Indian Institute of Information Technology Dharwad
From Cloud to Edge: The Processing Revolution of 5G

EC361 - Introduction to 5G
Course Instructor: Jagadeesh RB

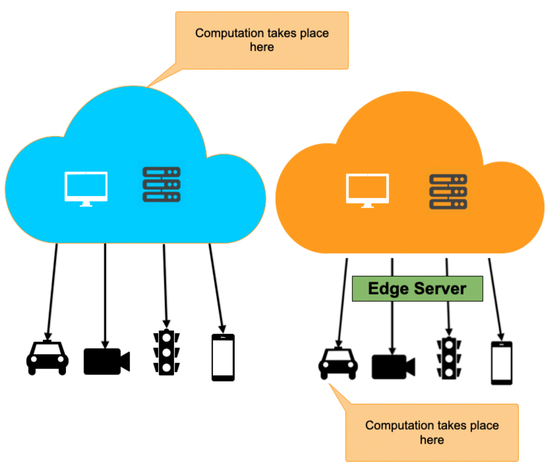
Abstract

The dawn of 5G brings a revolution in mobile network capabilities, promising ultra-fast speeds, ultra-low latency, and massive device connectivity. However, to truly unlock the potential of these advancements, we need a complementary technology: edge computing. This poster explores the synergy between 5G and edge computing, highlighting its objectives, implementation strategies, and the transformative impact it will have on various applications

By processing data closer to its source, edge computing dramatically reduces latency, **enhancing network efficiency and user experience**

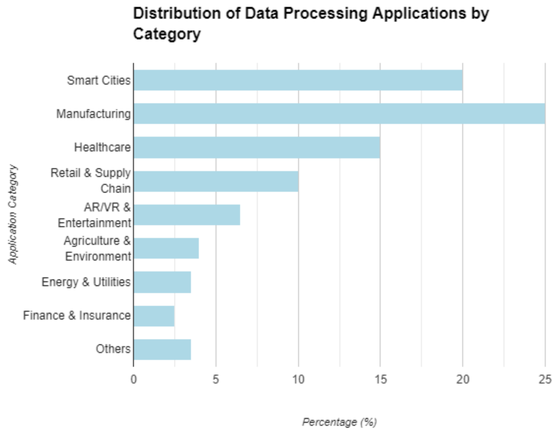
Introduction

The world is on the cusp of a mobile revolution driven by 5G! Imagine a future where real-time data processing unlocks a new era of possibilities. This future is closer than you think, thanks to 5G and edge computing Latency, the time it takes for data to travel, has always been a bottleneck for certain applications in mobile networks. With the increasing demand for real-time experiences, the limitations of existing networks are becoming apparent.
. However, to fully unlock the potential of 5G, we need a complementary technology: edge computing. Edge computing addresses the latency challenge by processing data closer to its source, at the network edge.



Materials

One of the key benefits of edge computing is its ability to cater to diverse applications across various industries. This graph showcases the distribution of potential applications that can benefit from 5G and edge computing. Leading the pack are Smart Cities, Manufacturing, and Healthcare, followed by AR/VR and other innovative fields.



Methodology

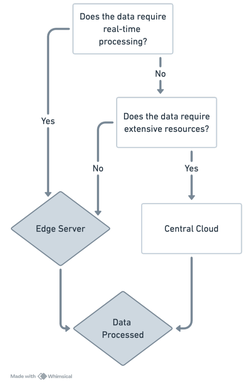
Reliable and secure data exchange is crucial between edge servers, devices, and the central cloud. Common protocols used in edge computing include:

- MQTT (Message Queuing Telemetry Transport)
- HTTPS (Hypertext Transfer Protocol Secure)

Benefits of these Technologies:

- These protocols and technologies offer several advantages:
  - **Reliable Data Exchange:** Protocols like MQTT and HTTPS ensure data integrity and security during communication.
  - **Efficient Communication:** Lightweight protocols like MQTT minimize network overhead for resource-constrained devices.
  - **Simplified Deployment:** Containerization technologies like Docker facilitate faster and more consistent deployment of applications at the edge.
-

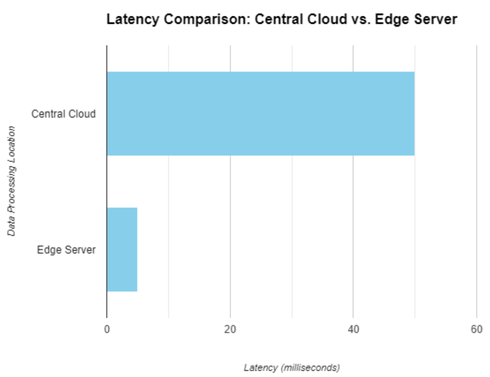
In 5G networks, edge computing distributes data processing for optimal performance. Data requiring immediate action, like in self-driving cars, gets processed at nearby edge servers for minimal delay. Less time-sensitive data is also processed locally at the edge, reducing network traffic. Complex tasks requiring significant resources are then directed to the central cloud. This distributed approach leverages the strengths of both edge and central processing, ensuring efficient data flow and unlocking a wider range of applications in the 5G era.



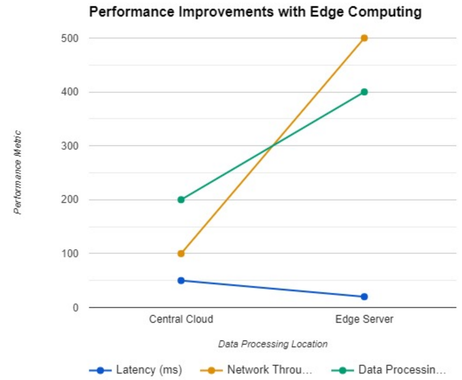
Results

The following graph demonstrates the impact of edge computing on latency This graph demonstrates the significant reduction in latency achieved through edge computing.This reduction in milliseconds translates to real-time capabilities for applications like:

- Autonomous vehicles requiring immediate response to sensor data.
- Augmented reality experiences that rely on instantaneous data processing.



The graph depicts the dramatic performance boost achieved through edge computing. Processing data locally significantly reduces latency, minimizing delay and empowering real-time applications. This is evident in the sharp drop compared to relying solely on the central cloud. Additionally, network throughput soars as less data burdens the network, freeing up bandwidth. Finally, processing speed shows improvement when tasks are handled locally on edge servers.



Conclusion

Edge computing unlocks the full potential of 5G networks by optimizing data processing. It leverages both edge servers and the central cloud, achieving:

- **Reduced Latency:** Faster processing at the edge minimizes delays, crucial for real-time applications.
- **Improved Network Efficiency:** Local processing reduces data traffic, leading to a more efficient network

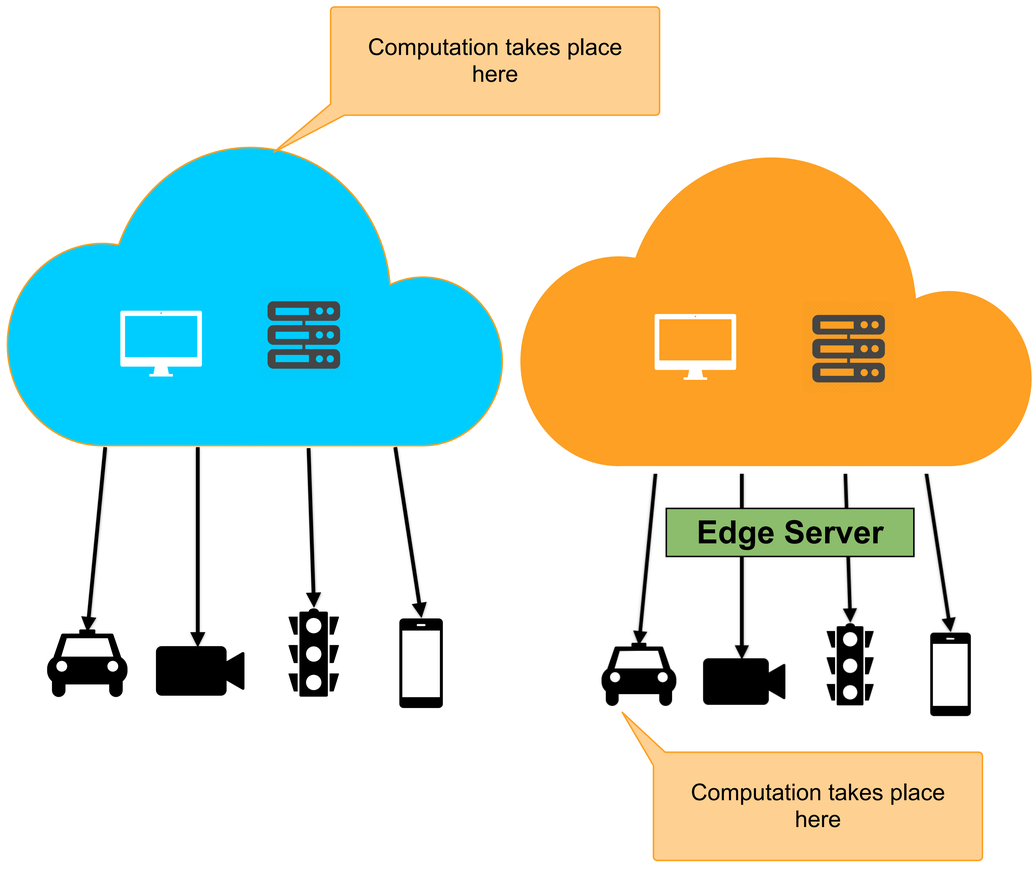
This paves the way for a future of:

- **Real-Time Decision-Making:** Faster processing empowers real-time responses across industries.
- **Widespread Innovation:** Edge computing unlocks new applications in smart cities, healthcare, and industrial automation

Acknowledgements

Jaishana Bindhu Priya, Hari Prasad, Eswar Naik, Rishikesh, Parth Pawar

References : Hassan, Najmul & Yau, Kok-Lim & Wu, Celimuge. (2019). Edge Computing in 5G: A Review. IEEE Access. PP. 1-1. 10.1109/ACCESS.2019.2938534.


Computation takes place here
Edge Server
Computation takes place here