

# Edge Computing: A Decentralized Evolution of the Cloud

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# Introduction

- Rapid growth of connected devices and real-time applications
- Traditional cloud computing reaches its limits
- **Edge computing** brings computation closer to the data source

# Why Edge Computing?

- **Latency:** Reduces delay for real-time responses
- **Bandwidth:** Minimizes data transfer volume
- **Privacy:** Keeps sensitive data local
- **Resilience:** Operates even with cloud disconnections

# Architecture Overview

- **Edge devices:** Sensors, wearables, cameras
- **Edge nodes:** Gateways, micro-servers, local processors
- **Cloud layer:** For large-scale analytics and storage

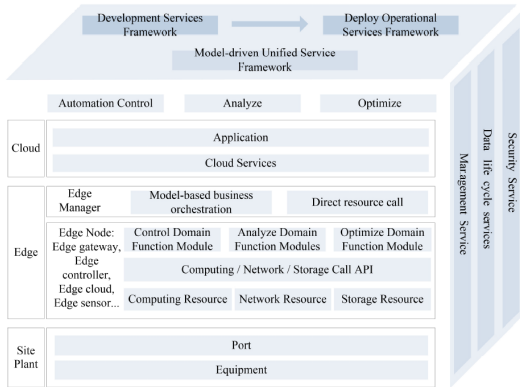


FIGURE 1. Edge computing reference architecture 3.0.

## Use Case: Internet of Things (IoT)

- Smart homes: temperature, lighting, security
- Environmental monitoring: air quality, agriculture
- Local processing improves responsiveness and privacy

# Use Case: Autonomous Vehicles

- Onboard sensors generate huge data streams
- Requires instant decision-making (e.g. braking)
- Edge computing enables safety-critical operations

## Use Case: Smart Cities

- Real-time traffic management
- Public safety and surveillance
- Energy optimization and environmental monitoring

## Use Case: Healthcare and Telemedicine

- Real-time patient monitoring
- On-site diagnostics in emergencies
- Strong data privacy and compliance (e.g. GDPR)



# Advantages and Challenges

## Advantages:

- Lower latency and bandwidth usage
- Better data privacy and security
- Improved resilience and scalability

## Challenges:

- Complex management of distributed nodes
- Interoperability with cloud platforms
- Security at the edge

# Trends and Future Perspectives

- Integration with AI and 5G for smarter edge decisions
- Lightweight containers and orchestration (e.g. K3s)
- Research in privacy-preserving analytics, federated learning

# Conclusion

- Edge computing addresses key limitations of centralized cloud
- Use cases show strong benefits in latency, privacy, and efficiency
- Future: a hybrid cloud-edge ecosystem

Thank you!

# Open Discussion

## Discussion Point

Edge computing reduces data exchanges by processing locally. But:  
**With network demands constantly rising, will edge computing be enough?**

Or is it just a temporary relief before a new saturation point?