# A Study on Edge Computing in 5G

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## ABSTRACT

Fifth generation (5G) is next generation cellular network for communication and it includes enhanced features like increased quality of service, low latency and high reliability but it demands high computations and traffic. Edge computing is an advanced technology that can support the development of 5G by bringing the feature of cloud computing to the user equipment. Different advancement in edge computing led to solve some problems in cloud computing like high latency and lack of security. This paper includes a study on the use of edge computing in 5G communications and how it can be wisely used to enhance its features.

Keywords : Edge computing, Cloud computing , latency

### Introduction

Edge computing is a mechanism where the cloud features are extended that enables the edge servers to perform high computational tasks and to store more amount of data. Introduction of cloud computing was a huge wave in the industry but the reduced computational speed and storage capacity at the user end was the major drawback. In cloud, remote data servers are used to save the contents and in edge computing, it is completely replaced edge servers which are placed closely to the user devices[1].Edge computing contains the features that can help wireless  communication as now the advanced features like augmented reality and virtual reality are in action. These applications also demands high throughput[2].Edge serves in the edge cloud are placed  locally and it can be used to distribute different decisions in a mini cloud[3].This paper includes how different features of edge computing can be effectively used in 5G communication.

### Architecture Of Edge Computing

Architecture of edge computing includes edge nodes and edge gateways which are connected with edge servers as shown in the fig1.Edge computing can both work as a single platform or even as a combined form with other components like cloud[4].In the architecture of edge computing  edge servers are placed in the edge of network that is near to the user equipments[5] , this can reduce the energy consumption but in cloud high energy is consumed.
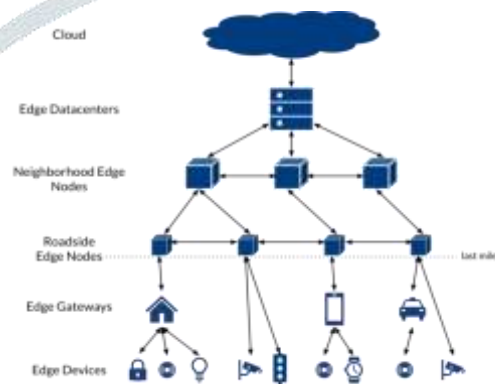


Fig 1:

As in 5G communication is predicted to have communication in less than milliseconds and the

packets can be transferred quickly in edge computing.

## Needs for 5G Communication

The number of mobile phone users are expected to reach 25 billion by 2020[6] and so massive amount of data will be generated which is about 30 times as earlier. By then highly interactive applications are expected to release and those will demand high quality of service .Another important need is the use of this communication method in heterogeneous environment and interoperability.

5G communication is supported by three types of technologies. Firstly high frequency bands that support high bandwidth is required[7], secondly to reduce interference while using high frequency bands small cells are used. Thirdly massive multiple input and multiple output allows the base station to use many antennas, therefore more neighboring nodes can communicate simultaneously.

## Requirements Of  Edge Computing in 5G

There are four basic requirements that can be used for the operation of edge computing in 5G. Firstly edge computing provides low latency to support delay sensitive applications and services and  secondly as data and user requests are handled by the edge servers   , processing is considered to be easier. It also requires high data rate so that high amount of data can be generated[8]. Lastly edge computing keeps data and application logic to the edge clouds and so the availability of clouds are also important.

## Facilitators Of Edge Computing in 5G

There are five different facilitators that helps edge computing in 5G communication

- Dynamic access to radio access technologies

It provides access to different technologies like Wi-Fi and even some newly developed radio access technology like  NR[9].

- Software defined network(SDN)

This defines a network architecture that divides network in to control and data planes and this division helps to simplify the network and new services can be also created[10].

- Network function virtualization (NFV)

It is also called as virtual functions and it can handle a large amount of data to provide flexibility in the network[11].

- Device to device communication

Here device to device communications happens through ad-hoc connections and this is carried out without the interference of base stations .This process can increase the reliability of the whole system.

- Massive MIMO

It keeps multiple antenna elements to increase antenna array at transmitter and receiver so that the user equipments can offload tasks to an edge.

## How  Edge  Computing  helps  5G

There are different ways how edge computing can support 5G communication. They are

- Storage
  Different storage strategies are provided by edge servers and save a large amount of data from the equipments. Edge servers offer a distributed local storage also and the amount of data stored is even less than cloud.

- Data analysis
  Real time data can be easily analyzed from large amount of unprocessed data by edge computing and the results can be easily made use for decision making. This type of analysis will be helpful for 5G communication[12].

- Operation.
  Edge computing works on remote control and monitoring and so this feature can be made use in the wireless communication procedure.

- Security enhancement
  An additional layer of security is provided between cloud system and user equipments. This layer can supply extra security with least requirements.

- Processing
  Edge computing is having a capability to offload all computations and processing from the user equipments to the edge cloud. This procedure can reduce the load as well as the processing power. The user equipments discussed here vary from smart phones to smart factories.

## Conclusion

Study on edge computing applied in 5G cellular technology reveals many advantages like a) less operational cost b) high quality of service c) energy efficiency. Apart from these advantages the efficiency can be increased by fog based architecture or by mobile edge computing. The quality of edge computing is a measure of customer satisfaction but it includes hardware characteristics and so when implemented in 5G , calculations are done in that manner. Inclusion of this technology gives many benefits like remote surgery but this combinations can give rise to new issues and it can be studied and resolved in the future.

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