Embracing the future with distributed cloud and edge computing

Abstract

The cloud has long been recognized as a key enabler of digital business that drives a multitude of benefits across the enterprise. These include speed to market, improved service levels, and reduced IT costs. However, the future does not stop at cloud computing. With a growing demand for high-speed applications, enterprises should look towards edge computing, to further enhance customer experience, provide real-time insights, and optimize asset usage between the edge and the cloud. Enterprises have an opportunity to embrace distributed and edge computing and evolve their business models to realize exponential value.

The need for distributed cloud and edge computing

Amidst the global turbulence caused by COVID-19, TCS conducted a Business Impact Survey[1] which highlights how digital transformation is pivotal to business continuity. Its key takeaways include:

- Organizations with essential digital capabilities are coping better with the pandemic than those who lack them

- Many organizations are actively expanding their digital capabilities

- Amid shrinking budgets, digital transformation is rising as a priority

- Remote work is a new long-term norm, and nearly all organizations are investing to make it productive and safe

Many enterprises utilize a hybrid cloud solution, combining a private cloud with one or more public cloud services. While hybrid cloud models are prevalent and are the foundation of the digital core, according to Gartner, by 2024, most cloud service platforms will provide some distributed cloud services that execute at the point of need.[2] It is the distributed cloud and edge that will further improve customer experience while enabling the activation of real-time insights.

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[1]   TCS Business continuity report

[2]   Gartner Research

Business expectations versus reality gap

Borderless enterprise and ecosystem business models are built on the next generation of cloud computing, which extends the advantages of cloud through distributed cloud and edge capabilities.[3]

Distributed cloud enables cloud services across geographically distributed locations, while the overall governance, enhancements and operations are centrally managed and owned by the public cloud provider.

Edge computing, on the other hand, is a distributed computing paradigm that brings computation and data storage closer to the location where it is needed to improve response times and save bandwidth. Information is not filtered through distant data centers; instead, the cloud comes to you. Edge computing platforms enable zero-touch, secure, distributed computing architecture for applications, data processing at, or near, the edge. There is a growing demand to address lower latency, and support and improve resilience to network disconnection.
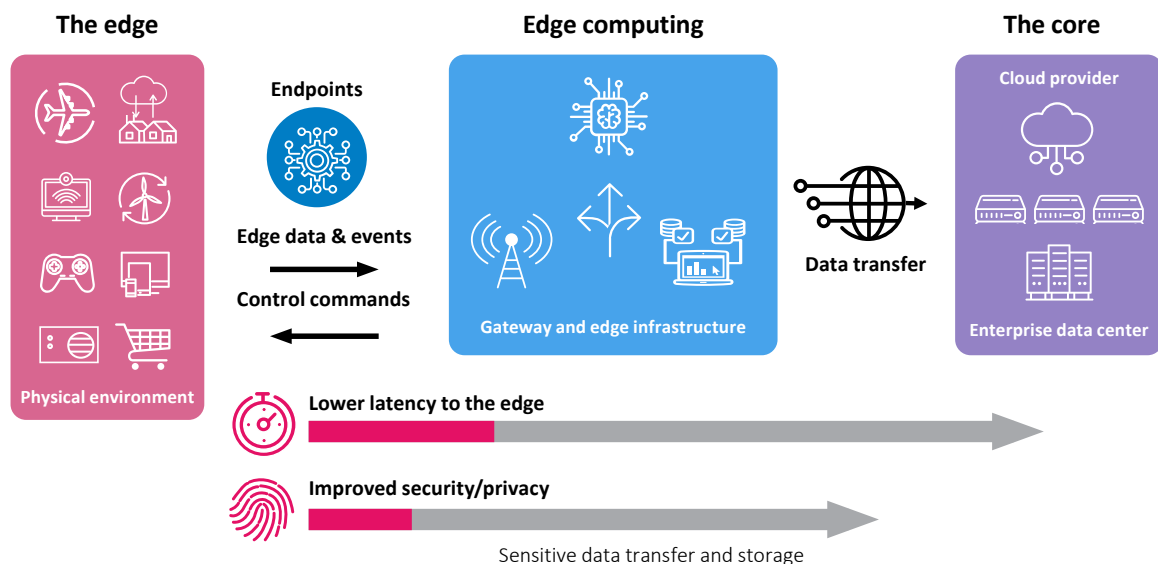

Figure 1: A high-level view of the edge computing architecture

Distributed cloud and edge computing together will help improve data compression and transfer in the connectivity layer of the technology stack, reducing network bandwidth and making a wider range of internet of things (IoT) applications possible.

IDC predicts that by 2023, more than 50% of new enterprise IT infrastructure deployed will be at the edge, rather than in corporate data centers, which is up from less than 10% in 2021.[4]

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[3]   Gartner Research

[4]   IDC Prediction

A view into the future – the next horizon

The Gartner 2020 Cloud End-User behaviour study[5] shows approximately 75% of enterprises prefer to have cloud computing in a location of their choice to meet their business needs. To this end, it is anticipated that there will be an increase of over 50% use of distributed cloud by 2025[6]. Telecom companies are contributing to edge open-source projects like Akraino[7] (blueprints for the edge), and colocation vendors, such as Equinix, are investing in software abstraction layers that run on their distributed infrastructure.

Enterprises best define these capabilities through business use cases that generate value for them. Some examples are:

- **Predictive maintenance:** Edge solutions are particularly useful in sectors where organizations would incur massive losses when systems go down. For example, in the global oil and gas industry, the digitization of its pipeline coupled with edge data and analytics expertise can enable organizations to proactively manage their pipelines, addressing defects and preventing failures.

- **Retail and commerce optimization:** E-commerce optimization is another area gaining traction. As more B2C and B2B organizations increase their digital sales capabilities, edge computing offers capabilities for improved and personalized customer experience.

- **Healthcare innovation:** The healthcare industry had already seen high growth in edge investments, and the COVID-19 pandemic has further accelerated the move to telehealth and the need for medical devices to track patients at home. With the capability to solve several healthcare problems, edge computing can enable new business models.

- **Public sector:** Distributed cloud and edge computing solutions with resilient, scalable, and sustainable infrastructure are enabling smart cities of the future. These solutions are improving quality of life by introducing easy-to-use, digitally enabled service offerings, reduced traffic and optimized energy consumption leading to eco-friendly and carbon-neutral societies.

Innovations from distributed cloud and edge capabilities that are enabling the future across the ecosystem include:

- **Performance, redundancy and privacy:** Distributed cloud offers geographically dispersed infrastructure (at the customer's location of choice), which helps tackle the needs of performance, redundancy and privacy regulations.

- **Anywhere operations:** It constitutes an IT operating model that is designed to support customers and enable employees everywhere and manage the deployment of business services across a distributed infrastructure.

- **Security mesh and privacy-enhancing computation:** The cybersecurity mesh enables secure access to digital assets, independent of where it is hosted. It decouples policy enforcement from policy decision-making using a distributed cloud delivery model and allows identity to become the security perimeter. Privacy-enhancing computations, closer to the customer, enables processing data in untrusted environments and multi-party data analytics.

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[5] TCS Edge whitepaper

[6] Gartner Predictions

[7] Akraino is a set of open infrastructures and application blueprints for the Edge

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- **Emergence of data center marketplace as a new edge option:** Edge computing technology needs to sit as close to the action as possible. It may be a factory floor, a hospital room, or a North Sea oil rig. Unlike big data centers, we will have small units and local data centers working on a new model. New data center aggregators, such as Edgevana can help enterprises to think globally and act locally.

- **Private 5G pushing enterprises to the edge:** 5G technology is superior in many ways to existing networking options. Public 5G will transform how we do many things, but it will take years to reach widespread adoption. Forrester sees immediate value in private 5G — a network dedicated to a specific business or locale such as a warehouse, shipyard and factory. Private 5G is here now, and we expect it to fuel edge computing.

- **New edge vendors and public cloud growth:** Cloud services continue to grow but as edge computing gets to be the new platform for business computing, it will demand new capabilities from the public cloud providers (e.g., extend to Azure Edge Zones with Azure Stack, AWS Wavelength [low-latency applications running on 5G devices], Google Anthos at the Edge, collaborations with AT&T on 5G connectivity, and the Google Mobile Edge Cloud). Mobile edge computing provides a highly distributed computing environment that can be used to deploy applications and services, as well as to store and process content near mobile users.

- **Reshaping of teams with new model:** As the sprawling deployments span edge sites, multiple clouds and corporate data centers will start getting into a managed umbrella of a single distributed cloud and operating model that integrates all the disparate environments. The existing infrastructure and operations personnel will work with DevOps teams, platform engineering and operations teams, or fusion teams.

The graphic below showcases this ecosystem of innovation that is driven forward by distributed cloud as reflected in the examples recapped above.
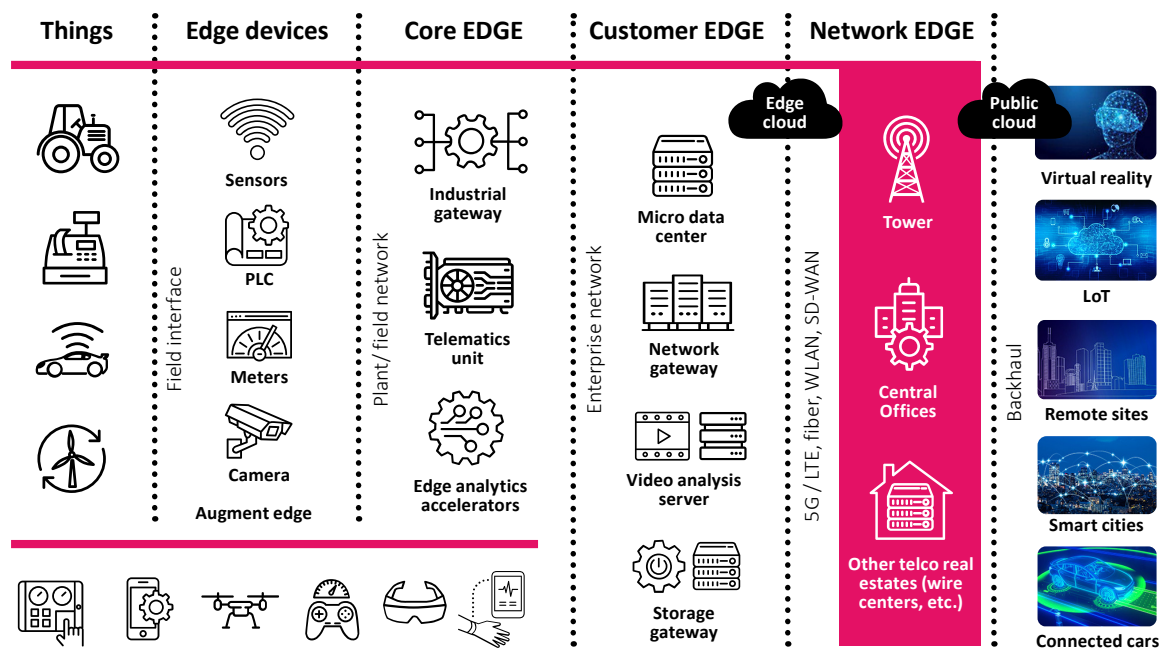
Conclusion

Edge technology is continuously evolving, and there is a need for a concentrated effort to arrive at standards for interoperability. When this is enabled by an open-source governing body, and supported by large cloud service providers, it will become easier for enterprises to increase the pace of adoption, including ability to shift between service providers.

Areas that will need attention for enhancing distributed cloud and edge computing include:

- **Cloud and systems design** — Understand how everything fits together. Cloud computing is less about building new systems from scratch and more about putting systems together based on existing (native) services. These include predicting and monitoring system performance and comparing attributes of different services and data models. Cloud skills with network, databases, and application architecture is key to adoption.

- **Security** — Understand function and implementation of network security. This includes data protection with authentication, encryption, and certification while assessing the security profile of new devices and applications.

- **Digital innovation** — The full value of the cloud comes from leveraging its capabilities to develop innovative digital use cases that deliver operating efficiencies and growth. Future businesses and societies will be crafted using digital innovations enabled by the cloud.

Now, the time is ripe to leverage the evolving capabilities of edge to reimagine the future and write the next chapter of digital evolution.

About the authors

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Parthiv is a results-oriented leader in TCS. He is responsible for building trusted advisory relationships and delivering digital transformations. He has more than 24 years of experience helping Fortune 500 companies drive complex global multi-tower enterprise transformation initiatives. He is recognized for his thought leadership and ability to drive innovative solutions across supply chain, IT and data management areas.

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Awards and accolades

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