Mobile Edge Computing in Agriculture Sector

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Abstract. The communication gap between operating devices which we use to serve our daily needs and the data centers(i.e.,cloud) where actual data is stored has been increasing making the process speed of devices slow. Advancement in technology and companies working on various data to process the end devices has been a issue since customers want their devices to process fast. To solve the above issue Mobile Edge Computing(MEC) comes into picture, Where MEC installed between devices and the database cloud makes the devices to gather data fast thereby reducing latency and making the devices to work fast. Mobile Edge Computing can solve majority of problems in every domain. In this research paper we will be discussing how mobile edge computing solves issues in agriculture sector reducing cost for farmers and maintain data by various companies.

1 Introduction

Modern generation is seeing a rapid growth in technology by utilizing various IOT devices, Mobile networks(5G spectrum), Machine learning and Artificial intelligence and the data generated by using this technologies is very huge and the companies working behind the scenes needs to store the generated data in cloud for processing and maintain security that need to be guaranteed to the customer. The advancement of devices running to solve customer needs require more processing power and more battery as the data is processed from cloud to devices. Latency will be a issue when the devices communicate to and fro from cloud to IOT devices. To overcome this problem Mobile Edge Computing(MEC) plays a vital role where MEC is installed close to the customer devices, Increasing the device processing speed with less battery, less memory and RAM and the latency is reduced. MEC acts as a bridge between end user devices and the cloud where wholesome of data is stored in the cloud and edge computing servers offload the data that needs the edge devices to work faster.

In this paper we discuss how Mobile Edge Computing helps to solve the issues in agriculture by increasing processing speed of IOT devices that are used in agriculture and data gathered by IOT devices from MEC servers which can be used by companies and farmers to improve the crop yield and protect crops from pests and diseases by studying the obtained data . In this paper we also discuss what are the challenges that existing system is facing and how Edge computing helps to overcome the issue, We will also see how processing

speed can be achieved by using data replication to reduce power utilization and response time of devices and what challenges do Edge computing face.

2   Related work

Mobile Edge Computing has became a new trend in recent technology where it is still in developing phase and the first deployment of MEC has been in china where it potentially reduces latency for devices to work fast. Various research and study has been undergoing in full pace. N.Bhalaji has published a paper on Efficient and Secure Data Utilization In Mobile Edge Computing By Data Replication where data is replicated making it easier for IOT devices and edge devices to work easily and with more speed. Shangguang Wang, Yali Zhao, Ching-Hsien Hsu from china published a paper on Edge servers deploying in mobile edge computing where the latter discussed where edge servers should be placed making the devices communicate with cloud and the MEC servers.

In this paper we will be discussing how edge IOT devices in agriculture respond to MEC servers and how fast the data can be obtained and what will be the processing speed. We use data replication technique to break the data in chunks thereby making easy for the devices to communicate between.

3   Edge Server Placement in Agriculture

Edge server acts as a bridge between connected devices and the cloud where the final data is stored. A drone running in a agriculture can be used for various purposes like monitoring the fields, pesticide spraying and many other. It uses a IOT sensor and chip embedded in it operated using remote can even fly to higher altitude. Companies using this as the main source to gather information and to increase the performance of the drone by deploying edge server between the drone and the final cloud storage. This makes the drone to communicate fast between the final cloud devices and reducing latency. Even the companies can gather data for the business making it a win-win situation for both farmers and companies. Even-though there are challenges involved in deploying edge servers but the processing speed is very fast compared to other devices working with non edge servers.There can be other devices as well the servers lets you to connect to any number of devices and the offloading and communication happens to and fro.

4   Data Replication and it's uses in Mobile Edge Computing

Data duplication plays a major part in Mobile Edge Computing where the data is duplicated and placed between the end devices so that the devices can use the data more fast increasing the processing speed and reducing latency and even can maintain high security for the data. Even-though this was achieved before
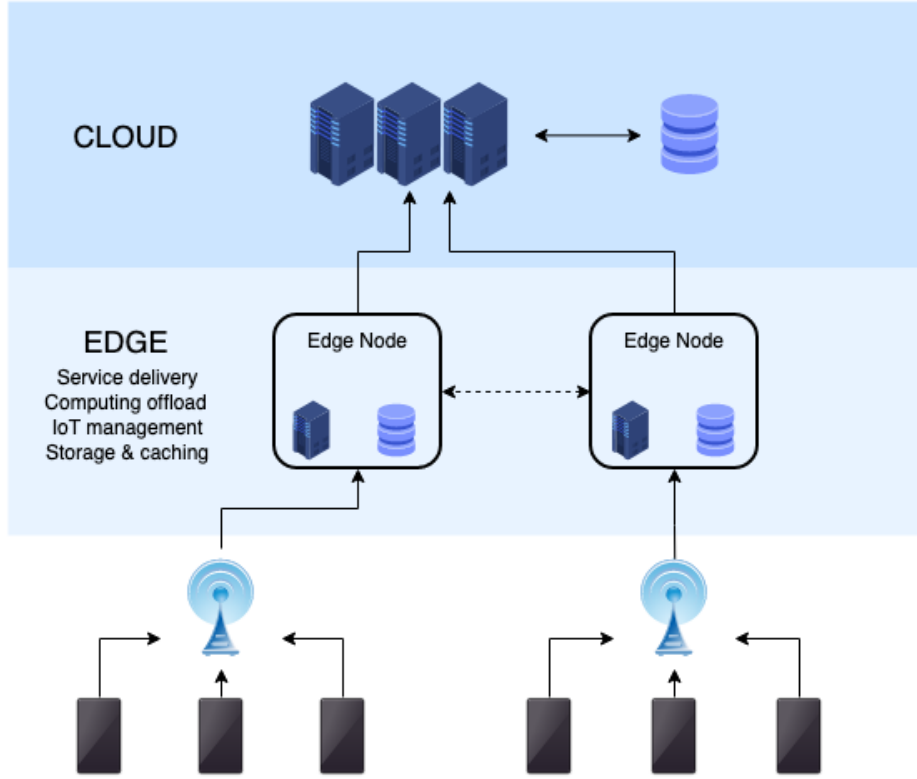
Fig. 1. Edge Server Placement

using cloud computing but the cost and latency paved way for the latter one as the newer one concentrates on placing close to end devices rather than remote ones.Below shows the methods how data is replicated and how it will be used in our agriculture sector.

4.1   Randomized Duplication

Randomized Duplication is one of the method where the data is duplicated in nodes. Later the mobile nodes diffuses the data to nearby devices working and when this occurs the count is incremented and reset to zero if the same type of data exist in visited node. This method prioritizes based on how frequently data is retrieved. Now considering an example on an automated weed remover in agriculture where the device use IOT to run and the data is processed to-and-fro from end device to cloud device to extract data. By using data replication the data is duplicated and placed in mobile nodes. Whenever the weed remover pings the mobile node for the data to process the mobile node diffuses the data and increment the count. If the weed remover again wants to access data and if

the data exists the count is reset to zero by this we can achieve more processing speed and reduce latency. It uses the formula

$$Rep = d1!/d1 - Ms(pow)i1 \qquad (1)$$

4.2   Blow-fish Encryption/Decryption

This methodology looks into protecting the data from hackers at mobile edge where the data replicated in several nodes can acts as main source for attackers. To avoid this the data is encrypted before it is allocated and later it is duplicated. Blow-fish is used for faster encryption and decryption utilizing less memory where it uses XOR logic and 32bit for encrypting data. Below is the figure showing the observed results of latency with security(CWRS) and without security(CWR).
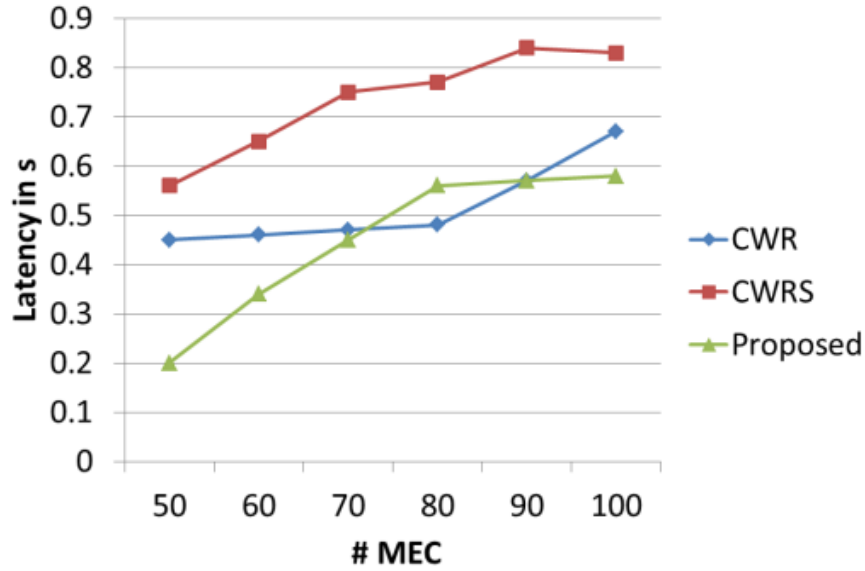

Fig. 2. Latency Observed

5   Advantages and Disadvantages of Mobile Edge Computing

5.1   Advantages

Mobile Edge computing will be the future if implemented in complete phase as still it is in development stage many companies are showing interest in mobile edge computing thanks to it's reduced latency and fast processing by data

retrieval. Data processing can be fast from edge devices to cloud devices by implementing edge servers close to IOT devices. Many algorithms have been developed to reduce the latency power. Companies can make huge profits and the data obtained can be used further for research or quality purpose. Potential problems can be solved by using mobile edge computing. First thing is data can be secure and free from hackers and the end companies can use it for further use.

5.2   Disadvantages

Mobile Edge Computing has some disadvantages but the advantages outweigh the disadvantages where the installation cost is high as the edge servers needs to be installed between edge devices and cloud servers. Data needs to be efficiently used as technology is increasing in a rapid phases the potential risk of hackers can also increase.

6   Conclusion

Finally Mobile Edge Computing has a great future when implemented in full phase. Many companies are testing this out and in close to implement mobile edge computing. It has all the potential powers that modern systems cannot do and some of them are fast processing power, reduced latency, fast data retrieval, data secure and many more. The end devices can work faster reducing the risk and man power. Mobile Edge Computing can work for any end devices with more processing power.

[6], [8], [2], [3], [10], [1], [9], [4], [5], [7]

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