

Edge Computing in IoT Devices

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Introduction

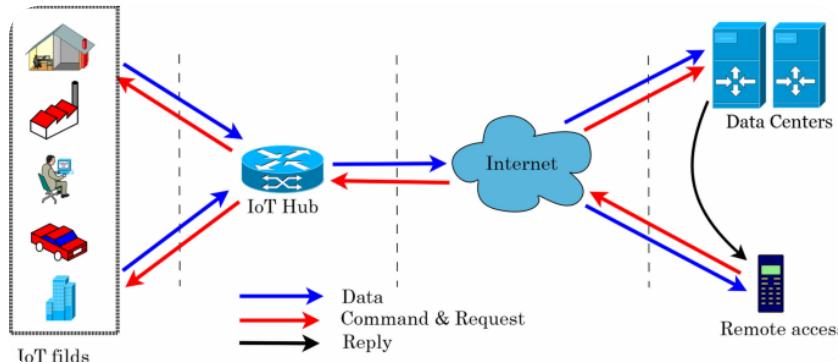


FIGURE 1: INTRODUCTION

Background / Problem Statement

- Cloud processing causes delays in time-sensitive IoT applications (e.g., autonomous vehicles, healthcare monitoring).
- Data transfer to the cloud consumes significant bandwidth.

Research Question / Hypothesis

Does edge computing significantly improve IoT performance in terms of speed, efficiency, and security compared to cloud-only processing?

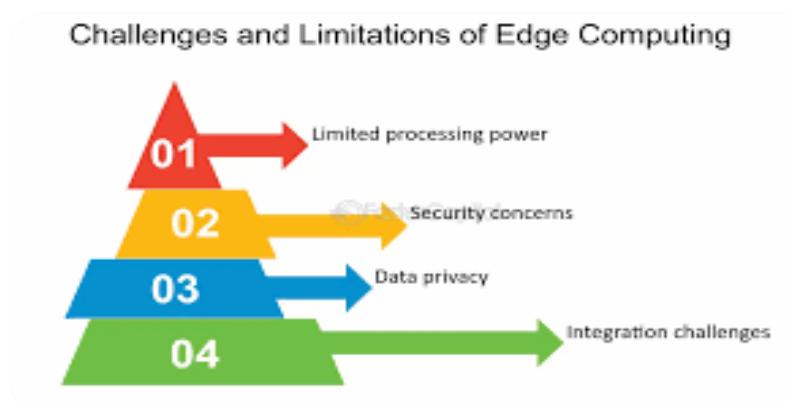
Methodology

1. Set up IoT devices (sensors and local processors).
2. Configure two test environments:
 - Cloud-only processing
 - Edge + Cloud hybrid model
3. Things to collect: response time, bandwidth usage, and data privacy control.

Experiments

- Case Study 1: Smart Home Sensors
 - Response time measured when controlling lights/appliances.
- Case Study 2: Wearable Health Monitor
 - Heart rate monitoring compared: edge-processed alerts vs. cloud delays.
- Case Study 3: Security Camera Feeds

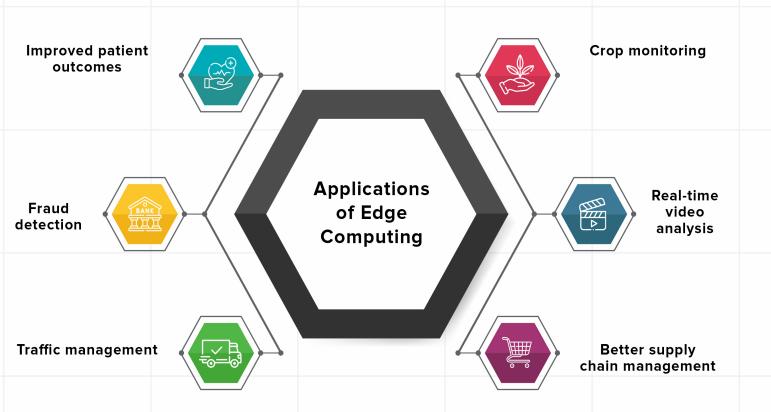
Limitations



Applications

Edge computing in IoT is already transforming various industries:

- **Smart Homes:** Faster device responses (lights, appliances, security cameras) without cloud delays.
- **Healthcare:** Wearable devices that detect anomalies in real-time and alert doctors instantly.
- **Autonomous Vehicles:** Onboard AI for decision-making reduces reliance on distant servers.



Recommendations

To maximize the benefits of edge computing in IoT systems, these following measures are recommended:

- **Hybrid Deployment:** Combine edge and cloud for scalability and reliability.
- **Enhanced Security Protocols:** Introduce device-level encryption and cheating proof hardware.
- **AI Integration:** Use artificial intelligence at the edge for adaptive decision-making.

Key Findings

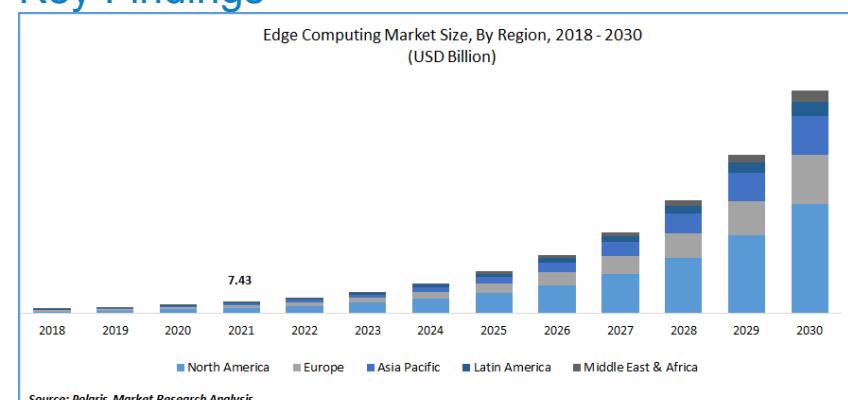


TABLE 1: KEY FINDINGS OF EDGE COMPUTING

Discussion

While edge computing boosts performance, challenges remain:

- Hardware limitations of small devices.
- Security risks if edge devices are physically compromised.
- Need for standardized frameworks to integrate edge and cloud seamlessly.

References

- IEEE IoT Journal, 2024
- Cisco Edge Computing Whitepaper

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