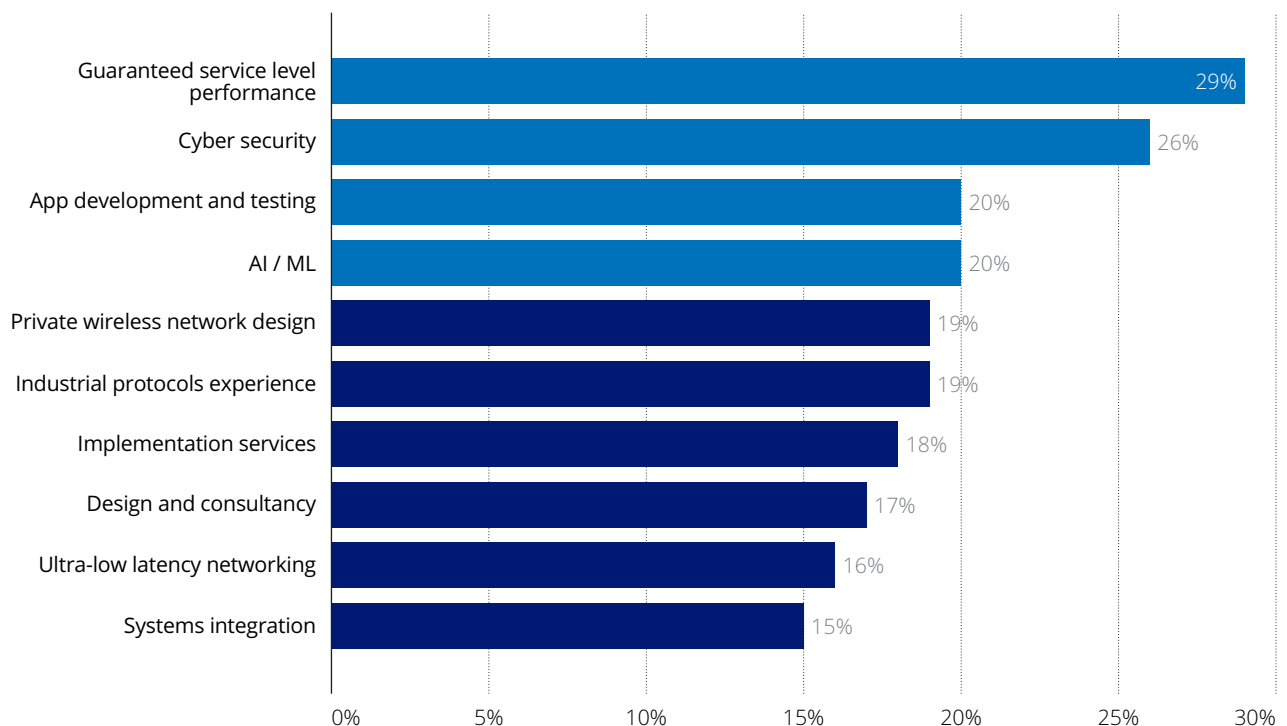
Partner expectations rise

Ultimately, enterprises want key services partners to help tie together their edge – infrastructure, devices, operating environments, connectivity, and applications. Partners fill the expertise gaps in design, planning, integration, orchestration, security, monitoring and management, trouble detection and remediation. Keep in mind your edge will evolve and scale over time.

An edge ‘as a service’ portfolio combines professional services (e.g., design and integration) and on-demand managed services across all edge-relevant infrastructure and technologies. Enterprises benefit from a partner who supports a range of services to deliver on their business case, operating the edge as a coordinated stack with real-time, end-to-end visibility and performance (see Figure 9). Service providers for edge have to simplify a CIO’s life, not just offer a cheap price.

Service providers for edge have to simplify a CIO’s life

Figure 9: Capabilities edge adopters require from their key partners



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Journeys to the Edge

Starting points

Journeys to the edge can have various starting points and objectives. The four pathways are a composite view of how different enterprise motivations and actions can lead to an edge

path. Such journeys are not mutually exclusive in mission or industry, and several can be run concurrently within the same organization.

Sustainable resilience with the edge advantage



Objectives

Sustainable operations are a growing legal requirement in many countries as well as an ethical imperative. Reporting requirements are getting tougher, demanding robust audit trails and complete transparency. For example, Scope 1 and Scope 2 of greenhouse gas accounting standards cover an organization's direct and indirect emissions, while Scope 3 covers emissions and waste produced across an organization's entire value chain, from suppliers through to end customers.



Why edge?

Edge services have a role in supporting efficient on-demand usage of resources, asset management and overall business transparency, which is important if compliance details must be exposed for public scrutiny.



Most likely to benefit

Transport and logistics, energy and utilities.



Stakeholders

Depending on industry, stakeholders are likely to span legal, investor relations, health and safety, HR, fleet management, building and plant operations as well as IT.



Outcome

46% of enterprises using edge to support sustainability objectives said their investment had exceeded expectations. That result rose to 57% among those using a hosted edge solution.



Examples

- 1 — A specialist chemical logistics firm uses edge to support real-time track and trace of dangerous goods because operational transparency is a business-critical capability related to Scope 3, required by the chemical companies that are its core customers.
- 2 — A water utility uses edge for 360-degree operational visibility across its infrastructure, including unmanned pumping stations that need to run and be monitored 24/7. Collection of rich visual and other data analytics is beginning to enable predictive insights that mitigate potential water shortages.

Data security with the edge advantage



Objectives

Maintaining the physical and digital security of people, assets, and operations, as well as data privacy, are boardroom concerns with business-critical impact. The growing number of connected devices and things generate more data to be protected and more vectors for cyberattack. Regulatory oversight around physical and data security continues to tighten around organizations, and severe monetary consequences exist for non-compliance.



Why edge?

Edge compute and low-latency connectivity support tools for pattern matching threats and other illegal activities that cause financial, physical or reputational losses.



Most likely to benefit

Financial services, manufacturing.



Stakeholders

IT and cybersecurity, but also legal and compliance, and line-of-business departments are all stakeholders – accountability for security is everyone's business now.



Outcome

61% of enterprises specifically deploying edge for business and customer data security said their solution is meeting expectations, and 20% say it is exceeding expectations. More generally, four out of 10 of all enterprises said that improved security of local data storage/connectivity was an indirect impact of their edge investment.

Examples



- 1 — A banking group uses edge to secure temporary ATMs deployed at sporting events. This managed service, combining compute and connectivity, supports mundane tasks such as alerting if money is running out and performs security functions. Physical security alerts are triggered if an ATM is knocked over, but more important is fraud detection using video cameras and behavioral analytics. When fraud is detected the reaction must be swift, and backhauling data to a central hub takes too long. Edge data processing triggers alerts and can shut down a rogue machine.
- 2 — A manufacturing firm uses edge processing with IoT sensors to help automate physical asset security, audit goods processing and improve efficiency. The organization typically ships 1.4 million SKUs to 900 destinations. Edge processing reconciles actual and expected shipping weight of packaged goods, to alert against pilfering or errors before generating a digital bill of lading for onward shipment.

Better customer experiences with the edge advantage



Objectives

Successful organizations need to do more than satisfy customer needs, they need to anticipate them. Buyers fall into categories of behavior, and organizations need to identify and properly interact with these audience segments. They need to understand how they can influence closing the immediate deal; and how to build positive experiences and foster brand loyalty to win repeat purchases over the long term.



Why edge?

Enterprises that prioritize customer experiences look to edge for better visibility and manageability of their existing systems. They are interested in harnessing AI and automation to provide new self-service tools to clients.



Most likely to benefit

Energy, transport and logistics.



Stakeholders

Anticipating needs and delivering positive experiences to customers is a top-level concern that goes straight to the CEO. CIOs and their IT departments execute on the CEO's direction.



Outcome

Edge solutions deployed to help with customer experience exceeded expectations for almost 4 in 10 enterprises (38%), and another 54% say these solutions meet their expectations.

Examples



- 1 — A global FMCG manufacturer uses edge to host a direct-to-consumer “headless” e-commerce platform, serving one of its major food product divisions. The distributed platform lets customers shop and engage with the manufacturer’s brand in new ways. Customers can design their own food products, and the output is orchestrated with a remote inventory management system. The edge solution supports better shopping experiences by managing application latency.
- 2 — Customers can be reassured that fraudsters will be detected and stopped quickly if an ATM is compromised with the benefits of edge-enhanced behavioral analysis, according to a financial services firm using edge. Security is a core capability supported by the edge, meeting expectations set for financial institutions.

Better employee experiences with the edge advantage



Objectives

There are two categories of workforce experience improvements: safety and efficiency, and enablement tools. Safety procedures may not be an exciting topic, but it is essential to provide skilled employees with a better work environment. Workers appreciate receiving smarter, better knowledge and collaboration tools to help them do their jobs.



Why edge?

Enterprises that prioritize employee experiences look to edge for better visibility and manageability of their existing systems. They are also concerned about both physical and cyber security to help protect their workforce.



Most likely to benefit

Transport and logistics, healthcare, energy.



Stakeholders

Employee experience is driven by compliance and legal departments requiring safety and efficiency improvements. Compliance and legal departments work in concert with HR and the company's lines of business.



Outcome

Enterprises focused on better experiences for their workforce can be more difficult to impress. Three-quarters of enterprises are satisfied with edge solutions targeting employee experience. Only one in seven enterprises (14%) say their edge investments for employees are exceeding expectations.

Examples



- 1 — A healthcare group is deploying edge to support integrated data sharing and delivery to hospital staff in near real time. Currently, much time is wasted extracting data and delivering it to the right person in a format they can use — potentially delaying life-saving assistance. While edge addresses latency issues, the more persistent challenge is extracting non-standard data such as MRIs from connected devices.
- 2 — As part of its digital transformation, an electronics manufacturer is trialing Magic Leap augmented reality headsets in its distribution staging centers, empowering workers to find and document real-time slots for products. This is one of the applications the manufacturer is using to justify the overhaul of its in-building networks to support real-time operations, as it moves to software-defined manufacturing to improve product quality and output.

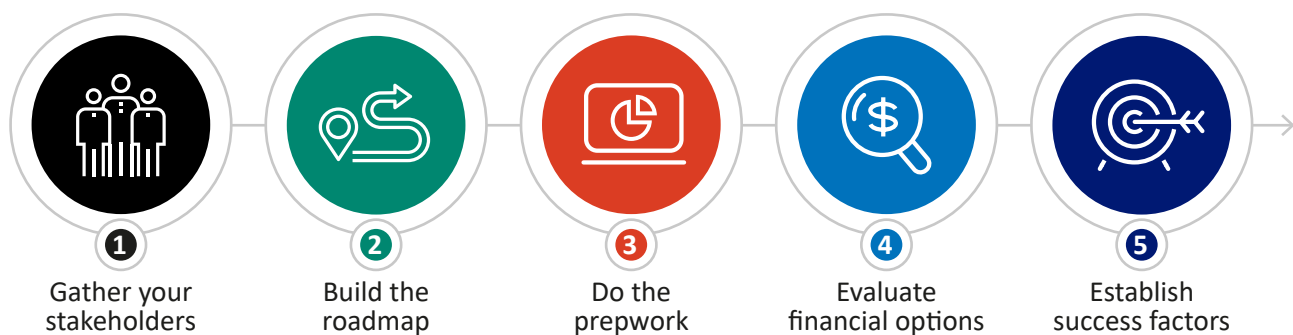
Key factors

Five key staging posts

Journeys to the edge can yield many powerful outcomes. However, this year's enterprise research indicates that gaining an edge advantage

requires passage through five key staging posts (see Figure 10):

Figure 10: Staging posts to the edge advantage



Source: Omdia

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“ Know your use case – don't try to fit a square peg into a round hole. Bring all the stakeholders and partners together on one table. ”

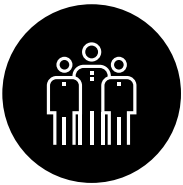
Financial services firm



“ Companies get into trouble not doing due diligence on their own operations because there are different facets of these and often different siloed methodologies in play. ”

Manufacturing firm





1: Gather stakeholders to identify need

Ensure that on-the-ground beneficiaries are part of edge solution design. In an ideal scenario they have advocated for a requirement that an edge solution can satisfy. Their intimate knowledge of your processes and areas of friction are critical to identify, champion and validate use cases. Not least, they can be the roadblock that stops your project dead (see Figure 11). Old-fashioned time-and-motion observation of people at work can be powerful to identify problem areas that edge can address. Constructive and collaborative dialogue is required.

“Agreeing the use case isn’t an IT project, it’s a joint effort.”

Healthcare group

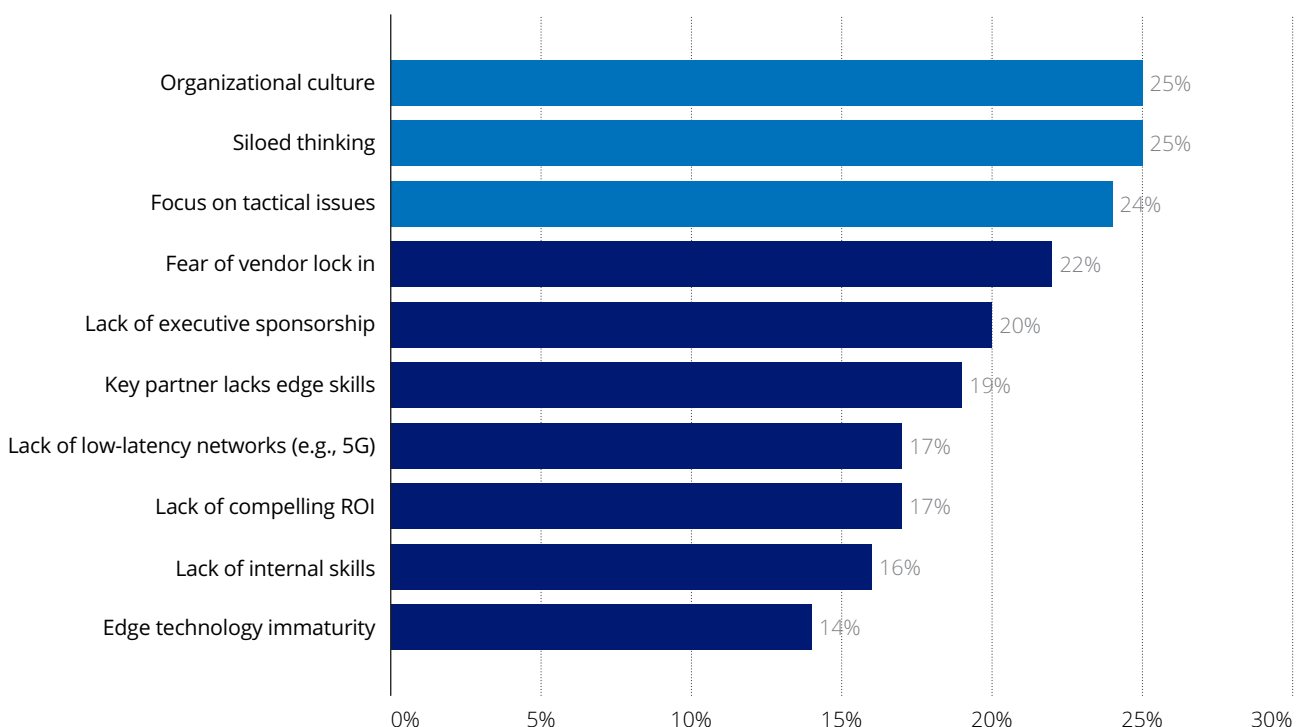


2: Build the roadmap

Build a roadmap identifying short, medium and longer-term objectives. Quick wins can build confidence for additional deployments in other sites and other departments. Ensure that the roadmap aligns to broader business objectives, rather than promoting a technology.

Case evidence: Creating a roadmap to become a smart hospital/caregiver is the top-line objective for a large health group interviewed. The CIO stressed that defining the roadmap could not be a technology project – it had to be a joint effort with employees. A discovery workshop yielded several sub-projects now implemented using edge. A short-term objective was deploying sensors to monitor patient movement in care homes. The health group is deploying real-time face recognition for security and access control. Improving diagnostic data distribution to health professionals’ devices on and beyond hospital grounds is underway, and the health group is exploring AI tools for faster diagnostics.

Figure 11: Biggest barriers to edge adoption in organizations



N=621

Source: 2023 Omdia NTT Edge Advantage Survey

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3: Do the prep work

Seizing the edge advantage requires preparation – organizationally, operationally, and technically. Many enterprises cited problems with technical debt rendered them unable to proceed. Several enterprises in this year’s research recommended an audit of both data and network architectures. Understanding in-house data types, current data architecture and application performance needs were important tasks to deploy edge solutions effectively. Others stressed the importance of refreshing their wide-area network to deploy edge solutions. Several noted that a traditional hub-and-spoke network configuration is no longer fit for purpose. MPLS networks are too rigid compared to the flexibility of SD-WAN. Together with edge computing, SD-WAN could support the low-latency application performance critical for some use cases. With a refreshed WAN, these firms were now turning their attention to improving their campus and LAN environment.

Case evidence: A logistics firm found that edge computing and SD-WAN was a necessary progression to become a truly real-time operation, enabling location reporting of worldwide goods to their customers. It is now activating a new warehouse trialling private 5G that could become a blueprint for how warehouse operations will run across this global organization in future: Within the building, robots perform packing and unpacking, and their activity is seamlessly integrated with a warehouse management system to maximize space utilization without compromising safety.



4: Evaluate financial options

Consider the benefits and risks of a capex versus an opex-driven investment. Will owning and managing assets (such as servers and radios) for the edge solution drive to expected objectives faster and more efficiently? Importantly, do you have all the relevant skills in-house to keep the solution in optimal shape? As edge solutions become more complex, enterprises are increasingly interested in finding expert partners with comprehensive skills to take over more tasks on their behalf. Consumption-based models are also gaining favor as an efficient method of cost/benefit management, according to this year’s research.

Case evidence: An electronics manufacturer noted it is a just-in-time operation for manufacturing, inventory and distribution management. Therefore, it made sense that its partners could contract in a similar way – if this did not compromise their SLA commitments.



5: Establish success factors

Explore supplier willingness to speak your language and deliver against the key metrics that drive your business. Are they interested in understanding how to align their activities to outcomes that matter in your operations?

Case evidence: A mining company highlighted a partner that offered a no-capex approach to improve the business by deploying a private 5G network and edge. The partner argued that the proposed solution would improve the mining company’s load variability rate. To deliver on that claim, the partner offered to fund, install, and operate the infrastructure, in return for 30% of any incremental profitability achieved because of the deployment.

Final thoughts

The edge advantage is real – and it is here and now

Enterprises are deploying edge to address urgent and specific business needs. The vast majority of deployments are achieving real benefits, and some are exceeding enterprises' expectations. Enterprises can see how edge increases performance, delivers new capabilities, and/or reduces risk.

Journeys to the edge can start at any pace

Enterprises start the journey with anchor applications that address their most pressing needs – process automation, real-time data access or better security – then usage spreads to more locations, departments, and applications.

Enterprises don't go it alone

Nearly all enterprises work with expert partners to design, deploy and manage some, most, or all of their edge. Increasingly, enterprises want to work with fewer partners that bring wider skillsets.

Appetite for edge is growing

Whether it's a one-off snackable edge deployment for an ad-hoc use or part of a wide-scale digital transformation, edge is adapting to enterprises' consumption preferences. This is true both operationally and commercially: Edge as a Service is emerging as an attractive choice, putting enterprises in control operationally and financially, empowering them to focus on delivery of what really matters: business results.



Further information

Explore Edge as a Service with NTT

NTT's Edge as a Service portfolio delivers solutions on-premises or "at the enterprise edge" by packaging IoT applications and devices for enterprise operations, private 5G networks to enable secure, fast mobile connectivity for applications and devices, and edge computing to collect, process, and analyze applications and device data and to enable predictive performance results.

For more information:

[NTT's Edge as a Service](#)
[Customer case studies](#)

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