

TECHNICAL SEMINAR

# Edge Computing

Bringing computation closer to where data is created

PRESENTED BY

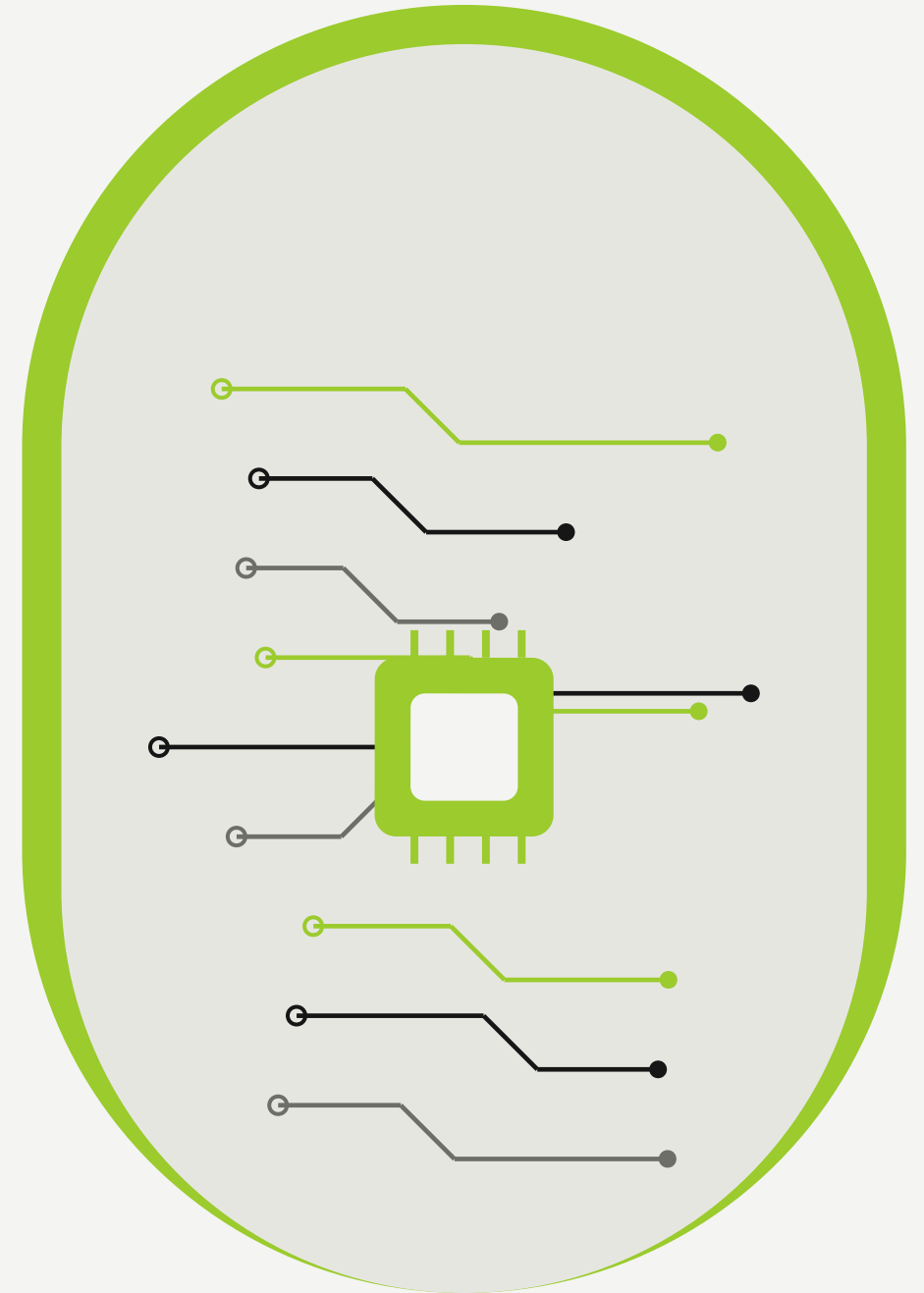
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GUIDE

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DATE

**March 2026**



# Agenda

- 01** Overview
- 02** Core concepts
- 03** Applications
- 04** Challenges
- 05** Future



Image

# Introduction

- Billions of devices now generate data at the network edge
- Sending everything to the cloud adds delay and cost
- Edge computing processes data near its source
- It powers real-time apps like autonomous vehicles and smart factories



# Evolution

**2000s**

**CDNs**

Content cached near users

**2016**

**MEC**

Compute inside mobile networks

**2012**

**Fog computing**

Cloud extended to the network

**2020s**

**AI at the edge**

Models run on devices

# Key concepts

1

## Latency

Time for data to travel and be processed — the edge cuts it sharply.

2

## Edge node

A small server or gateway close to the devices it serves.

3

## Offloading

Deciding which tasks run locally and which in the cloud.

# How it works

## 1 Sense

Devices collect data

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## 2 Filter

Edge node cleans and aggregates

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## 3 Decide

Local model acts instantly

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## 4 Sync

Summaries go to the cloud

# Architecture

**Three tiers — device, edge and cloud — each doing what it does best.**

Devices sense, edge nodes make time-critical decisions, and the cloud handles long-term storage, training and fleet-wide analytics.



Architecture diagram

# Applications



Image 1

## Smart factories

Machine faults detected in milliseconds



Image 2

## Connected vehicles

Local processing for safety features

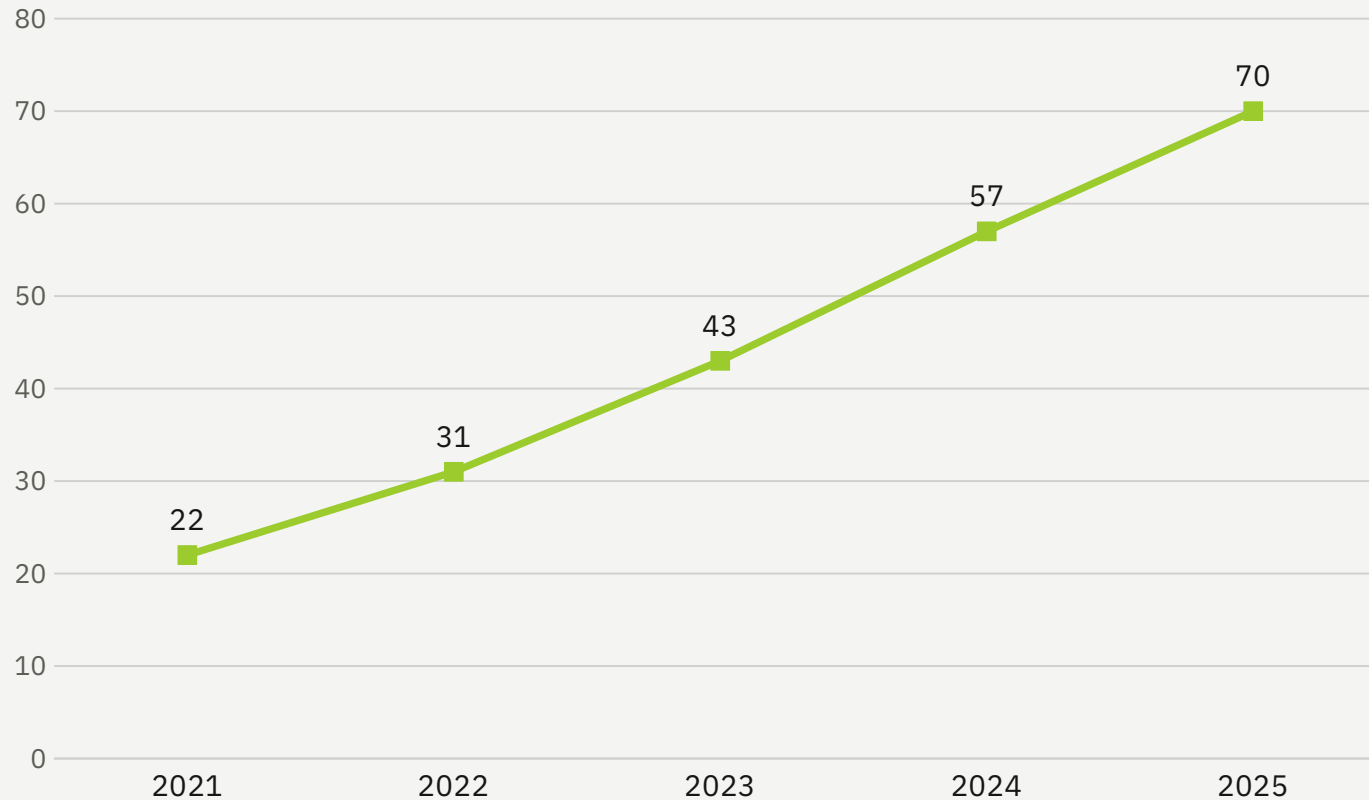


Image 3

## Retail

In-store analytics without uploading video

# Adoption trend



Adoption has grown steadily as 5G and low-power AI chips matured.

*Sample data for illustration — replace with your own figures.*

# Advantages and limitations

## Advantages

- ✓ Very low latency
- ✓ Lower bandwidth costs
- ✓ Better data privacy
- ✓ Works with poor connectivity

## Limitations

- Harder to manage many nodes
- Limited compute per node
- Physical security of devices
- Standards still evolving

# Open challenges

1

## Orchestration

Deploying updates to thousands of nodes.

2

## Security

Protecting devices in the field.

3

## Energy

Running models on tight power budgets.



**The future cloud is not  
one place — it is  
everywhere data is born.**

Looking ahead

# Conclusion

- Edge computing complements, not replaces, the cloud
- It is key for real-time, privacy-sensitive applications
- Management and security are the main open problems

# References

- [1] Survey paper on the topic, IEEE Access, 2024.
- [2] Textbook chapter covering fundamentals, 2023.
- [3] Recent conference paper on applications, 2025.
- [4] Industry white paper (generic reference).



# Questions?

Thank you for listening.