The business value of data is unleashed at the edge

How to plan your edge infrastructure for maximum business impact

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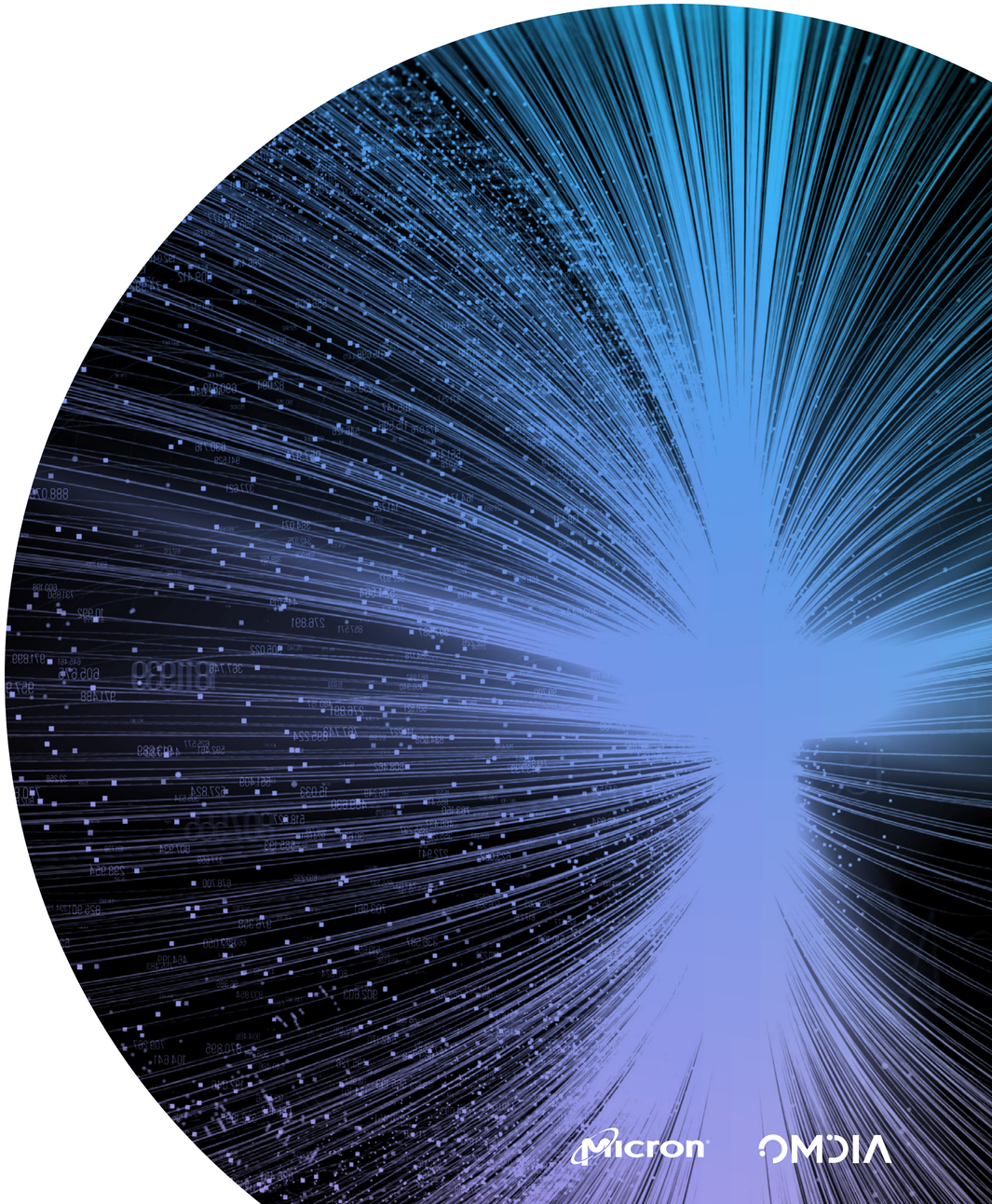
Micron

Catalyst

Over the last two decades, the global computing demand has continued to accelerate as businesses embraced digitalization, reaping the commercial benefits of new software technologies and virtual collaboration. A new wave of opportunity is upon us as the availability of connectivity and intelligent devices at the edge is expanded and democratized. Edge computing and 5G are actively enabling the implementation of new business processes at locations where computing devices could have never been placed before like the middle of an agricultural field, a fish farm in the middle of lake or a remote oil extraction site.

At the same time, the nature of devices and applications is changing. The collection and real-time processing of data is increasingly important. As a result, latency and bandwidth are becoming key performance determinants and are driving the need for more computing power to be placed closer to end users and machines. Security and data volume are also factors that can influence end users to place more of their servers at the edge.

In this report we discuss the factors and strategies that can help companies extract the maximum business value from deploying edge infrastructure. The key focus for IT teams should be matching the computing and edge resources at the edge to their workloads and ensuring that equipment configuration considers requirements for memory capacity and bandwidth, storage capacity and durability, processing power and I/O throughput. Our research shows that data-intensive workloads at the edge are growing the fastest, which makes the first two determinant key to maximizing the value of edge computing.



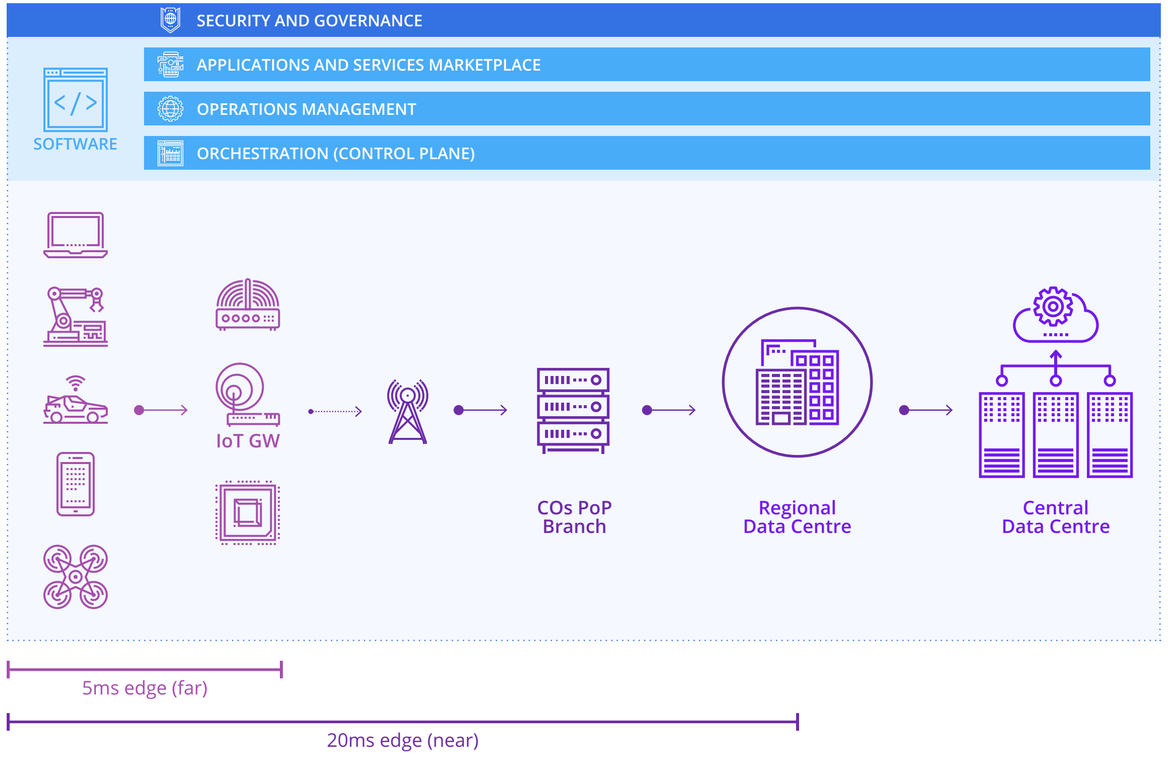
The fogginess at the edge

A key challenge for IT decision makers has been navigating the proliferation of computing and storage options and business models. This is particularly true of edge computing. After researching this space in depth for several years, Omdia found that there are no commonly accepted set industry practices, edge computing definitions or taxonomy.

Defining the edge

To create a specific definition, Omdia has chosen to segment computing locations based on latency or round-trip time (RTT) to the end user device, or machine. We define the edge as locations with maximum 20 milliseconds (ms) RTT. Edge locations can be further subdivided as those less than 5ms from the end user device or machine (far edge) and those between 5ms and 20ms from the end user or machine (near edge). Omdia differentiates between communication service provider (comms SP) edge, cloud edge and enterprise edge. The comms SP edge includes cell towers, central offices (COs) and regional DCs, as well as leased space in colocation provider data centers (DCs). The cloud edge includes leased space in colocation provider DCs, including small point-of-presence (PoP) infrastructure deployments. The enterprise edge includes branch offices, industrial locations, regional DCs and leased space in colocation provider DCs.

Omdia's edge computing frameworks



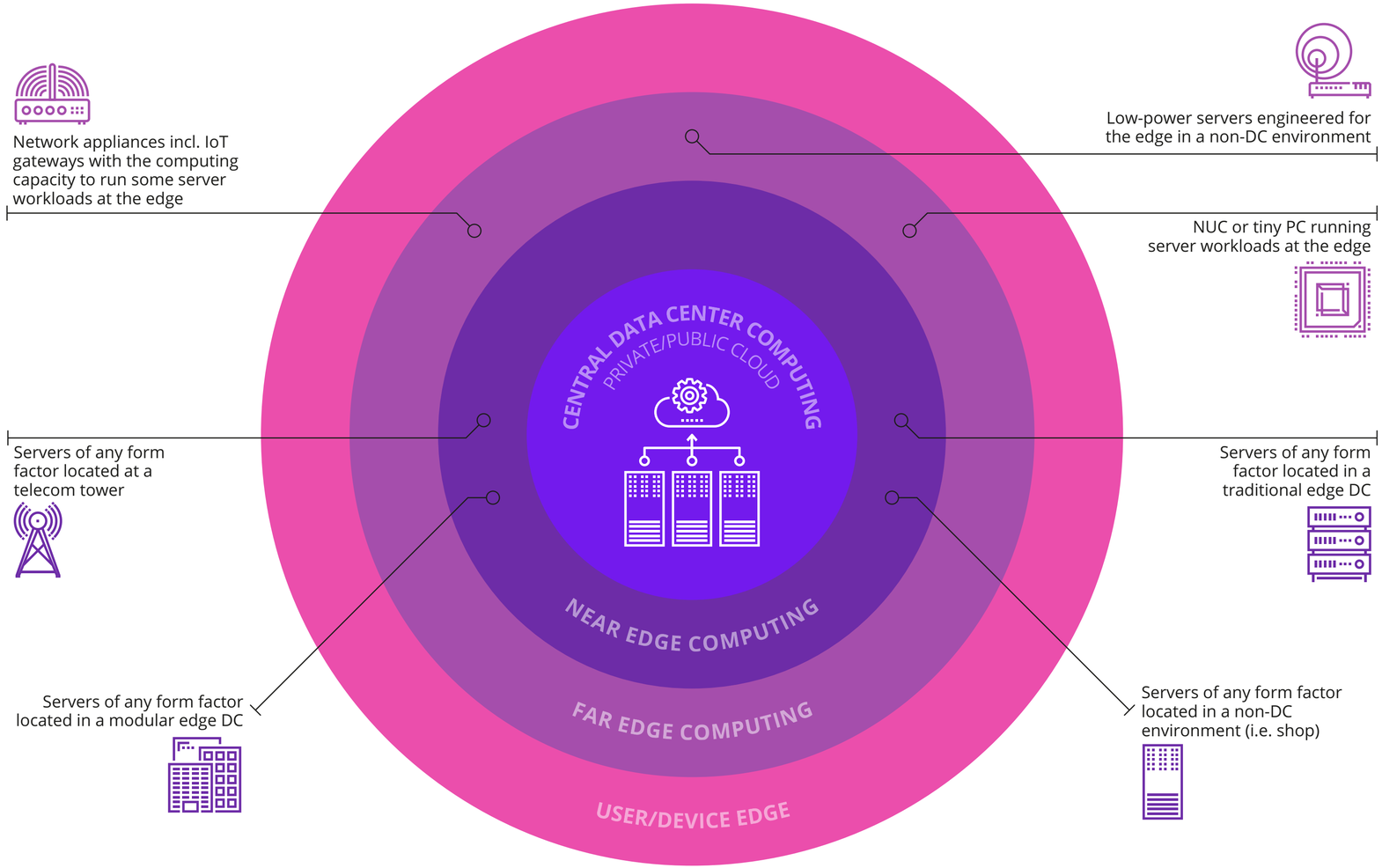
SOURCE: OMDIA

An abundance of edge solutions

Computing, storage, and networking options have proliferated so much over the last decade that simply defining the edge as a low-latency location is no longer enough. Businesses looking to launch new services or optimise application performance, security, or cost by deploying computing resources at the edge need to bear in mind that there are multiple ways forward. Any of the below options can enable a 20ms RTT between compute and edge device, user, or machine.

- Many cloud and colocation data centers are in close proximity to edge location. This is particularly true in metropolitan areas around the globe. If latency is a priority concern, these data centers might offer a low enough RTT to the edge device. This is has prompted voices in the industry to coin the phrase “the cloud lives at the edge”. IT decision makers should verify the latency of the cloud computing and storage services available to them.
- Depending on the edge location, traditional servers and storage fit the bill. It’s important to note that there is no minimum-size when it comes to edge computing deployments. Omdia has seen deployment size range from a singular server to multiple racks, depending on computing requirements. Hyperconverged infrastructure (HCI) deployments at the edge often start with a singular server node, providing both computing and software-defined storage, with end-users adding extra nodes or storage expansion when they’ve fully utilised the first node.
- Where a building does not exist or is not available close by, a modular or micro data center might be a good alternative. These can include ready-built and custom-built data centers or several racks or can be a singular rack, equipped with backup power, cooling, fire suppression, etc. Omdia has seen the popularity of modular data centers increase over the last two years, with increasing availability of off-the-shelf solutions enabling lower lead times and cost.
- There are server form factors optimised for outdoor environments or hot, dusty places like ships and factories. Whenever an application requires the computing resource of a singular server and in-server storage is sufficient, these can be a cost-effective option for IT teams. Omdia tracks server form factors with integrated wireless connectivity which can operate from via cellular connectivity. The recent disaggregation of HCI hardware and software has enabled end-users to virtualize the computing and storage resources of such servers to enable multiple applications to efficiently operate on that singular device.
- Network appliances have evolved with new blade form factors enabling the addition of compute and storage nodes. Similar to the tiny PCs, these can be configured with high-capacity SSDs to maximise the storage in a small-footprint device.

The new edge device ecosystem



SOURCE: OMDIA

It is important to note that as device types at the edge have proliferated, so have the business models and go to market strategies of equipment vendors. As-a-service options have grown significantly with traditional IT equipment vendors like HPE, Dell EMC and Lenovo offering their servers and storage on a pay-as-you go model. Similarly racks of servers and storage owned, configured, and managed by cloud service providers can be a place on a company's premises to enable access to low-latency computing.

Regardless of the IT equipment form factor, location, or business model it is being deployed under, the key determinant of successful edge computing deployment is equipment configuration:

- Memory capacity and bandwidth
- Storage capacity and durability
- Processing power and processor combination
- I/O throughput

The first two determinants have been front of mind for IT teams as more applications have become constrained by the sheer amount of data they need to take into account to provide maximum end-user value.

The business value of data

Data-intensive workloads are growing the fastest

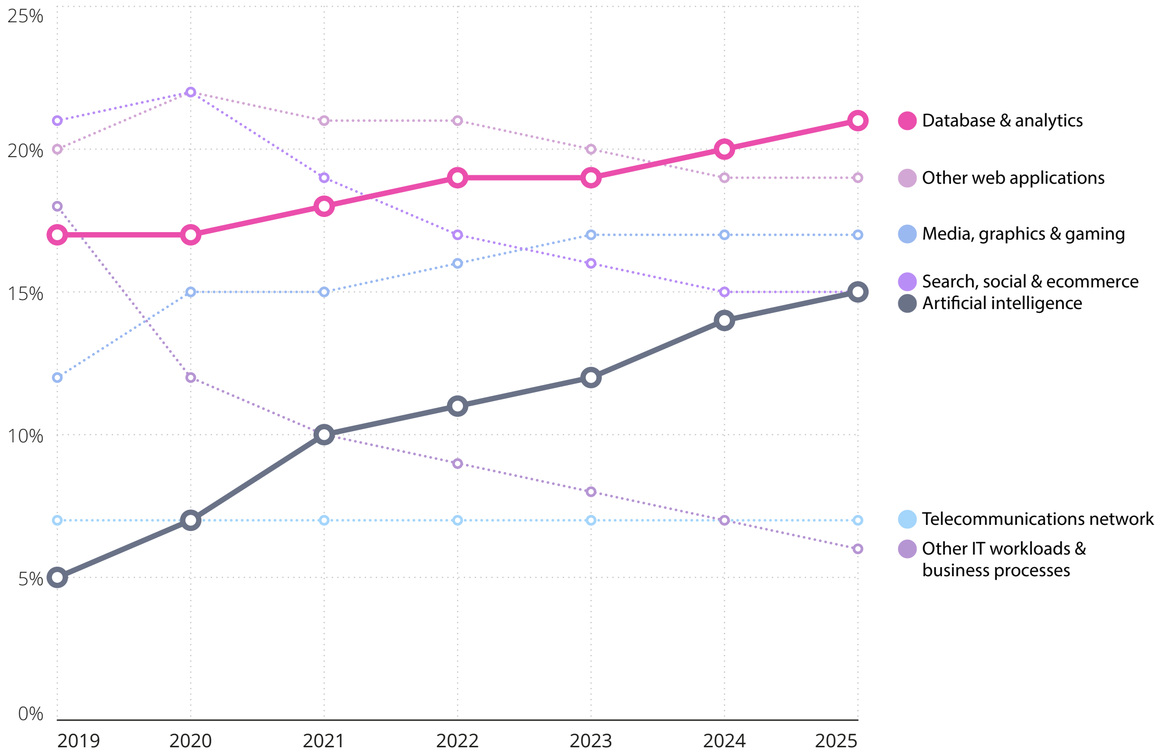
Database & analytics and artificial intelligence (AI) are two of the fastest growing workload groups globally because they're giving companies a competitive advantage by:

- Enabling process optimization and new product creation, which in turn helps companies differentiate and compete more successfully
- Offloading teams of repeatable and even occupationally hazardous tasks, and in the current environment helping cope with staffing challenges

While data-intensive workload proliferation is true for all computing environments, growth at the edge is particularly significant in terms of unlocking new business value. Edge computing is not new for many enterprises, but the adoption of advanced data analytics and AI is still in its infancy. Many of the companies Omdia have spoken to began their edge computing journey by deploying process automation first and data analytics second, as exemplified by the case studies we explore later in this report.

Any edge computing exploration project should include an assessment of new software applications which can enable companies to address the points above. In Omdia's experience, data is key for the successful extraction of new value or operation of new software applications or devices.

Global server shipments by workload group



SOURCE: OMDIA

Storage and memory innovation will enable better performance for data-intensive applications

A distinct focus on innovation in memory and storage has been clear in the cloud and data center industry. Vendors have introduced higher capacity, higher bandwidth, and higher reliability flash over the last years. Micron's recent introduction of 232-layer NAND enables 100 percent more write and up to 77 percent higher read bandwidth than prior generation 176-layer NAND. Importantly the denser NAND enables more capacity at a smaller footprint, solving a major space constraint issue at the edge.

Micron also announced improvements in its memory technology with its new generation 1-beta memory, providing more than 35% higher capacity per die than its prior generation. The new memory also has 8.5Gbps data rate and uses 15% less power compared to prior generation devices. The technology, shipping to smartphones today, will be a significant enabler of performance improvement for data-intensive applications like real-time analytics and AI.

The software ecosystem enabling lower cost enterprise storage has also been ripe. Software-defined storage (SDS), deployed at scale by cloud service providers, continues to grow in the enterprise. It can be a cost-saving option for end-users as it provides built-in automation and orchestration for the provisioning and scaling of storage. SDS hardware can also help end-users decrease cost as it can be bought from any vendor and is interoperable with various SDS software choices. This allows end-users to hunt around for different options, increases their bargaining power with hardware vendors and allows for a multi-vendor sourcing strategy. Whenever application performance is defined by the availability of fast SSD storage, utilizing SDS to save costs without compromising on components can be a winning IT strategy.

Innovation in interconnection technology is also ripe and Omdia is actively watching the emerging Compute Express Link (CXL) interconnect. Semiconductor vendors have united around CXL enabling better composability of IT equipment and, importantly, memory pooling. The performance of data-intensive applications is often impacted by memory bottlenecks, CXL can expand the memory available to an application beyond the physical compounds of the server where the application is being processed. For the edge, where companies typically deploy a smaller number of servers, this ability to pool resources can enable application performance assurance and better utilization across the deployed server fleet.

End-user stories

Private 5G and computing at the edge creates new value in the supply chain

Approximately 40% of US GDP flows through the Utah Inland Port Authority (UIPA). Some of the US's busiest ports (Los Angeles, Long Beach, Oakland) rely on UIPA to transfer cargo in and out of inland markets. Tracking the flow of cargo across the 16,000-acre port authority was becoming an increasing challenge exacerbated by extremely climate and challenging terrain.

5G + IOT DEVICES + SERVERS AT THE EDGE

UIPA deployed IoT-based sensors and gauges to monitor truck and rail movement, connected to servers at the edge with a private 5G network. It relied on the help of multiple external partners and required the compute and network to have a high degree of autonomy.

REAL TIME DECISION MAKING REDUCES CONGESTION AND IMPROVES SUSTAINABILITY

The edge computers process data from the sensors and gauges in real time benefiting from low latency. This has enabled logistics operators within the port's ecosystem to see the movement of every container. The new capability has prepared UIPA for both seasonal cargo surges and the future integration of autonomous vehicles in the supply chain. It's also enabled them to better prioritize rail routes, reducing the carbon footprint of the ecosystem dependent on the UIPA.

NEXT – MINIATURIZE AND MULTIPLY

Today the edge-based servers and storage UIPA uses are housed in a mobile trailer. Its intent is to shrink the compute and storage footprint by relying on new technologies like denser processors and high-capacity memory and SSDs. Once it optimizes its edge hardware it intends to multiply deployments to potentially hundreds of locations. These would support thousands of sensors, cameras, and gauges.

5G and edge servers enable video analytics

Sinkaberg Hansen is a large Atlantic salmon fishery, operating off the cost of Norway at the remote island of Gjerdinga since 1977. Aquaculture is a significant industry in Norway, where climate and natural conditions make it an ideal location for fish farming. The country is the world's largest producer of Atlantic salmon, but also farms rainbow trout, mussels, Atlantic halibut, and other aquatic species.

AN INDUSTRY OF SCALE TROUBLED BY UNSOLVED CHALLENGES

A fish farm of 1 million salmon can be managed by just a few farmers who handle the daily feeding and ensure the overall well-being of the salmon. Like most farmers in Norway, Sinkaberg Hansen operates a central feeding system with tubes to deliver feed to the fish in their cages. This is already monitored by camera placed near the cages to help farmers determine when to start, adjust or stop feeding.

The challenge is that the lack of light, water reflection, short daytime in Norway and low-resolution camera prevents farmers from getting a clear picture during the feeding process which can result in feed waste or underfeeding.

VIDEO ANALYTICS TO THE RESCUE

Sinkaberg Hansen deployed high resolution cameras connected to edge servers to process data locally, at their fish farm. The connection relies on a virtual 5G network built by a local communication service provider. The network enabled high uplink speeds required to transfer the fish farm's video streams to the edge servers with very low latency, allowing farmers to take actions immediately.

The farmers at Gjerdinga now have a clearer view of the feeding process, fish behavior and the environmental status of the cages. Importantly the solutions will enable Sinkaberg Hansen to deploy more cameras as their business grows and if they opt to deploy other applications in the future.

Cinema chain deploys HCI at the edge

Kinepolis Group is a Belgian cinema chain with 50 cinemas located across Europe (Belgium, France, Spain, Luxemburg, Switzerland, the Netherlands, and Poland) and 44 cinemas in Canada. Kinepolis deployed compute in one central data center and across 22 remote cinemas but found that it could not support all its locations from its central data center because of latency challenges.

BUSINESSES REQUIRE 24/7 LOW-LATENCY COMPUTE AT LOCATIONS WITH NO IT STAFF

High availability and disaster recovery were central IT environment design requirements because applications core to Kinepolis' business—such as ticketing, food and beverage sales, and climate control—must run 24/7.

A key requirement for Kinepolis is that they have high-performance storage and computing that can be from a central location to save IT resources. It was also paramount that the equipment and software at each edge location be provisioned, monitored, and orchestrated remotely from Kinepolis' central IT office in Belgium.

MANAGEMENT AND MONITORING SOFTWARE MAKE ALL THE DIFFERENCE

The cinema chain deployed HCIs at 22 theatres in Europe and started using remote provisioning, management, and monitoring software to ensure the robust operations of the edge equipment.

DATA ANALYTICS IS NEXT

Kinepolis shared plans to add new all-flash HCI nodes at the edge to run SQL workloads as it increases its use of data analytics. As it assesses the deployment of further HCI nodes, a key factor the cinema company is considering is the configuration of the equipment, to ensure that their analytics platform is not constrained by storage and memory capacity and bandwidth.

Notably, as Kinepolis no longer needed to hire IT specialists at all remote sites, it was able to deploy IT staff to work on more strategic projects, creating extra business value.

The value of AI at the edge and an optimal configuration

A North American communications company which operates in different sectors from cable TV to wireless wanted to increase its operational effectiveness and efficiency. The company generated over $45 billion in revenue in 2019 and manages 300+ million wireless devices, 27 million broadband internet customers, 16 million video subscribers, and is in 52 million US homes in 41 states.

THE CHALLENGE OF GAINING INSIGHTS FROM DATA

The wireless network operations team was facing a significant set of challenges with being able to support its growing customer base. The team contracted 130 network support engineers to support their business on a completely reactive basis. The wireless network operations team was drowning in data but was unable to gain insights from this data because it was all in different formats and needed to be 'cleaned', tagged, and loaded into a data repository.

AI MADE SOLVING THE EXTRACT, LOAD, AND TRANSFORM (ETL) CHALLENGE PRACTICAL

The data gathered by the wireless team was a mixture of telemetry data and customer data, each with different retention periods and privacy settings. The previous approach to ETL took up to ten days for a single data set. This was of little use as by the time the data was available to be analyzed it was out of date, and some of the data was missing due to data retention policies. The use of AI techniques was core to the automation of ETL, helping with the classification of unstructured data.

THE BENEFIT OF MOVING COMPUTE CLOSE TO THE DATA

Initially the network team turned to the cloud and used general purpose CPUs and HDD storage to perform the ETL, which took ten days to train on a single data set. Realizing they needed a new approach they invested in edge-located servers configured with co-processors, high bandwidth memory and NVMe SSD storage.

UNLOCKING UNEXPECTED VALUE

The project's initial aim was to improve the operational efficiency and to deliver added value to the company's customers by improving the service quality. It was able to reduce the number of contracted third-party engineers from 130 down to 30.

The process for extracting, loading, and transforming data became real-time and 97.5% automated, compared to ten days and fully manual. The combination of these enables the wireless network operations team to provide proactive support to customers that drives improved customer satisfaction.

Beyond the operations improvements, the company was able to start providing proactive information to its customers and local government during natural disasters. It also enabled quick identification of problem hotspots so communications can be re-established quickly.

Bottom line

Most enterprises are already digital, but edge computing holds the key to unlocking new business value in what is a challenging macroeconomic environment. Harnessing the power of connected devices and data at the edge can enable significant process optimization and new product creation. This can in turn drive differentiation and competitive advantage. Edge computing can enable the use of new process automation, offloading teams of repeatable and even dangerous tasks, and in the current environment helping cope with staffing challenges.

Key to maximizing the value of edge computing is ensuring optimal application performance. This requires the right configuration of edge infrastructure. Many of the high-growth applications share one commonality – they are data-intensive and require high capacity and high bandwidth memory and storage.

Omdia recommends that enterprises:

1. Carefully evaluate new software applications which can unlock new business value.
2. Assess what compute, memory and storage resources are needed for optimal application performance.
3. Pinpoint where data is accumulated and how much of the workflow depends on moving that data.
4. Look at striking a balance between infrastructure configuration, design, and supplier. Beware of the proprietary storage array trap. Multi-vendor SSD-based software-defined storage solutions can cost the same as single-vendor traditional HDD-based storage arrays.

Appendix

About

Micron

We are a world leader in innovative memory solutions that transform how the world uses information. For over 40 years, our company has been instrumental to the world's most significant technology advancements, delivering optimal memory and storage systems for a broad range of applications.

We deliver comprehensive customer collaboration, support, and quality throughout the product lifecycle and around the world.

For more information visit: **www.micron.com**

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Omdia

Omdia is a global technology research powerhouse, established following the merger of the research division of Informa Tech (Ovum, Heavy Reading, and Tractica) and the acquired IHS Markit technology research portfolio*.

We combine the expertise of more than 400 analysts across the entire technology spectrum, covering 150 markets. We publish over 3,000 research reports annually, reaching more than 14,000 subscribers, and cover thousands of technology, media, and telecommunications companies.

Our exhaustive intelligence and deep technology expertise enable us to uncover actionable insights that help our customers connect the dots in today's constantly evolving technology environment and empower them to improve their businesses – today and tomorrow.

*The majority of IHS Markit technology research products and solutions were acquired by Informa in August 2019 and are now part of Omdia.

Methodology

The Technology team at Omdia is the leading source of information, insight and analytics in critical areas that shape today's technology ecosystem—from materials and components to devices and equipment, to end markets and consumers. Businesses and governments in more than 150 countries around the globe rely on the deep market insight we provide from over 300 industry analysts in technology sectors spanning IT, telecom, media, industrial, automotive, electronics, solar and more.

What sets Omdia's Cloud and Data Center Research Practice apart is our team of technical, experienced analysts, and our end-to-end coverage of the industry.

- The 10 lead analysts that are the main contacts for our clients all have been in the industry for over a decade, have a technical background and a strategic mindset. This gives us the confidence to say that we have the experience, training and skills needed to effectively help you connect the dots, see all perspectives, and stay ahead of disruption. The 10 lead analysts are supported by a large team of primary and secondary research experts, data scientists and specialists. We're also more global and diverse than ever, located in 4 countries, across 6 time zones, communicating in 10 languages.
- Our unique data points/perspective include the physical aspects of the data center (IT enclosures, backup power, cooling, modular DC construction) and a detailed view of DC IT (servers, storage, networking, operations, and development software), including who is shipping and who is buying DC equipment, as well as, where they are placing it (centralized vs. edge location). We've also built a comprehensive view of the cloud and colocation services ecosystem including service provider investment in IT equipment and DC buildout. Our rapidly growing portfolio of primary research is also helping us provide end-user perspectives and what is impacting their purchasing decisions. In fact, it is hard to list all viewpoints our team can provide.

The quantitative and qualitative data used for the completion of this report is based on Omdia's Data Center Compute Intelligence Service.

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The Omdia team of 400+ analysts and consultants are located across the globe

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