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VERTIV EBOOK

What Is IoT Edge Computing?

Edge vs. Cloud vs. Fog Computing

What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Devices

Edge vs. IoT Devices

What Are the Advantages of Edge Computing for IoT

Conclusion and Resources

VERTIV

VERTIV EBOOK

What Is IoT Edge Computing?

Edge vs. Cloud vs. Fog Computing

What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Devices

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What Are the Advantages of Edge Computing for IoT

Conclusion and Resources

VERTIV

VERTIV EBOOK

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What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Devices

Edge vs. IoT Devices

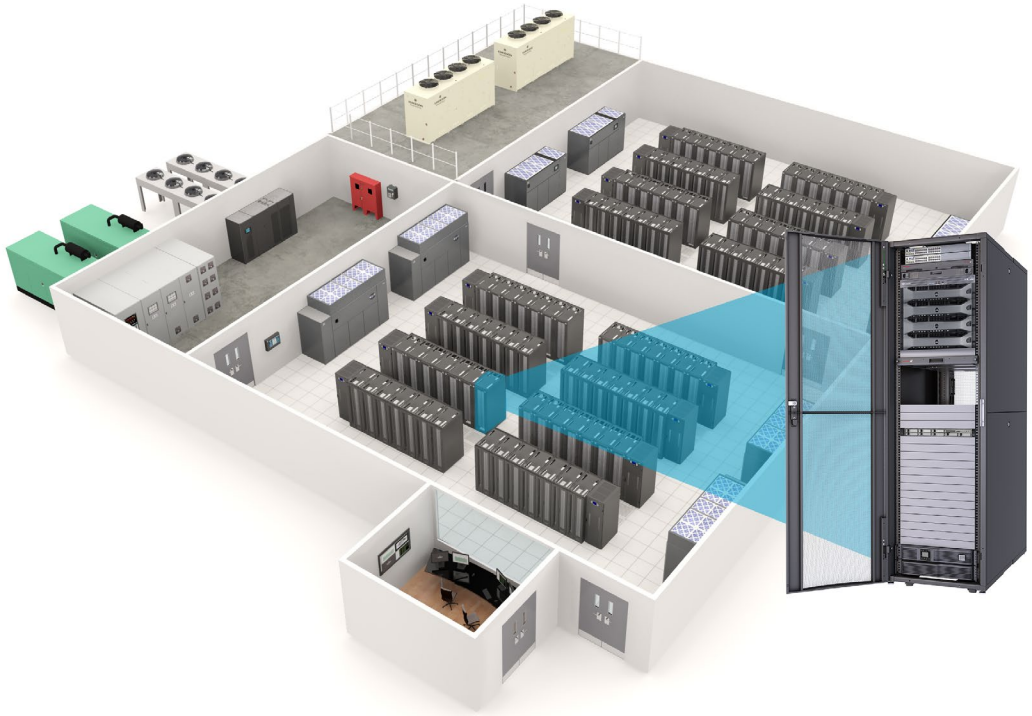
What Are the Advantages of Edge Computing for IoT

Conclusion and Resources

What Is IOT Edge Computing?

No matter the industry in which you operate — retail, healthcare, manufacturing, education, telecommunications, or anything else — the work you do is increasingly facilitated by IoT edge computing. This essentially means that you are using Internet of Things (IoT) applications or IoT devices, otherwise known as smart devices, that collect, send, receive, and analyze data. These IoT devices could be anything from sensors on machines or people to smartboards to any piece of hardware in your work environment connected to the internet or your IT network.

The large amounts of data being gathered and transmitted by these various IoT devices have to be analyzed and processed somewhere, and that's where edge computing comes into play. Imagine if all that data had to travel back to a company's central data center for processing, then be sent back to the devices for consumption. It would take some time. As businesses and people increasingly rely on and expect access to real-time data to make decisions and get work done in the moment, companies must move computing and storage closer to customers, associates, and devices so they can process data locally. This improves the users' experience and allows people to immediately benefit from what the data is telling them. Thus, the network edge continually grows and expands.



VERTIV

VERTIV EBOOK

What Is IoT Edge Computing?

Edge vs. Cloud vs. Fog Computing

What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Devices

Edge vs. IoT Devices

What Are the Advantages of Edge Computing for IoT

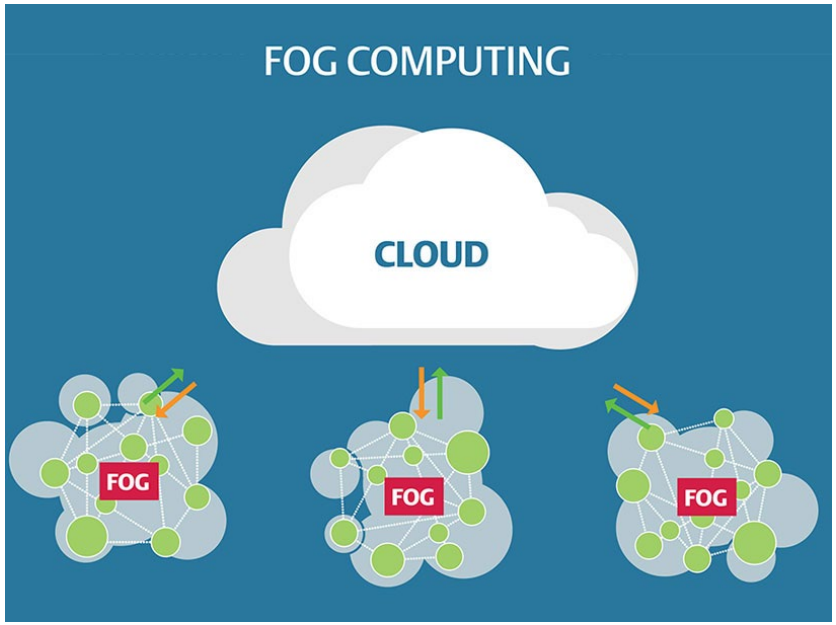
Conclusion and Resources

Edge vs. Cloud vs. Fog Computing

Edge computing is closely related to cloud computing and fog computing concepts.

Although the concepts overlap, they are distinct. It's easy to understand how they differ by simply identifying their common themes:

- All three concepts refer to distributed computing and concentrate on the physical deployment of compute and storage resources in relation to data produced.
- The differences lie in their location.
  - While edge computing is closer to the data source leading to higher speeds and lower latency;
  - Cloud data centers house more powerful machines than those deployed at the edge, thereby offering better scalability on larger datasets;
  - Finally, fog nodes can bridge this gap by combining features from both ends - being device-centric as well as providing strong computational power for analytics purposes.



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VERTIV EBOOK

What Is IoT Edge Computing?

Edge vs. Cloud vs. Fog Computing

What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Devices

Edge vs. IoT Devices

What Are the Advantages of Edge Computing for IoT

Conclusion and Resources

What Is the Network Edge?

The network edge is distributed IT deployed where the data is consumed — in **retail stores**, **medical clinics**, **branch offices**, **university campuses**, manufacturing plants, or home offices, to name just a few examples.

The problem is that IoT edge computing presents many challenges for companies and data center managers. When a company's centralized data centers or core data centers are planned and built, the data processing facilities are specifically constructed around the needs of mission-critical IT equipment and devices. Power, thermal management, security, and access are all fully taken into account well in advance of constructing the data center facility where servers and the foundation of the company's IT backbone will live.

But that is rarely the case with IoT edge computing sites. Rather, companies use whatever space they have available to serve as their network and edge computing architecture. It could be an unused office, a back room, or even a storage closet. Obviously, these spaces aren't really set up to accommodate the power and cooling needs of servers and the other edge computing devices needed to process data and ensure companies can reliably and securely meet the increased digital demands being placed on their businesses every day. That's why companies need **edge infrastructure** built for IoT edge computing.

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VERTIV EBOOK

What Is IoT Edge Computing?

Edge vs. Cloud vs. Fog Computing

What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Devices

Edge vs. IoT Devices

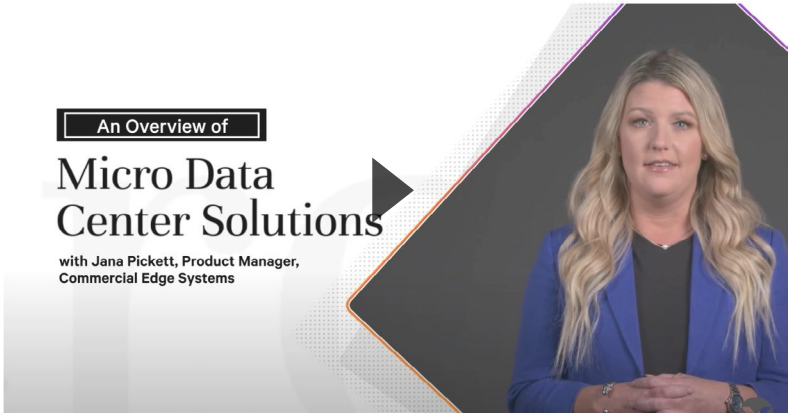
What Are the Advantages of Edge Computing for IoT

Conclusion and Resources

Benefits of Standardized Edge Computing Architecture

While each edge site's performance, environmental, physical location, and form factor challenges are unique, so are each company's scale, speed, and IT complexity requirements. Given the rapid rate of digital transformation today, solid IT infrastructure needs to be quickly deployed in remote locations as efficiently as possible.

Micro data centers are integrated data centers or self-contained rack solutions, that power, cool and monitor your system to ensure your business is always up and running. They offer power protection and distribution, cooling and intelligent, outlet-level monitoring where you need it when you need it. And because every situation comes with unique constraints and specifications, many pre-built micro and micro modular data center options can be designed to meet your specific needs and then standardized across multiple edge data center locations. Micro data center designs are also built for rugged industrial conditions like factory floors, which offer a secure enclosure protecting sensitive equipment from particulates and unauthorized access.



What is a micro data center? Easy to deploy and requiring a minimal footprint, these integrated data centers, or self-contained rack solutions, power, cool and monitor your system to ensure your business is always up and running.

VERTIV

VERTIV EBOOK

What Is IoT Edge Computing?

Edge vs. Cloud vs. Fog Computing

What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Devices

Edge vs. IoT Devices

What Are the Advantages of Edge Computing for IoT

Conclusion and Resources

What Are IoT Edge Computing Devices?

In the world of the Internet of Things (IoT), data storage and processing are critical components for connected systems. Devices that collect and transmit data can either send it directly to the cloud or an edge device for processing and instruction. This decision is based on parameters that dictate the optimal course of action. M2M systems allow for multiple connected devices to perform tasks as instructed by an edge computing device or a network. A router can facilitate control of data flow through extended access to devices and provide greater visibility and actionable insights, both locally and over larger distances. One of the key components of IoT edge devices is their ability to trigger a response from an actuator. The synergy between sensors, actuators, and edge computing devices provides visibility and the capability to act over long distances, which is critical in IoT systems. This results in an interconnected ecosystem where data is analyzed and actions are taken automatically. Thus, IoT edge devices are critical components that enable efficient communication, processing, and management of data flow in modern connected systems.

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VERTIV EBOOK

What Is IoT Edge Computing?

Edge vs. Cloud vs. Fog Computing

What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Ddevices

Edge vs. IoT Devices

What Are the Advantages of Edge Computing for IoT

Conclusion and Resources

Edge vs. IoT Devices

IoT edge computing relies on both edge devices as well as IoT devices, and some devices may have the same terminology. A computer or other device may become an edge resource if it processes data locally or makes low-latency decisions. Also, edge devices can be considered IoT devices if they have sensors that can generate raw data.

Edge

IoT

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VERTIV EBOOK

What Is IoT Edge Computing?

Edge vs. Cloud vs. Fog Computing

What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Ddevices

Edge vs. IoT Devices

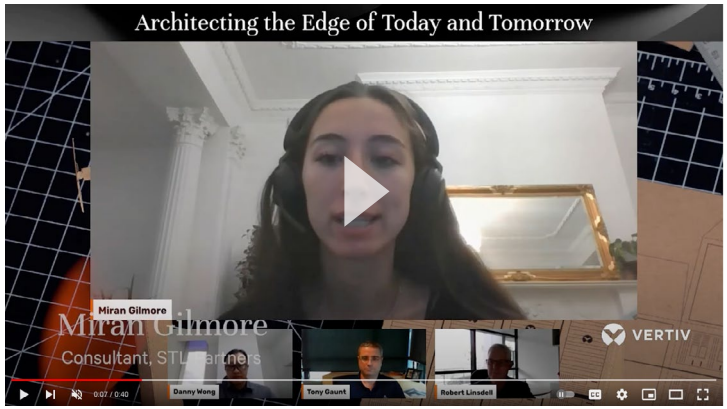
What Are the Advantages of Edge Computing for IoT

Conclusion and Resources

What Are the Advantages of Edge Computing for IoT?

Edge computing offers several advantages for businesses implementing IoT applications. Business owners can rely on consistent connectivity even if cloud services are compromised by utilizing local edge data centers for data storage and processing. Data processing near or at their source reduces data transmission time for central locations and reduces server and resource usage resulting in improved network performance – a key pillar of business continuity. **Edge sites** share key characteristics that help determine equipment selection and architecture decisions, allowing IT infrastructure solution providers to offer integrated and prefabricated edge architecture solutions.

These options include prefabricated racks, rows, aisles, and modular data centers that can help companies standardize design and systems across multiple edge sites while streamlining deployment times and reducing the costs to implement, manage, and replicate their computing resources. Solutions built specifically for edge deployments often integrate rack space, power, cooling, and monitoring in one package. They are typically available in several configurations, sizes, and capacities, with enough options to give companies the flexibility to meet specific needs. Yet, they still dramatically simplify the infrastructure selection process. It can be a simple matter of plug and play to realize the many benefits of IoT edge computing anywhere and everywhere your network is expanding.



Miran Gilmore from STL Partners talks about the huge value of #edgecomputing to today's businesses as the number of edge sites continues to grow.

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VERTIV EBOOK

What Is IoT Edge Computing?

Edge vs. Cloud vs. Fog Computing

What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Ddevices

Edge vs. IoT Devices

What Are the Advantages of Edge Computing for IoT

Conclusion and Resources

Advantages of Edge Computing

Reduced Latency

Workloads are processed at the source, speeding processing timeframes.

Greater Autonomy

Edge applications can perform predetermined, authorized actions, powering business processes.

Regulatory Compliance

By maintaining and processing data locally, organizations can meet data privacy requirements in all the areas they serve.

Cost Savings

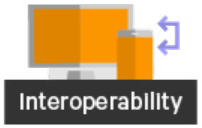
Edge processing reduces connectivity, data storage, and other costs. However, it can increase energy costs, if not managed well.

Enhanced Security

Data can be accessed, stored, and protected locally, reducing the probability of a disabling cyberattack.

Scalability

Edge computing helps organizations scale distributed networks, rather than centralizing all resources. It is a lot easier to stand up a micro data center than to build a hyperscale one, streamlining deployment.



Interoperability

Edge sites are often used to process M2M data for IoT applications, as well as connect to legacy applications.

Greater Reliability

Edge computing can enhance organizations' business continuity and disaster recovery (BC/DR) programs by providing local processing capabilities, spreading out workloads.

VERTIV

VERTIV EBOOK

What Is IoT Edge Computing?

Edge vs. Cloud vs. Fog Computing

What Is the Network Edge

Benefits of Standardized Edge Computing Architecture

What Are IoT Edge Ddevices

Edge vs. IoT Devices

What Are the Advantages of Edge Computing for IoT

Conclusion and Resources

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The realm of IoT edge computing represents an exciting and transformative frontier in our increasingly interconnected world. Throughout this eBook, we have delved into the intricacies and potentials of this technology, exploring its fundamental concepts, real-world applications, and the advantages it offers to businesses and individuals alike.

As we have seen, IoT edge computing empowers us to process and analyze data at the edge of the network, closer to the source, enabling faster response times, reduced bandwidth consumption, enhanced privacy, and improved reliability. This decentralized approach not only revolutionizes the way we interact with devices but also opens up a myriad of possibilities for innovation and efficiency across industries.

From smart homes to industrial automation, from healthcare to Financial Services, IoT edge computing has already demonstrated its ability to optimize operations, enable predictive maintenance, enhance situational awareness, and revolutionize decision-making processes. By pushing intelligence and computational power to the edge, we are no longer limited by the constraints of central cloud infrastructures but can harness the full potential of our interconnected ecosystem.

Additional resources

1. https://www.vertiv.com/en-us/solutions/vertiv-guide-to-edge-computing/

2. https://www.vertiv.com/en-us/about/news-and-insights/articles/educational-articles/what-is-iot-edge-computing--infrastructure-for-the-edge/

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(R06/23)