Introduction to
MLOps at the Edge

Álex J. Cantos
VP Product & Design
barbara

Index

Index

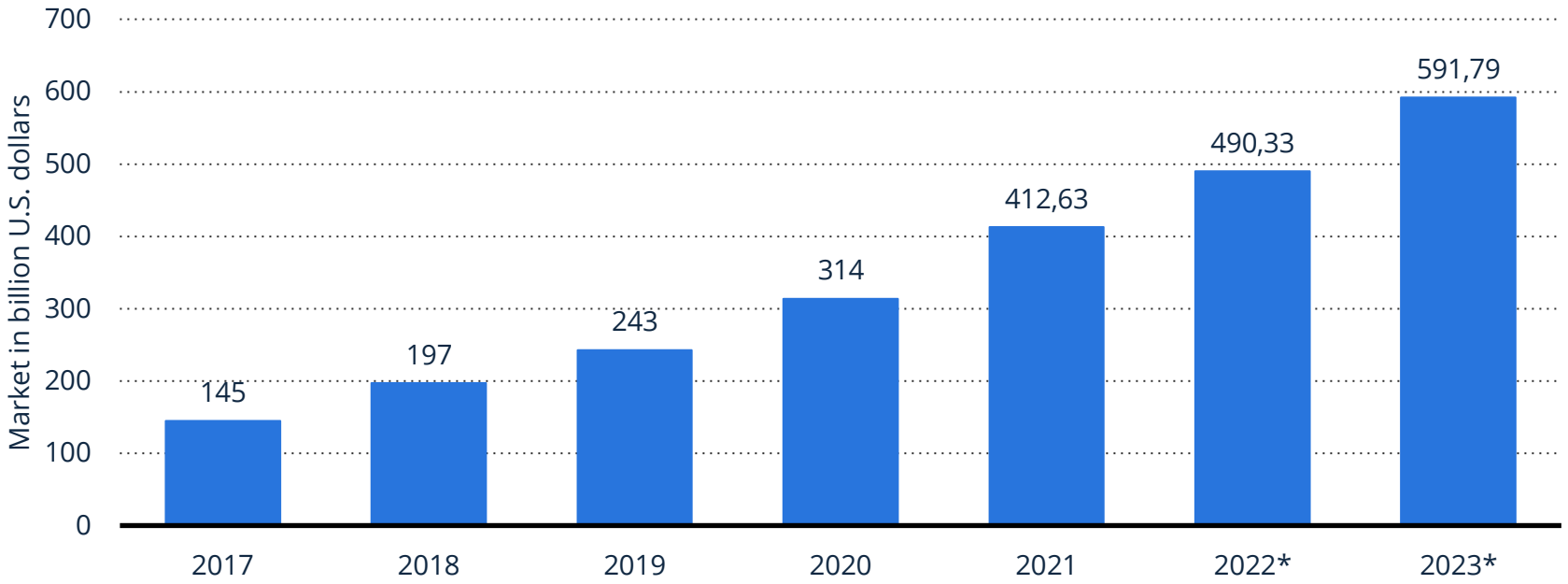
”

The Cloud is broken

barbara

Is the Cloud broken?

Global Cloud Computing Spenditure



statista

Then...
¿Why is it broken?

Because it is unable to cope with the following challenges...

Is the Cloud broken?
Cloud Computing Challenges

1. Dependence on the Internet

The cloud computing model **relies on the Internet** to access data and applications.

The performance and reliability of cloud services are affected by the **availability and quality of the internet connection**.

Is the Cloud broken?
Cloud Computing Challenges

2. High latency

Even with a quality Internet connection, **round-trip times to the cloud** (data center) may not be fast enough for certain applications

This is especially true for applications with **real-time needs**.

Is the Cloud broken?
Cloud Computing Challenges

3. Service availability

Cloud computing services may experience **downtime or service interruptions**, affecting business operations and productivity.

Is the Cloud broken?
Cloud Computing Challenges

4. Loss of control

Enterprises have **limited control over the physical infrastructure and underlying technology** used by the service provider.

This can make it **difficult to manage** and **optimise** resources, **troubleshoot** problems and **customise** services.

Is the Cloud broken?
Cloud Computing Challenges

5. Cost management

Cloud computing costs can be **unpredictable** and sometimes **unaffordable**.

Especially for **data-intensive tasks** such as computer vision or predictive maintenance, cloud computing costs can be unpredictable and sometimes unaffordable.

Is the Cloud broken?
Cloud Computing Challenges

6. Vendor lock-in

Moving data and applications from one cloud service provider to another can be complicated and costly.

This vendor lock-in makes it **difficult for businesses to switch to a different cloud service provider**, even if they are dissatisfied with the services provided.

Is the Cloud broken?
Cloud Computing Challenges

7. Security and privacy

Cloud computing involves sharing resources and data over the Internet, which makes it susceptible to **security and privacy breaches**.

Providers must ensure that data is protected and secure.

Is the Cloud broken?
Cloud Computing Challenges

8. Compliance

Businesses must comply with industry and government regulations governing the **management of sensitive data**.

Cloud computing can create compliance issues when data is stored in **different geographic locations** or shared across international borders.

¿Which is the solution?

¿What are the alternatives to Cloud Computing?

Index

Index

#EdgeIsTheNewCloud

barbara

> **The ability to create results through Artificial Intelligence and Edge Computing is the most significant value refactoring in the technology market since Cloud Computing**

Gartner

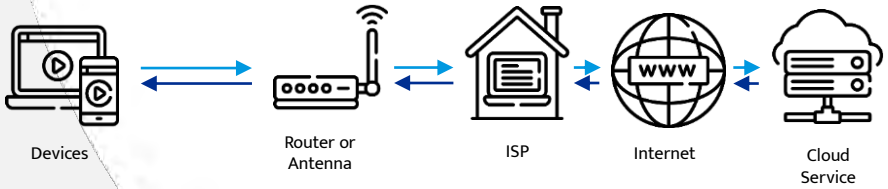
¿What is Edge Computing?

¿Why is it the solution?

#EdgeIsTheNewCloud

¿What is Edge Computing?

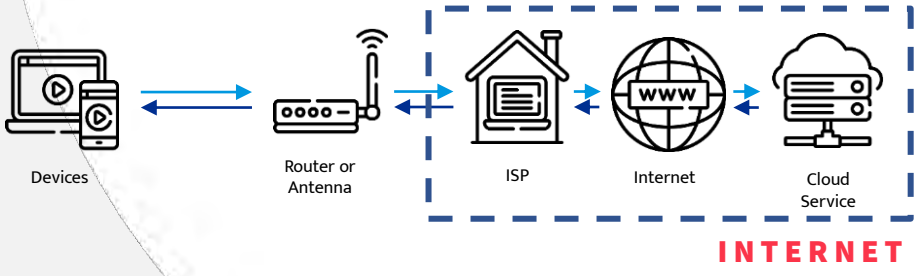
Edge computing is a distributed computing paradigm that **brings data storage and processing closer to where it is captured**, to improve response times and save bandwidth.



#EdgeIsTheNewCloud

¿What is Edge Computing?

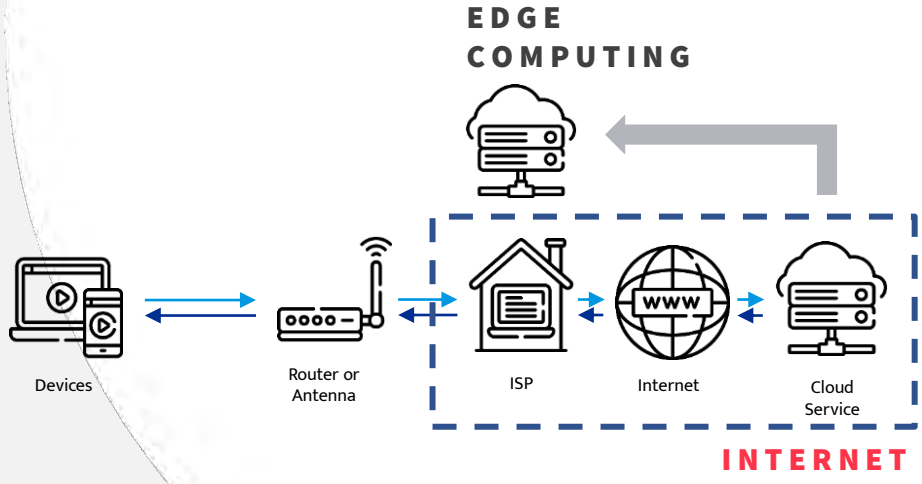
Edge computing is a distributed computing paradigm that **brings data storage and processing closer to where it is captured**, to improve response times and save bandwidth.



#EdgeIsTheNewCloud

¿What is Edge Computing?

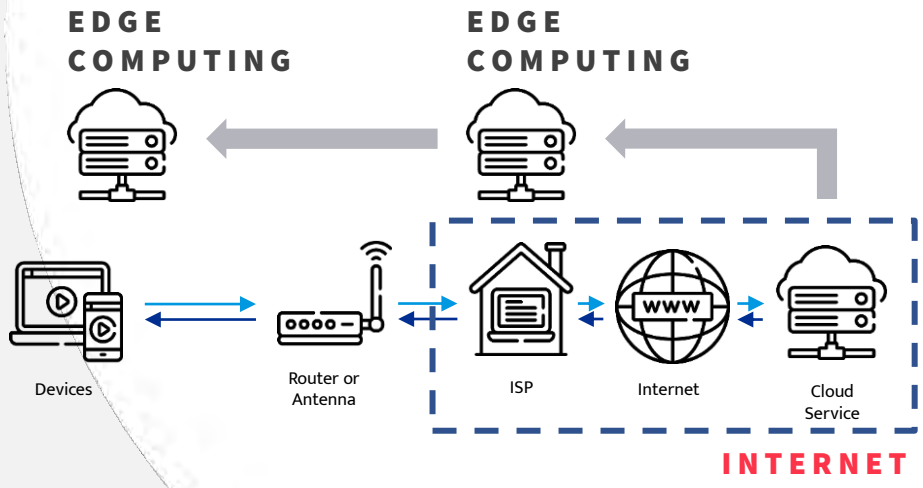
Edge computing is a distributed computing paradigm that **brings data storage and processing closer to where it is captured**, to improve response times and save bandwidth.



#EdgeIsTheNewCloud

¿What is Edge Computing?

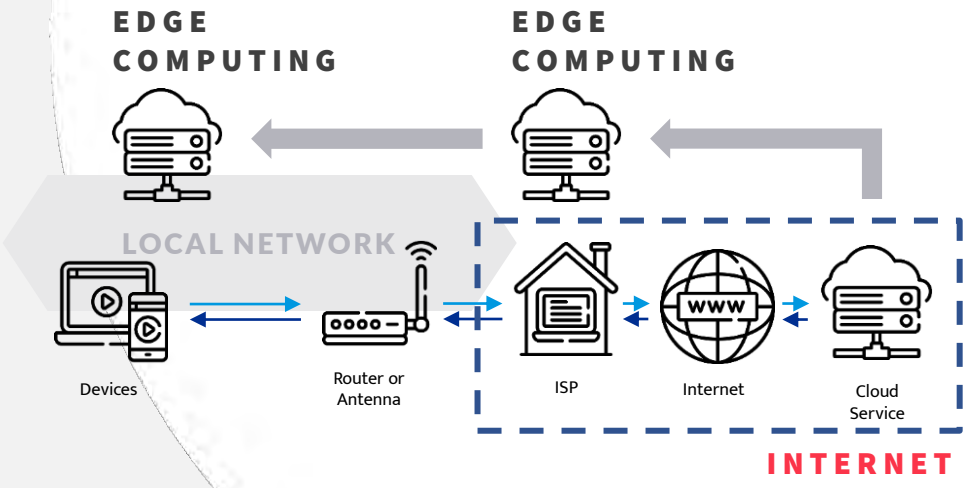
Edge computing is a distributed computing paradigm that **brings data storage and processing closer to where it is captured**, to improve response times and save bandwidth.



#EdgeIsTheNewCloud

¿What is Edge Computing?

Edge computing is a distributed computing paradigm that **brings data storage and processing closer to where it is captured**, to improve response times and save bandwidth.



#EdgeIsTheNewCloud

Edge Computing Drivers

Low latency

Edge computing involves processing data and analysing data where it is generated, **reducing latency and improving the speed** of response.

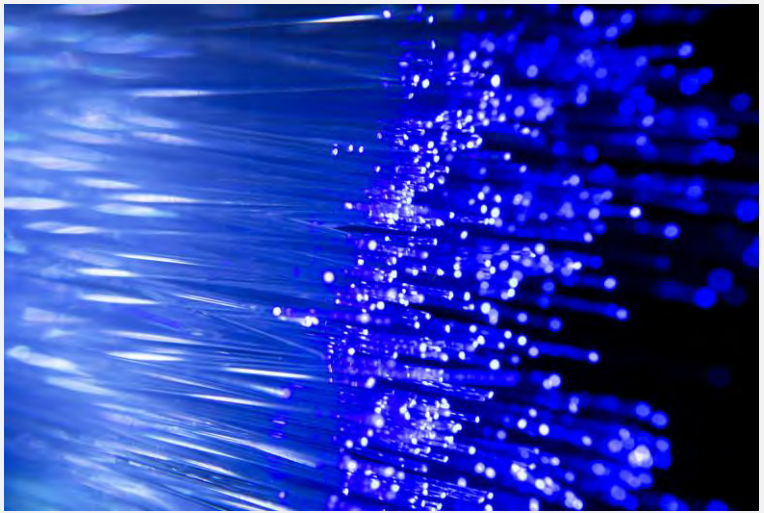
This is key for applications with **real-time needs**.

#EdgeIsTheNewCloud
Edge Computing Drivers

Lower bandwidth consumption

With Edge Computing, data is processed and stored on local devices, which **reduces the amount of data that needs to be sent** over network connections.

This reduces network congestion, improves available bandwidth and **lowers Cloud costs** dramatically.



#EdgeIsTheNewCloud
Edge Computing Drivers

Increased privacy and security

Edge computing is generally more secure than cloud computing, as data is processed locally and **not sent over a network connection**.

This can help **protect sensitive** company and user **data**.

#EdgeIsTheNewCloud

Edge Computing Drivers

Greater availability and autonomy

With Edge Computing, local devices **continue to function** even if there is an interruption of the network connection.

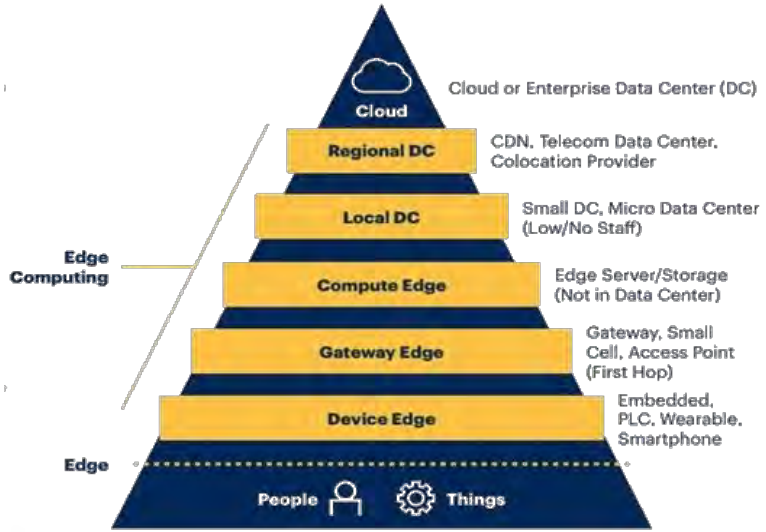
This promotes **autonomous system operation**, which is especially important for critical installations.

#EdgeIsTheNewCloud
Different types of Edge

- LATENCY

+ SCALABILITY (€/bit)

+ SECURITY

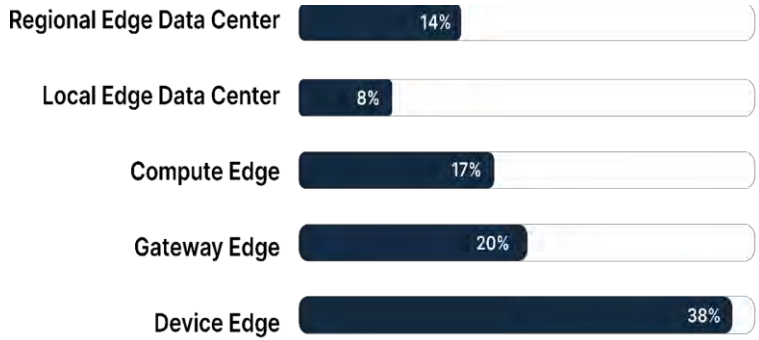


Fuente: Gartner. Understanding Edge Computing

#EdgeIsTheNewCloud
Different types of Edge

The two most promising segments are the **Gateway Edge** and the **Device Edge**.

Both segments stand out for their **development and adoption potential** and are expected to play a key role in the future in the digital transformation of companies and in the creation of new business models.



Fuente: Gartner Survey on where Edge Computing will drive revenue

Impact Radar for 2023

Range
- 6 to 8 Years
- 3 to 6 Years
- 1 to 3 Years
- Now (0 to 1 Year)

Mass
- Low
- Medium
- High
- Very High

Source: Gartner
767259_C

Index

Index

acciona

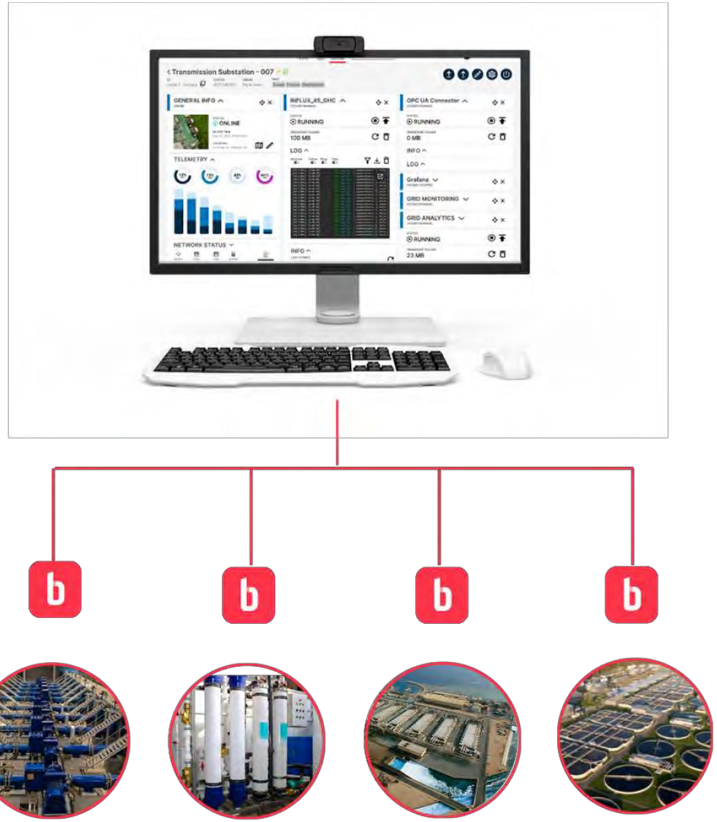
Intelligent virtual measurement of water components

The Challenge

Acciona needed to adapt its AI models to the Edge in order to manage them remotely at all of its locations around the world.

The solution

- Deployment of Artificial Intelligence algorithms in a cyber-secure environment.
- Reduce deployment time of your Edge applications by 86%.
- Optimisation of its chemical control processes in real time and in a cyber-secure manner.
- Saved around $250,000 per plant in its first year in regulatory and chemical costs.



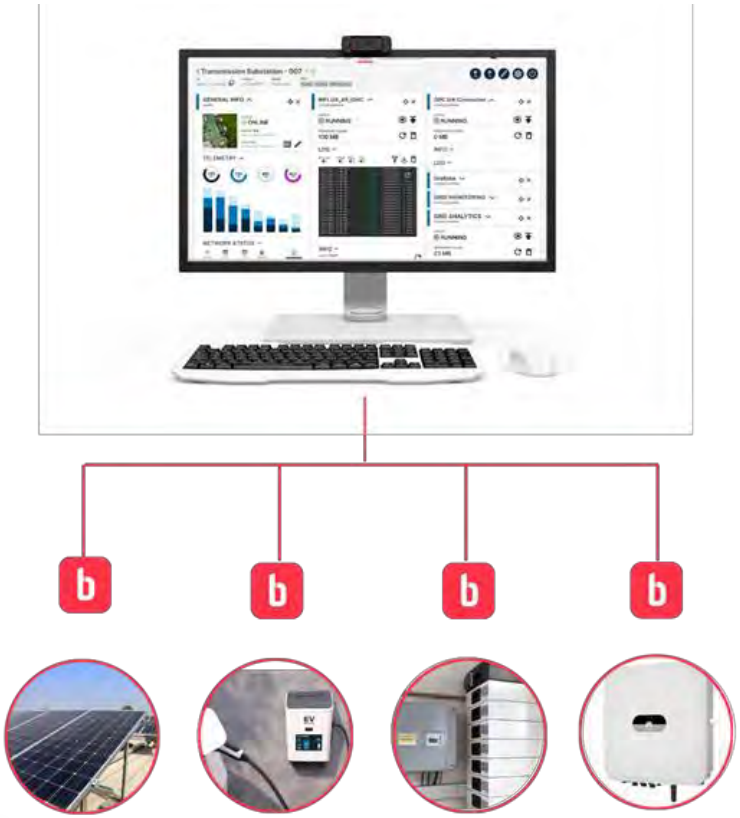
Energy flexibility in self-consumption systems

The Challenge

EDP needed to make off-grid elements (inverters, chargers and batteries) visible in order to balance energy flows.

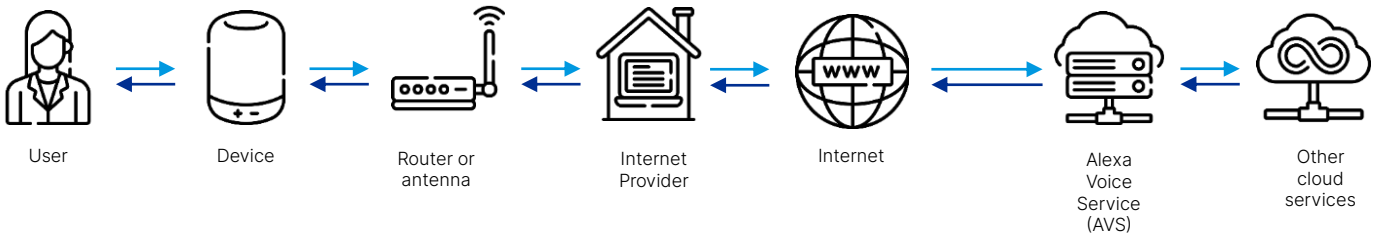
The solution

- Visibility of all elements in a supplier-independent manner.
- Command assets with real-time latency that decide when to produce, store or use energy based on external data (energy prices, weather conditions, etc.).
- Improved service margins by optimising energy flows.



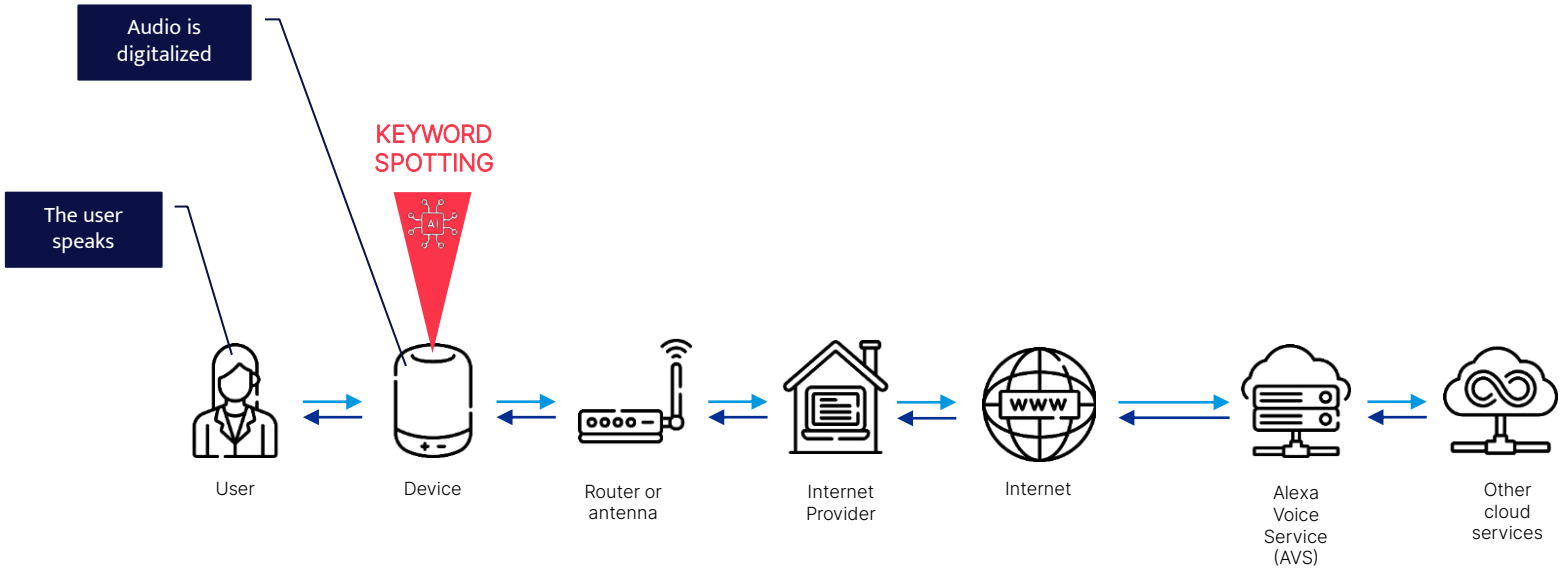
Edge Computing ❤ AI

The architecture of alexa



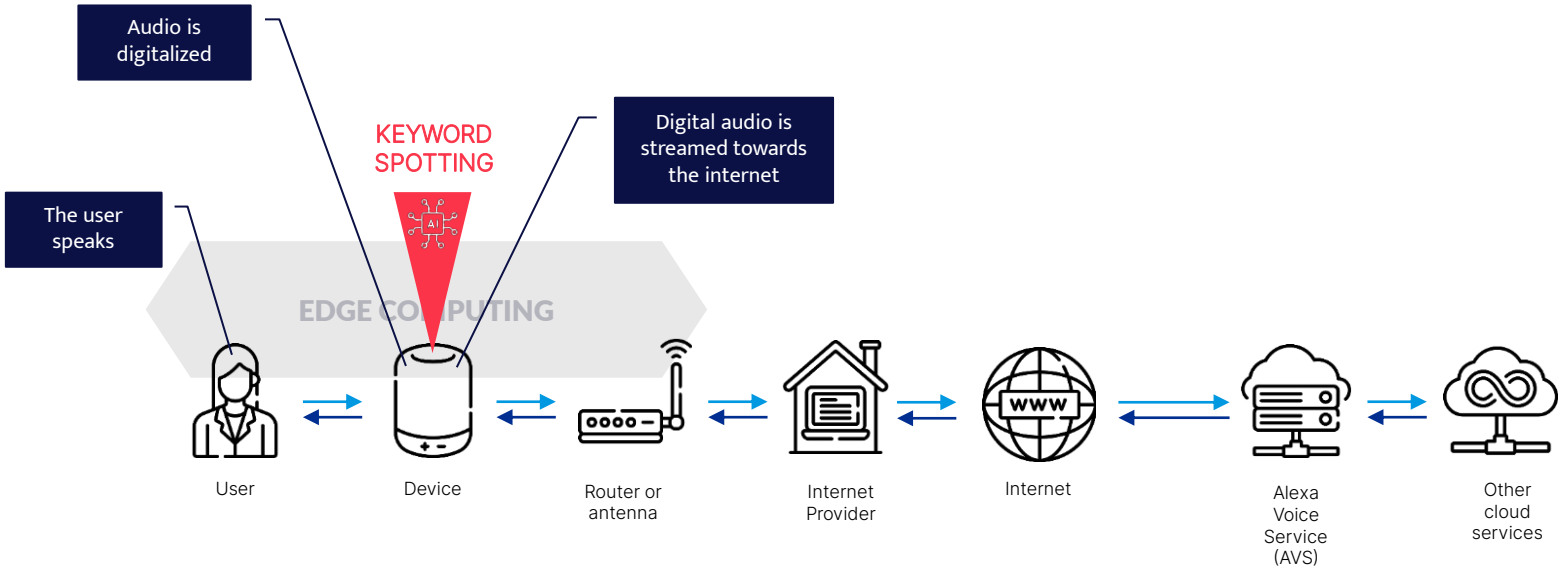
Edge Computing ♥ AI

The architecture of alexa



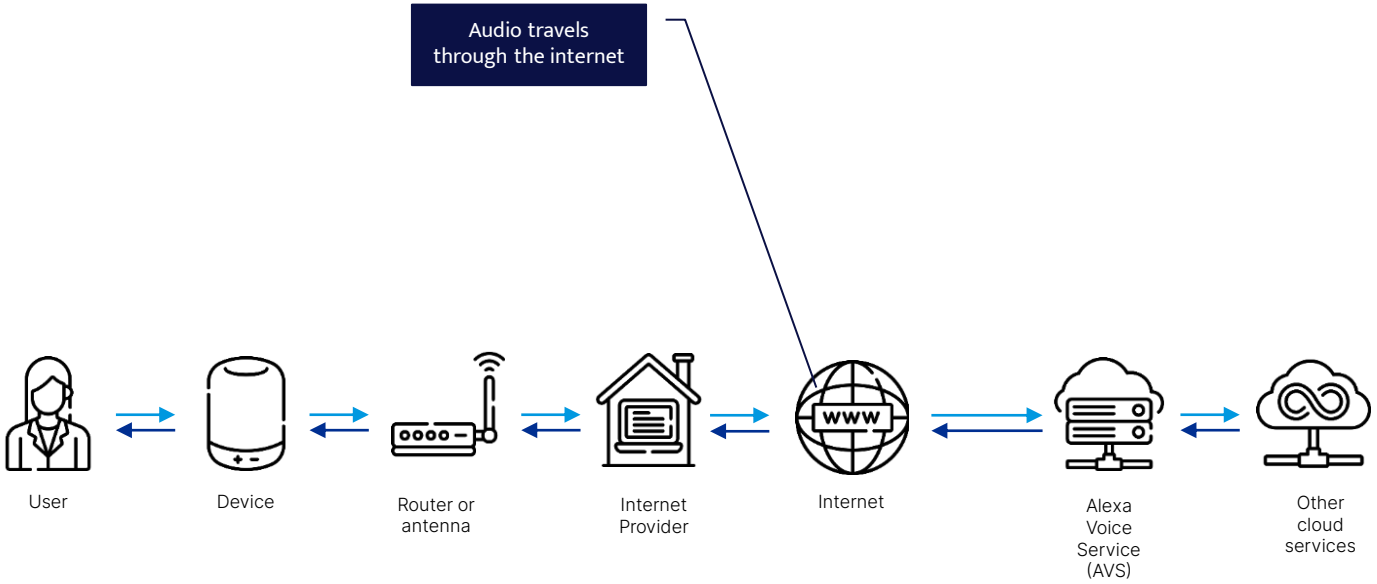
Edge Computing ♥ AI

The architecture of alexa



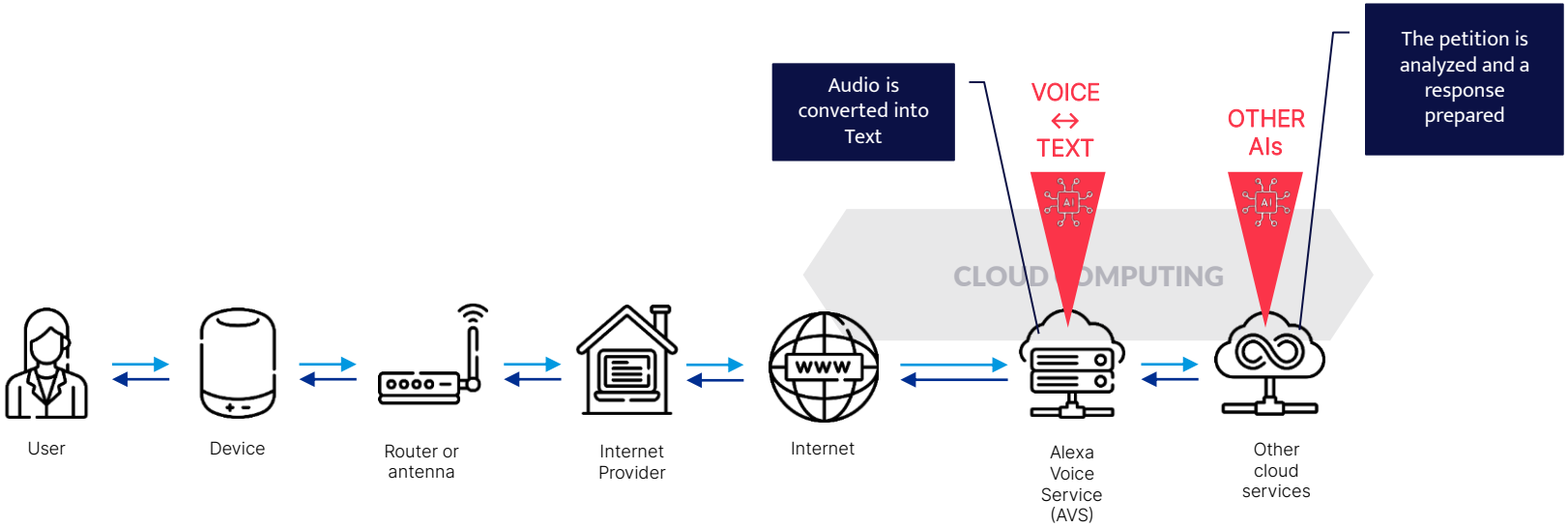
Edge Computing ❤ AI

The architecture of alexa



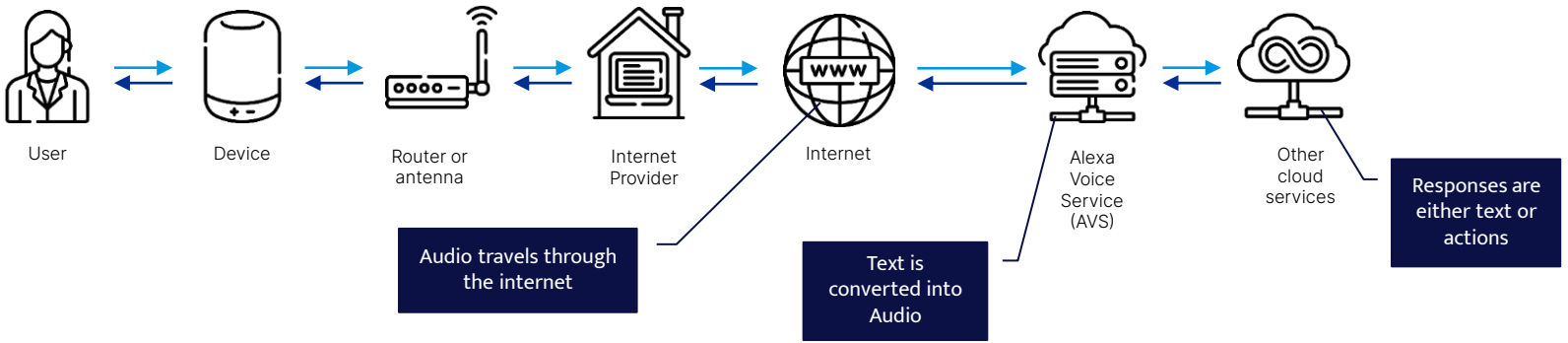
Edge Computing ❤ AI

The architecture of alexa



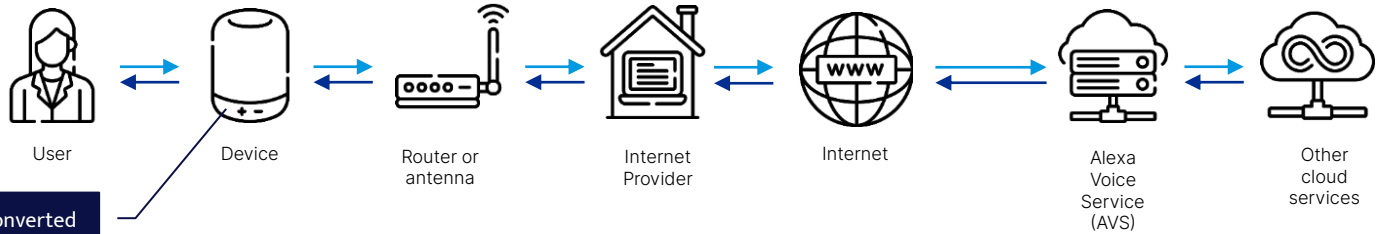
Edge Computing ❤ AI

The architecture of alexa



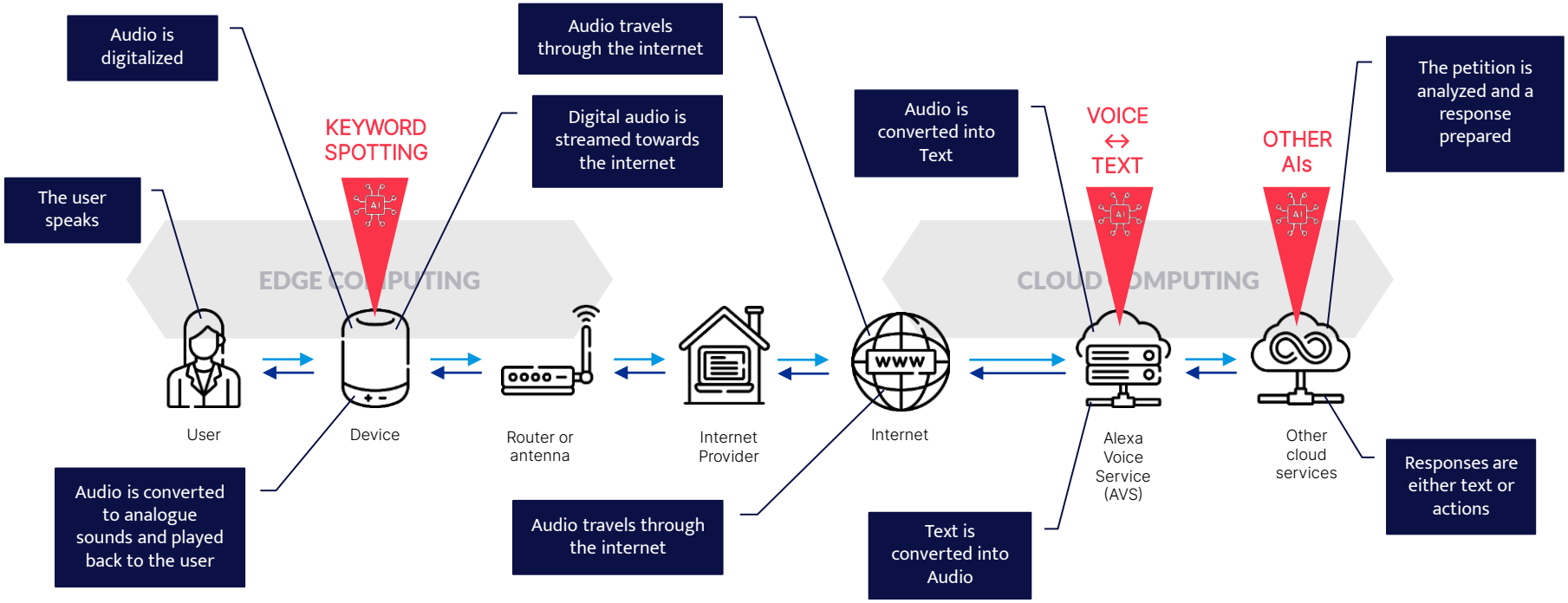
Edge Computing ♥ AI

The architecture of alexa



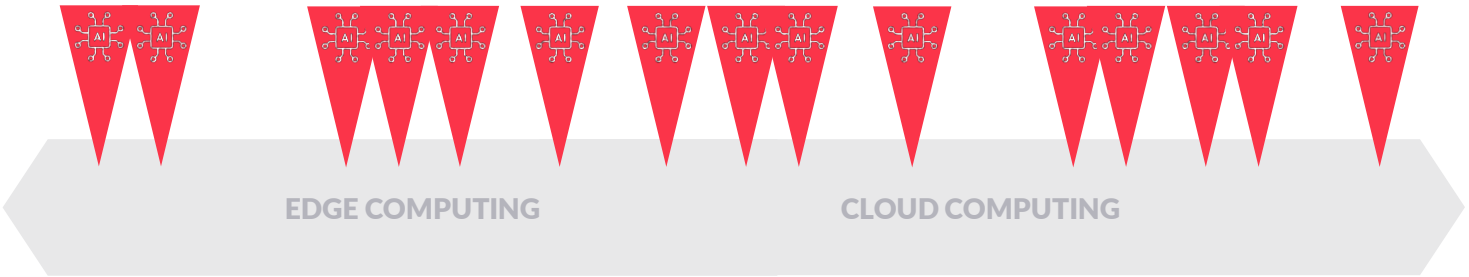
Edge Computing ♥ AI

The architecture of alexa



Edge Computing ❤ AI

The architecture of alexa



”

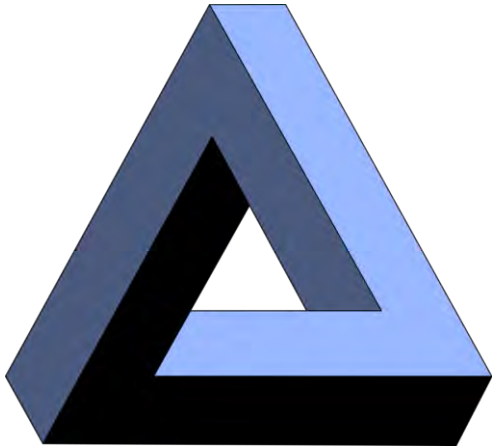
Maybe the Cloud is not broken…
Maybe it just needs some friends

barbara

Edge ❤ Cloud ❤ AI

A powerful combination

Artificial Intelligence



Cloud Computing

Edge Computing

¿How do we manage this complexity?

What are the tools that make it easier to manage scale models?

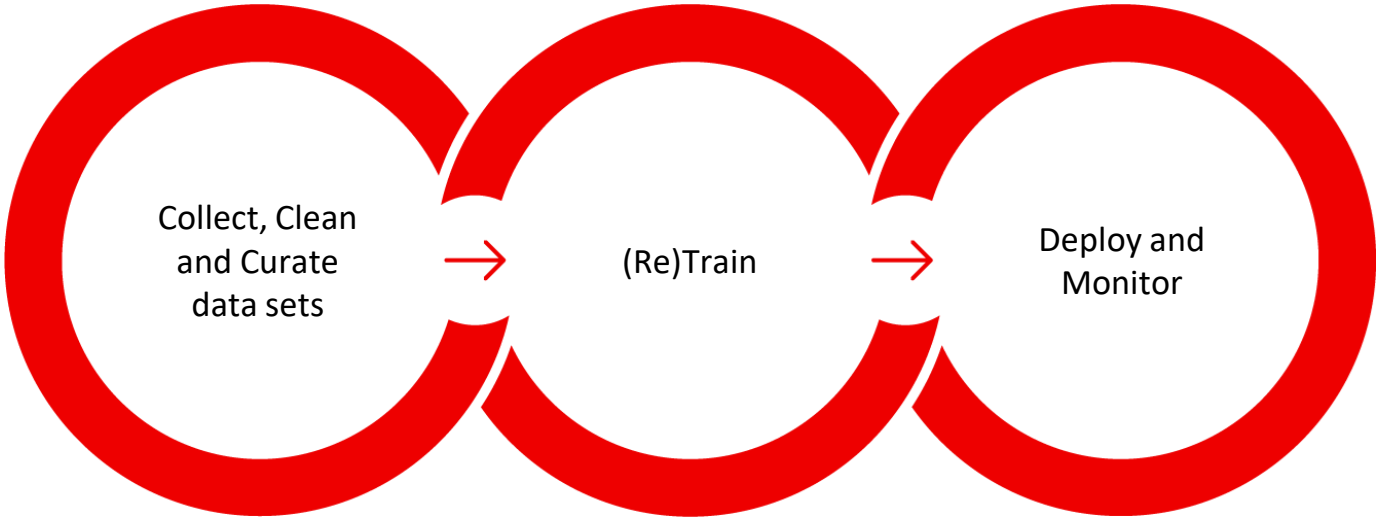
MLOps

Machine Learning Operations

A set of practices aimed at deploying and maintaining machine learning models in production in a reliable and efficient manner.

Edge ❤ Cloud ❤ AI

MLOps cycle



Edge ❤ Cloud ❤ AI
MLOps challenges

Edge Computing can be the solution

Two of the biggest challenges in putting ML models into production and monitoring them can be solved by using an edge computing platform.

Time to deploy a model in production

Biggest MLOps challenge survey

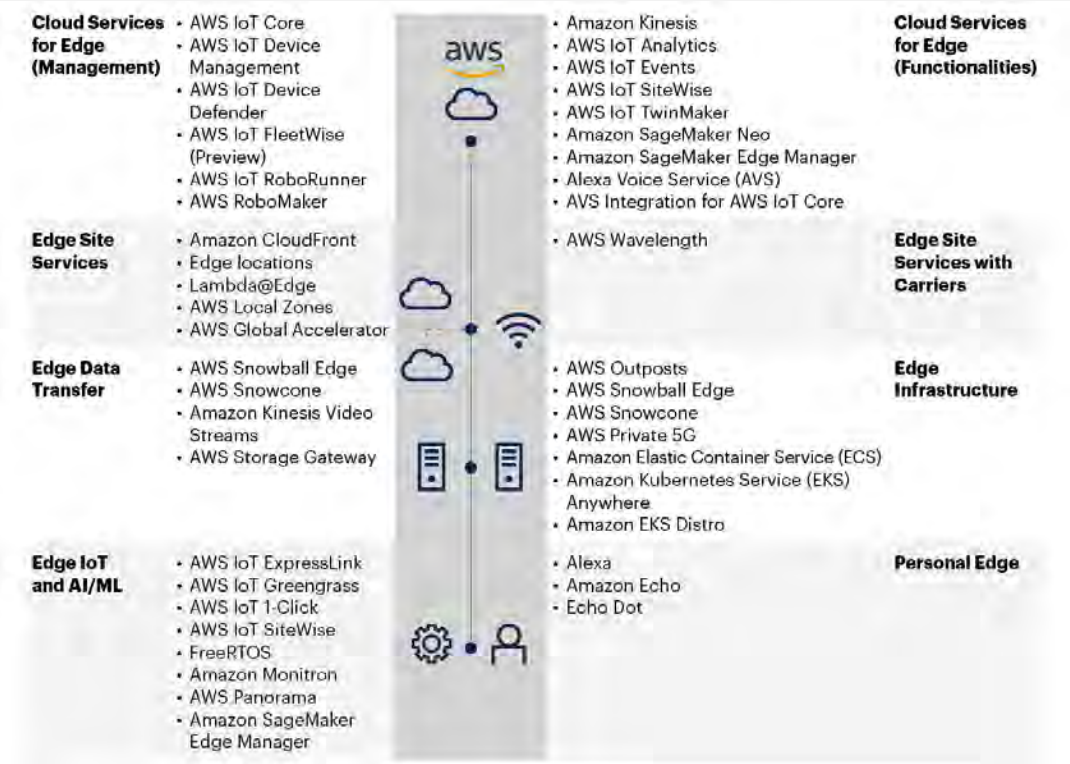
Fuente: AI Infrastructure Alliance

Index

Index

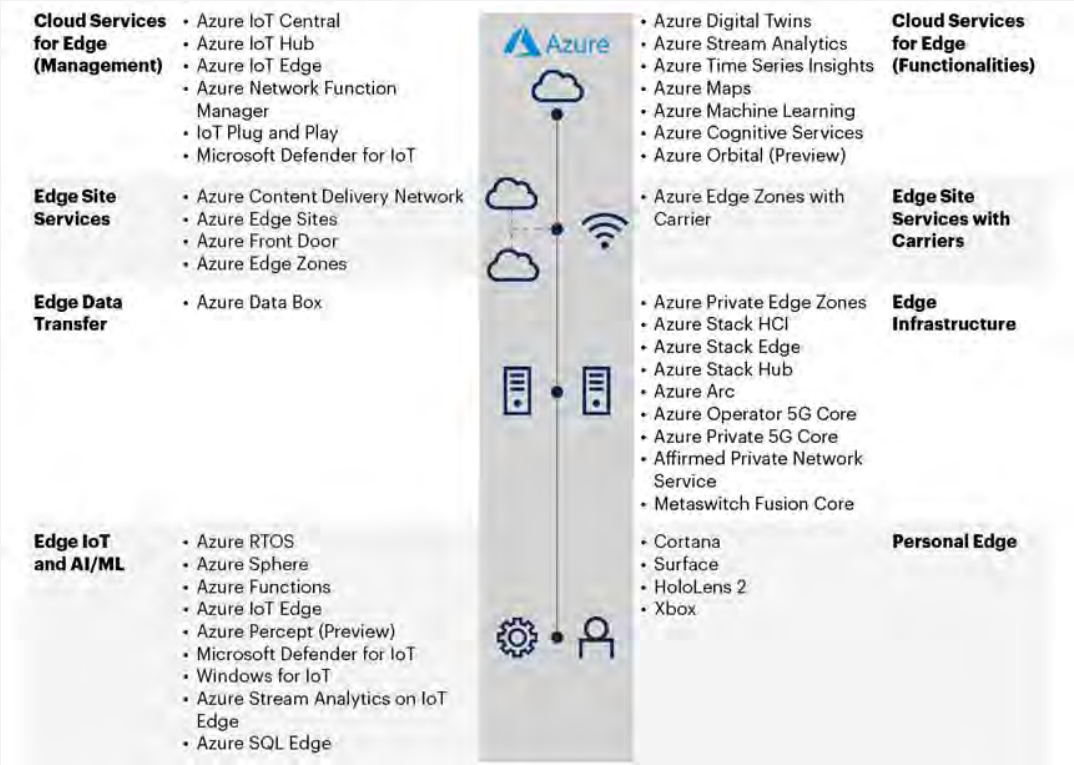
Edge Computing Platforms

Amazon Web Services



Edge Computing Platforms

Microsoft Azure



Edge Computing Platforms

Google

Enterprise

Google Cloud will shutter its IoT Core service next year

Ron Miller @ron_miller / 4:18 PM GMT+2 • August 17, 2022

Comment

Edge Computing Platforms

IBM

Edge Computing Platforms

Native providers

ZEDEDA

crosser

SUNLIGHT

avassa

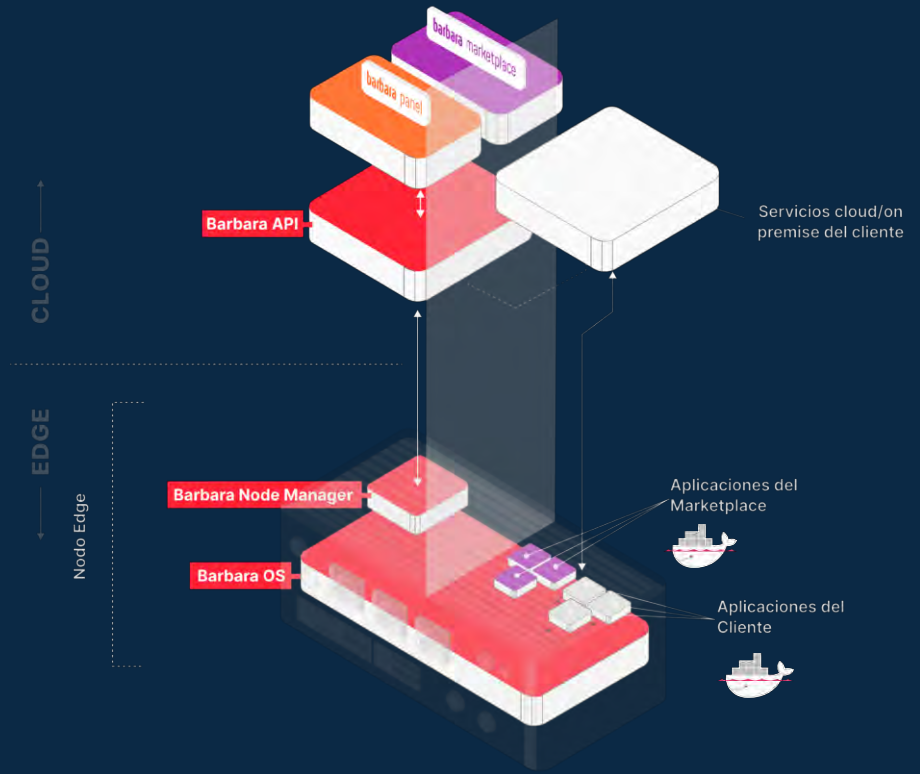
sixsq

barbara

Technological Stack

Promoting standardisation and openness

- **Barbara Marketplace**
  Connectors, databases and ML models in one place. Applications updated and ready to be installed.
- **Barbara Panel**
  All functionalities in a single interface. Accessible from any device (desktop, tablet or mobile).
- **Barbara API**
  Interoperability and integration with any other business system.
- **Barbara Node Manager**
  Software agent that allows remote management of Gateways.
- **Barbara OS**
  Linux-based operating system designed from the ground up to be lightweight and cyber-secure.
- **Edge Applications**
  Apps running on the Gateways, deployed and monitored through Barbara.



Index

Index

INDUSTRIES

With Edge Computing Applications

01. **Smart Grids**

02. **Smart Water**

03. **Smart Manufacturing**

04. **Computer Vision**

www.barbaraiot.com

Introduction to
MLOps at the Edge

Álex J. Cantos
VP Product & Design
barbara