



AN EXAMINATION OF THE GLOBAL IMPACT AND FUTURE OF EDGE COMPUTING

INTRODUCTION

This guide:

- Covers the rise of edge and hybrid cloud computing across the globe.
- Examines the impact of this game-changing new technology.
- Looks at how Equinix and Microsoft Azure are leading the way.

WHAT IS EDGE COMPUTING?

Edge computing is in use all around us—from the wearables on our wrists to smart utility grid analysis, safety monitoring of oil rigs, streaming video optimization, and drone-enabled crop management. But what is it?

Gartner defines edge computing as “a part of a distributed computing topology in which information processing is located close to the edge—where things and people produce or consume that information.”

Simply put, edge computing brings data storage and computation closer to the devices where that

data is being gathered, rather than relying on one central location that can often be hundreds, or even thousands, of miles away.

A huge advantage of this is that data processing, especially real-time data processing, does not suffer from any latency problems. What’s more, organizations can save money by processing their

data locally, rather than from a centralized or cloud-based location, which in turn can help with latency problems.¹

7 EDGE COMPUTING STATISTICS AND PREDICTIONS

1 **MILLISECOND (MS)**

This has long been the promise of combining 5G networking with edge computing: near-zero latency. That's 1/1000th of a second (about the length of a typical camera flash).

\$3.5B

The value of the global edge computing market in 2019.
Grand View Research.

75%

The amount of enterprise-generated data that will be created and processed at the edge by 2025 (that's up from just 10 percent in 2018). *Gartner.*

\$43.4B

The value of the predicted global edge computing market by 2027, representing a compound annual growth rate of 37.4%. *Grand View Research.*

57%

The percentage of mobility decision-makers that say they have edge computing on their roadmap over the next year. *Forrester 2019 Global Business Technographics® Mobility Survey*

30%

The percentage of IT budgets spent on edge computing over the next three years. "Strategies for Success at the Edge, 2019," a report by *Analysys Mason.*

29 **BILLION**

The projected number of connected devices globally by 2022 (18 billion of which will be IoT devices). *The Telecommunications Industry Association.*

THE EVOLUTION OF EDGE COMPUTING

The evolution of edge computing came as a result of the exponential growth of IoT devices. According to Statista, 50 billion IoT devices are projected to be in use globally by 2030, forming a “massive web of interconnected devices” between consumer electronics, home appliances, vehicles and more.¹

IoT devices connect to the internet for either receiving information from the cloud or delivering information back to the cloud and can generate material amounts of data.

With the rise of edge computing, the hybrid cloud is also evolving from being the integration of a data center with the public cloud, to becoming units of computing that are working in connection with the public cloud.

Furthermore, with Artificial Intelligence (AI) running across all systems, we are now entering the era of the intelligent cloud and the intelligent edge. In just a few short years, edge computing has grown from a tech industry “buzzword” into a strong trend that is being watched with great interest.

“Edge computing can make industries massively more efficient, and has the power to transform agriculture, industrial manufacturing and healthcare with its ability to offer real-time data analysis and insight from billions of devices in the field.”

Kevin Scott, Chief Technology Officer from Microsoft

¹ <https://www.statista.com/statistics/802690/worldwide-connected-devices-by-access-technology/>

WHAT IS DRIVING THE USE OF EDGE COMPUTING?

Edge computing provides many benefits, such as ultra-fast processing, low latency, cost-efficiency, scalability, versatility, data security, application security and more.

5 INDUSTRIES DRIVING THE USE OF EDGE COMPUTING

1. Content and streaming platforms
2. Driverless and autonomous vehicles
3. Healthcare
4. Augmented reality and virtual reality
5. Smart cities

DRIVING THE USE OF EDGE COMPUTING

CONTENT AND STREAMING PLATFORMS

Streaming services can improve network performance by deploying their delivery systems and content across multiple data centers. Also called “edge computing,” this strategy puts content closer to end users that live far away from major metros, meaning quicker and smoother content delivery. Mobile edge computing technology could further boost these speeds as content providers seek to use 5G—estimated to have over a billion users by 2023¹—to their advantage.



¹ <https://www.ccsinsight.com/press/company-news/3240-ccs-insight-predicts-1-billion-users-of-5g-by-2023-with-more-than-half-in-china>

DRIVING THE USE OF EDGE COMPUTING

DRIVERLESS AND AUTONOMOUS VEHICLES

Just like the global autonomous vehicle market itself (projected growth to \$556B by 2026¹), the amount of data self-driving cars need to record and manage is continuously growing.

However, securely storing, transferring and processing this amount of data is a major industry roadblock. With edge computing, data can be quickly uploaded and processed locally, allowing Connected Vehicle and Smart Transportation (CVST) companies to implement their findings into their vehicles and software faster.

¹ <https://www.alliedmarketresearch.com/autonomous-vehicle-market>

DRIVING THE USE OF EDGE COMPUTING

HEALTHCARE

To deliver targeted, preventative and effective medical care, health organizations are embracing connected devices and internet of things (IoT) platforms, a market expected to hit \$534.3B by 2025.¹ Wearable and diagnostic device use, along with data sharing, collection and analytics are expected to continue to soar for the foreseeable future as health care races to meet the rising demand for patient-centric care.

Credit: <https://www.vxchnge.com/blog/edge-computing-statistics>



DRIVING THE USE OF EDGE COMPUTING

AUGMENTED REALITY AND VIRTUAL REALITY

AR and VR headsets could soon be arriving in our homes and workplaces en masse—analysts project at least 50 million units will be in use globally through 2024.¹ In addition to home entertainment, other industries embracing the technology include education, tourism, construction and real estate, all of which require an edge computing network and connected data centers to deliver a seamless user experience.

¹ <https://www.idc.com/promo/arvr>



DRIVING THE USE OF EDGE COMPUTING

SMART CITIES

Cities around the world are expected to spend \$124B in 2020 on advanced technologies like AI, IoT and machine learning.¹ Testing and evolving these technologies requires agile data exchange within digital ecosystems where multiple players can share insight with low latency. Tapping into these already-flourishing ecosystems allow cities to integrate and exchange data together to overcome challenges related to climate change, transportation, pollution, health care and more.

¹ <https://www.idc.com/getdoc.jsp?containerId=prUS46016320>



Azure



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AT-THE-EDGE SOLUTIONS

In this hyperconnected world, there are some key areas where edge computing combines with private and public clouds to provide various “at-the-edge” solutions. These include:

Data at the Edge

Centralizing all processing in the cloud might look like an efficient thing to do, but that idea can run into problems when it comes to latency.

Often, data needs to be processed and acted upon at the point at which it is generated. The sheer volume of data generated by some applications is also growing rapidly; indeed, some autonomous vehicles are known to generate as much as 8-10 terabytes of data a day. This equates to approximately 858,993,450 pages of documents! In these cases, transmitting data to the cloud is not a viable option.

Data that is processed in a hybrid cloud solution has a distinct advantage in that it allows for that data to be filtered and processed via edge solutions before it is sent to the cloud. The cloud may also serve as a central site for collating data for further analysis from multiple edge sites.

AI at the Edge

Edge systems as part of a hybrid solution are often called upon to carry out tasks such as visual recognition or inspecting items on a factory line for defects, for example. These tasks rely on AI techniques such as machine learning or deep learning models to deliver speedy results, and may mean that hardware accelerators such as graphics processing units or field programmable gate arrays are required.

AT-THE-EDGE SOLUTIONS

IoT at the Edge

IoT has turned many assumptions upside down, especially around where, how and how quickly we can collect and manage data, analyze it, make predictions and create modelling around it.

Industries that stand to gain the most from the use of IoT at the edge are those who can extract the right business insights at the right place and time. Using platforms such as Microsoft Azure and their range of AI-driven applications, offers industries unlimited opportunities to innovate in this way.

5G at the Edge

The arrival of 5G will result in the need for hybrid cloud solutions across the globe and will make them essential rather than optional. The 5G's network speed should be 10 times faster than what a 4G network allows. This opens tremendous possibilities for far-away sensors to instantly give updates about connected devices.

5G will also raise the demand for hybrid cloud solutions since it processes data at the borders of a network rather than transferring data a significant distance first.

TRENDS DRIVING THE CO-EXISTENCE OF PUBLIC/PRIVATE CLOUDS AND EDGE COMPUTING TO CREATE HYBRID CLOUD SOLUTIONS

A few key trends are driving the co-existence of public/private clouds and edge computing to create hybrid cloud solutions. These solutions help to interconnect all their components.

Trend 1 – Digital Business

Digital business requires the interconnection of people, things, clouds, locations and data for real-time interactions.

Trend 2 – Data Compliance

Data compliance requires interconnecting data, analytics and networking in compliant locations.

Trend 3 – Business Ecosystems

Business ecosystems require interconnecting participants and supporting digital flows.

Trend 4 – Cybersecurity

Cybersecurity requires distributing and interconnecting security controls.

THE HYBRID CLOUD: AN EXCITING “BEST-OF-BOTH- WORLDS” SOLUTION

A “best-of-both-worlds” solution is the hybrid cloud, which combines on-premises edge computing infrastructure with private clouds or public clouds. This means organizations can reap the benefits and advantages of both.

In a hybrid cloud environment, data and applications can move between the edge and private and public clouds, enabling greater flexibility and extra deployment options. Edge computing slots into the hybrid cloud perfectly with the following advantages:

Control

Private infrastructure enables organizations to maintain greater control.

Flexibility

Organizations can take advantage of additional resources in the public cloud whenever they are required.

Cost-effectiveness

The ability to scale to the public cloud cuts down on extra costs for computing power.

Ease

Transitioning to the cloud doesn’t have to be overwhelming because migration can happen gradually, and workloads can be phased in over time.

THE HYBRID CLOUD

In conjunction with the intelligent cloud, the intelligent edge is a continually expanding set of connected systems and devices that gather and analyze data.

Users are able to benefit from real-time insights and experiences, delivered by highly responsive and contextually aware apps.

The hybrid cloud requires true innovation in how networks are analyzed, managed and orchestrated—they can no longer be attributed to hardware alone. Software functionalities must be implemented, and digital native Software Defined Wide Area Networks (SD-WANs) are now looking to edge computing as the simplest and most optimal way to connect everything together.



Azure



EQUINIX

MICROSOFT AND EQUINIX:

POWERFUL INTERCONNECTION FOR THE DIGITAL ENTERPRISE

Together, Equinix and Microsoft are enabling enterprises to transform their business by offering superior hybrid cloud application performance, thereby helping to enhance the user experience, reduce risk and increase security.

One solution that brings all of this together is Equinix Cloud Exchange Fabric™. This advanced interconnection platform offers software-defined direct connections to multiple cloud services from a single physical port. When combined with Azure ExpressRoute, it enables seamless, on-demand, direct access to cloud services such as Microsoft Azure.

Furthermore, the Equinix and Microsoft partnership simplifies the transition to hybrid architecture by delivering private cloud to public cloud interconnection at scale—enabling enterprises to easily integrate and manage a diverse hybrid cloud ecosystem.



MICROSOFT AND EQUINIX

Equinix's strong partnership with Microsoft allows organizations to take full advantage of a hybrid cloud infrastructure to eliminate various challenges, including:

Connectivity Challenges

Relying on the public internet to connect to cloud platforms often leads to increased latency and unreliable connections, resulting in poor user experiences and loss of productivity.

Compliance Challenges

Operating a hybrid cloud environment presents management and loss of control challenges, producing security and regulatory compliance gaps.

Architecture Challenges

Transitioning to a hybrid IT environment requires an IT model shift from siloed and fixed to integrated and dynamic, requiring an interconnected architecture that delivers the optimal environment for every individual workload.

HOW EQUINIX AND MICROSOFT ARE ENABLING THE FUTURE

The best way to predict future growth, particularly when technology is involved, is to ensure you have the right growth-enabling infrastructure across key industries.

1. Media and Entertainment
2. Autonomous Vehicles
3. Manufacturing and Warehousing



ENABLING THE FUTURE

1. Media and Entertainment Industry

For media and entertainment companies to provide ultra-fast, low-latency streaming services, content needs to be cached close to end users. Equinix's edge integration in close proximity to Azure enables this to happen.

Leveraging the power of the Microsoft and Equinix partnership, a media company can deploy a video rendering solution in the U.S. West region and choose Los Angeles as the Azure Edge Region to expose the ingestion and processing endpoints to customers. This delivers an ultra-fast, low-latency experience to the studios and designers from Hollywood dealing with video encoding and rendering in the cloud.

Since Azure Edge Zones are an extension of Azure, developers and operators can continue to use the same APIs, platform, and third-party tools to deploy and manage applications.

ENABLING THE FUTURE

2. Autonomous Vehicle Industry

Of the use cases mentioned earlier, the autonomous vehicles industry has the most explosive growth potential and is predicted to outperform the others. To enable the growth to happen, however, a revolutionary approach to connectivity and data management is needed. This is where “Azure Edge Zones with Carrier” is changing the game.

Azure Edge Zones with Carrier is best thought of as an Azure Edge Zone running within the 5G infrastructure of a telecom provider instead of Microsoft’s global infrastructure.

This setup enables manufacturers of Autonomous Driving-Assisted Systems (ADAS) to sign up with a telco provider and embed a 5G eSIM in every car. The vehicle talks to the connected vehicle platform running in Azure that is deployed across hundreds of edge locations managed by the telecom provider. This allows the ADAS manufacturers that have vehicle test fleets around the world to offload the raw data the vehicles are collecting in regional Hyperscaler locations to do compute crunching (“Hardware-in-the-Loop” or HIL) and/or store the massive data sets the test fleets are generating.

Equinix is playing a key role here by providing solutions that enable large uploads of data from the test fleets and from HIL testing to take place, accelerating improvements to the ADAS applications for the cars.

The sub-10 millisecond latency to applications from mobile devices made possible from this architecture is paramount in these instances and paramount to the evolution of the industry.

ENABLING THE FUTURE

3. Manufacturing and Warehousing Industries

As automation continues to drive the rapid transformation of the manufacturing and warehousing industries, so continues the need for infrastructure that enables ultra-low latency, high capacity, and a reliable and secure wireless network.

This is where Azure Private Edge Zones are material, as they enable business-critical command and control of automated guided vehicles (AGV) in warehouses; real-time communication between robots in smart factories; and augmented reality and virtual reality edge applications.

The other compelling benefit of the infrastructure is SD-WAN, a technology to create enterprise-grade WAN with increased bandwidth, high-performance access to the cloud, service insertion, reliability, policy management and extensive network visibility. SD-WAN on Azure Private Edge Zones helps organizations move away from complex, CAPEX-based models to a SaaS-based model, making it a more cash-advantageous way to manage network infrastructures.



GAIN A CLEAR COMPETITIVE ADVANTAGE

To stay competitive, companies must re-evaluate their IT infrastructures for the hybrid cloud, especially where population centers and digital ecosystems meet and converge. Those that implement a hybrid cloud computing system will gain even more of a competitive advantage.

Partner Selection

As companies seek to increase their consumption and move more mission-critical workloads into the cloud, partners and solution providers play a larger role, so choosing the right partners becomes even more critical to adoption success. For Azure environments, leveraging the robust community of cloud solution experts and maintaining existing relationships are key factors in avoiding any barriers to successfully moving to the cloud.

Dynamic Integrations

Transitioning to a combined edge computing and hybrid cloud IT environment requires a strong shift from siloed and fixed to integrated and dynamic, requiring an interconnected architecture that delivers the optimal environment for every individual workload.

Efficient Capabilities

Organizations today are often looking to downsize in-house data centers. At the same time, they are looking at using colocation facilities to access software and hardware vendors for virtualized services, security services and on-demand capabilities. The hybrid cloud is therefore the perfect way of having the best of both worlds.

ABOUT EQUINIX

Equinix, Inc. (Nasdaq: EQIX) connects the world's leading businesses to their customers, employees and partners inside the most-interconnected data centers. On this global platform for digital business, companies come together across more than 55 markets on five continents to reach everywhere, interconnect everyone and integrate everything they need to create their digital futures.

In a digital economy where enterprise business models are increasingly interdependent, interconnection is essential to success. Equinix operates the only global interconnection platform, sparking new opportunities that are only possible when companies come together.

Ready to find out more?

Edge computing and hybrid cloud are the future. Our expert team is on hand to answer any questions about this exciting new technology.

Learn more at Equinix.com/Partners/Microsoft-Azure