Technology deep dive: Cloud and edge computing

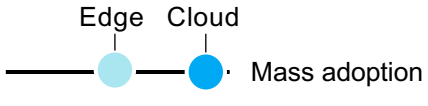
Description of technology

Cloud computing[1] offers ready-to-use, vendor-managed services (including computing power, storage, advanced-analytics tools and database access), and thus offers distributed computing resources.

Edge computing is useful in situations with latency issues (such as remote locations or sheltered building), using smart devices with computing power on the edge of the network.

Edge devices monitor and analyze data locally, only sending key data to central hub, thus reducing latency significantly.

Technology maturity



By 2022, clouds increasingly integrate as **70%** of enterprises will employ multi or hybrid cloud-management technologies, tools, and processes

Externally sourced software from cloud-service platforms, open repositories, and enterprise SaaS[2] providers will rise from **23% today to nearly 50% in 2025**

Industry applicability

1. Public-cloud offerings, not private- or on-premise-cloud setups.
2. Software as a service.

What it enables companies to do

Advanced analytics on demand
Faster scaling of machine-learning and deep-learning models across all company data

Availability of a suite of data and computing resources
On-demand end-to-end solutions for computing needs (including security, content-delivery networks, domain-name systems, etc)

Security across layers
Fault tolerant through redundancy, versioning, and managed cybersecurity protocols (including encryption)

Demand-based resourcing
Accessing scalable, on-demand, and practically infinite computing or storage capacity

Independence from hardware developments
Highest functionality and reliability managed by vendor, reducing need for consumers to invest in hardware upgrades or associated capabilities

Operations without network delay
Devices placed at edge of network to monitor and analyze data and reduce latency to milliseconds

Main opportunities

Example use cases

I ***Increase agility and speed***
Improve reaction time and time to market through low latency and 24/7 remote access to analytics and operating tools

II ***Save costs and protect resources***
Reduce need for owned hardware (eg, operations) and adapt resources to demand (pay as you go)

III ***Accelerate data-driven decision-making***
Deploy (customizable) ready-to-use analytics models and tools

Enable new operating and business models
Use cloud as native environment for applications and services (eg, edge computing)

Ensure business continuity
Ensured uptime and data security of systems as managed more efficiently and effectively by vendor compared with owned systems

Source: Expert interviews; *IDC FutureScape: Worldwide IT industry 2020 predictions*, IDC, October 2019; McKinsey analysis

Use case deep dive: Cloud and edge computing

Proof points

Use case	Situation and approach	Impact
I **Increase agility and speed** 	For accuracy, the Broad Institute of MIT and Harvard examines base pairs of the human genome 30 times In 2018, it took 8 minutes to sequence a human genome (16 terabytes per day)	Sequencing time dropped by **400%** through cloud-based analytics The gain in speed, without losing accuracy, allows researchers to “do important research faster”
II **Save costs and reduce complexity** 	Full cloud transition of a European utilities player operating in multiple countries with IT-run spend of ~€150 million and portfolio of ~500 applications running on 1,500+ server instances	Migrated **~90%** of applications to public cloud Reduction of **15%** IT-run spend Simplified portfolio by retiring one-third of applications
III **Accelerate data-driven decision making** 	Provider of automated, insights-driven, all-in-one solution that gives a unique end-to-end view of customer-value-management journey using cloud computing	Drive revenue uplift of **2–5%** by focusing client on higher-value-added activities (eg, designing campaigns) **2×** quicker implementation of solution allows teams to be up and running faster

Source: Expert interviews; McKinsey analysis

Expected technology-development horizons: Cloud and edge computing

Expected technology-development horizons

Deployment on demand through function as a service

Increasing serverless computing, eliminating need for infrastructure provisioning and management

Function as a service (FaaS) allows focus on implementation of business logic (instead of CI/CD[1]), paying only for code runtime

Broad application of event-based programming, saving capacities and costs

Seamless cloud computing

Frictionless interoperability between multi or hybrid cloud setups

Enterprises to have unified operations (virtual machines, Kubernetes, management tools)

Creating cloud-capable applications becomes low code by standard (eg, Google Appmaker, Amazon Honeycode)

Externally sourced software (eg, open repositories, enterprise SaaS[2]) will rise from 30% today to 80% in 2025

Full integration of AI for analytics and Cloud operations

Nearly all analytics-related tasks will be accessible virtually (including workload optimization)

Edge devices will be able to use AI to drive monitoring and analytics of data, providing more insights from the vast array of available data

AI will optimize and control operations (eg, self-healing, predictive maintenance), increasing reliability and reducing costs significantly

1. Continuous integration/continuous deployment.
2. Software as a service.

Source: Expert interviews; "4 trends impacting cloud adoption in 2020," Gartner, January 22, 2020; *IDC FutureScape: Worldwide IT industry 2020 predictions*, IDC, October 2019; MIT Technology Review (2019); O'Reilly survey on cloud-adoption (2020); McKinsey analysis

Enablers

Increased demand for application portability from multicloud-management technologies significantly reduces risks from vendor lock-in

A leading cloud-solution provider will have a distributed ATM-like presence by 2023 to serve a subset of services particularly for low-latency application requirements

The need for increasing computing power is rising exponentially, eg, the amount of computational power used to train AI models has doubled approximately every 3 months since 2012

Hardware becomes more standardized and costs rapidly decrease, which enable a broader presence of hardware with a high degree of interoperability

Barriers

Lack of specialized cloud skills (especially cloud security and multi-cloud management) can reduce migration pace significantly

Security and compliance requirements given tightening data-protection regulations (especially in banking, healthcare)

Lack of interoperability between clouds causing cloud lock-in—currently only cloud-native systems (eg, Kubernetes) are interoperable; costs of migrating from one cloud to another becomes a costly burden