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CHAPTER 7

MOBILE CLOUD COMPUTING

DR. KARUNA SHANKAR AWASTHI

ASSOCIATE PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE

LUCKNOW PUBLIC COLLEGE OF PROFESSIONAL STUDIES

drksawasthics@gmail.com

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ABSTRACT

Mobile Cloud Computing (MCC) is a new way for apps on phones and the cloud to work together. It changes how people use computers and other tech. This part looks at MCC in more detail, starting with the rules that let it join. Every part of the MCC is broken down into its stages, and we look at how each tricky part works. People think about how to fix issues with networks, security, and tech that can't do certain things. Use cases and how MCC can be used are talked about in the first part of the chapter. This part shows how adaptable MCC is when it comes to things like user services, moving around the office, and the Internet of Things. In it, the world is being changed and new findings and trends are being talked about. These concepts can be used in 5G technology, serverless computing, edge computing, and the combination of MCC and augmented reality. MCC shows that the area is changing quickly and will be important in the future. It's also a tech trend. There are many places and ways to use it where it makes a big difference. In the future, it might make links even faster and give people more fun things to do. People should be excited about the new things that mobile cloud computing can do as they move through the fast-changing digital world. That's the point of this study.

7.1 INTRODUCTION

When your phone and the cloud work well together, this is called mobile cloud computing. People now have a lot of options to choose from. Cloud computers keep and process data in different places, so it can be done by more than one screen. Apps for phones run faster, store more data, and work better when they connect to the cloud. Cloud computing and mobile computing have both grown, which is why mobile computing came about. The main way we use information has changed a lot because of smart phones, computers, and other portable gadgets. How we store, handle, and keep an eye on data has changed a lot because of the cloud. A lot of new things are now possible because of these two events. People will no longer let their phones' built-in limits stop them from doing things. Mobile phones are hard to use because they have small screens, not enough storage room, and batteries that die quickly. These issues can be fixed with mobile cloud computing. When phone apps use the cloud, it can store and process a lot of data. People will get more out of this and have a better time if the joining process goes smoothly. People can move around in their personal and professional lives with MCC because it lets them get to services and data from anywhere, at any time.

7.2 Fundamentals of Mobile Cloud Computing

It is the process of making, using, and developing computers that are small and light enough to carry around with you. There are always changes in this area. The whole point of mobile computers is to make it easy for people to get to information and services from anywhere. Hardware, software, and ways to send data make up mobile computers. Devices that can move around and join are made possible by their work together. In mobile computing, hardware means things that can be moved around, like phones, computers, and tech that you can wear. These things have a lot of sensors and strong computers that can do a lot of different tasks. This makes it easier to use these things while you're on the go because they are small and light. The most important thing about cell phones is the software. With apps designed just for phones and computers, they're easy to use and good at keeping track of their resources. "Apps," which stand for "mobile software," let the person use one to do things. It's always busy and different to make apps. These people write apps that can be used for work, play, health, and getting in touch. App shops make it easy for people to find apps, download them, and keep them up to date. Connectivity is important for mobile computing because it lets people connect to

online services and let their gadgets talk to each other. Mobile devices must be able to connect directly in order to work properly. This can be done through cell phone networks, Wi-Fi, and Bluetooth. You can talk to computers nearby, share files, and link to the internet with these tools. It's now much easier to share info thanks to new cell networks like 4G and 5G. This lets you talk to people and watch good movies right now. Location-based services (LBS) on cell phones let people see information that is relevant to where they are. Map-making apps and apps that keep track of where you are need GPS the most. People can use this tool to find their way, get ideas based on where they are, and meet with other people. An accelerometer, a gyroscope, or a magnetometer is some of the tools that app makers use to make apps that react to movement, direction, and background. People care a lot about their safety and privacy when it comes to mobile computers. Hackers and other people who shouldn't be able to see private information on phones need strong security to keep it safe. Information about users and mobile computers is kept safe with biometric verification, encryption, and secret ways of talking to each other. With cloud computing and mobile computing, users can store data and run apps from anywhere. It's easy for users to access their data and services from different devices because cloud services are flexible and can grow as needed. Putting mobile devices and the cloud together is a key way to get around the limits of what devices can store and do. To sum up, mobile computing is a big subject that includes technology, software, safety, and links. The group wants all people to have access to and own computers. The world of mobile computing will change as new ideas come up and technology gets better. People can use computers on their phones with these easy tips. Since phones are getting more and more important, they change how people get information and use services.

7.3 ARCHITECTURE OF MOBILE CLOUD COMPUTING

Your phone and the cloud can work together in a new way with mobile cloud computing (MCC). This lets mobile apps run better and do more. Mobile devices have limited resources, so MCC is built on how well they work with powerful cloud infrastructure. Cloud infrastructure gives you computer resources that you can change and scale up or down. With this method, jobs that need a lot of computing power are sent to cloud computers that are far away. This gets around the problems that mobile devices have, like their limited storage space, processing power, and battery life. Cell phones, cloud data, and the network that links them are the three main parts of mobile cloud computing. Mobile phones, like smartphones and tablets, are used to show people information and let them get to data and apps. This tech can do more with the cloud than it could by itself. On the other hand,

cloud infrastructure is made up of computers and data centre’s that store data, run programs, and work with data. With this method, mobile apps that need a lot of resources can get the work done, store data, and have room to grow. The radio networks that let phones and the cloud talk to each other are a big part of the MCC platform. For people to share files and talk to each other in real time, phones and the cloud need to be able to connect quickly and consistently. These new technologies, like 5G, are very important for making MCC's connection better because they give users the fast, low-latency links they need to have a fun and quick experience. One great thing about MCC is that you can use your phone or computer to do math while you play. The cloud system gets files and computer work to handle as part of the process of change. The results are then sent back to the phone. This not only makes better use of the limited resources on phones, but it also lets high-level apps that need a lot of resources run on phones that don't have them. MCC can also help people make cheap apps for their phones that are useful. To run apps that need a lot of storage room or processing power, developers can use the cloud, which has a lot of these things. People with low-end phones can still use these apps. Many mobile users couldn't get the tools they needed to make difficult apps before, but now everyone can. when you make an MCC, privacy and safety are very important. It is very important to keep data safe and correct since phones send it to the cloud. Secret data is kept safe with tools like encryption and secret contact routes. To keep people from getting in without permission, there are rules about who can use web services and how they can get to them. Edge computing and other parts of MCC bring work closer to the people who will be using it. Edge computing works with data that is closer to where it comes from, so there is less delay. This helps apps answer faster. Spreading things out also helps make the best use of data and cuts down on the need for tracked cloud services. As a whole, Mobile Cloud Computing is a new idea that makes it simple to use both phones and the cloud. This gets around the problems that mobile devices have and gives people new ways to use apps and have fun. Making mobile apps faster with the cloud not only helps MCC, but it also lets people create new, resource-friendly apps that work on many devices and with many people. It is thought that mobile cloud computing will shape the future of mobile computing. We will be able to live in a smart, linked world as long as technology keeps getting better.

7.4 CHALLENGES AND SOLUTIONS

It changed a lot of things. It's also made life easier and linked people from around the world. But this change in technology has some bad sides as well. There are worries about safety and the system's limits, among other things. Something very

bad is going on: people are always scared for their safety. Cell phones come with a lot of risks, such as malware, con artists, and data breaches. People keep private data on their computers, so they need to be kept safe. To keep it safe, save user information, use digital ID, and make sure your security is always up to date. Things are harder because cell phones can be used with many different programs and tools. Different brands of phones and computers may not be able to easily connect to each other because they use various types of operating systems. People have already said that cross-platform apps can be made and that the style can be changed. These styles can help app developers make apps that work on lots of different platforms and screen sizes. This link trouble might get better if the cell company tries to be more reliable. The batteries in cell phones still don't last long enough. As things get better and have more features, they need more power to run. Because of this, it's not always simple to get the longest battery life. Tech that lets you charge things quickly is also being made, along with computers and apps that use less power. Making cells that last longer and work better is one way that better battery technology can help solve this problem. They also have an important but hard to get to part that lets you connect to networks. The links are still acting up in some places, even though 4G is usually available and 5G networks are still being built. This makes it less safe to use on the web. More work is being done to connect more places and make the network bigger. One answer is to make progressive web apps, which work even when you're not online. Some services can still be used by people who have trouble connecting to the internet. It's tough to keep up with and store all the data that is constantly being made and used on phones and computers. Keeping track of all the files, movies, and photos that people save on their phones and tablets is becoming more important over time. Cloud storage and smart caching can help with easy storage bugs. AI-based predictions and smart ideas help users get more out of their storage space and have a better time. When making a phone app, it can be hard to think about how it will look on a small screen. It is important to have good UI and experience design. Make sure that people with screens of different sizes and resolutions can use the app well. If you use fluid design, test with people using a range of devices, and follow the design rules that are specific to each platform, you can fix these problems. Feedback and design that is used over and over again make the experience and user interface better all the time. Some apps and services on phones can't talk to each other, so things move more slowly. It can be hard for users to combine data and functions from different apps. Data forms and programming interfaces (APIs) make it easy for apps to share data and talk to each other. Open standards should be used by everyone in the company so that people can talk on the phone and get to know each other better. It can be an invasion of privacy for apps to get information about users and use it for other

things. People should be able to have a unique experience while still having their data safe. You should have clear privacy rules, strong privacy rules, and ways for people to say yes if you want people to trust you. Mobile phones can help protect privacy by following the new rules for data security and being made with privacy in mind. Last but not least, smart phones have made it easier to work, talk, and learn, but they also have some problems. More work and new ideas are always needed in the most important areas, such as privacy, freedom, security, compatibility, battery life, network link, data management, user interface design, freedom, and data management. If people who work with mobile computers put users' needs first and work together to improve technology, they can fix these problems and make the experience better and safer for users.

7.5 APPLICATIONS AND USE CASES

It has changed how we get news, work, and meet. It's now a big part of our everyday lives. There are numerous tasks that mobile computers might be employed for. A lot of places work better, connect better, and are easier to get to because of them. People talk in various ways when they use smart phones. A lot of sites, apps, and games let people talk to each other even when they're not in the same place. Cell phones can do a lot more now than they used to. This lets anyone, any business, or any group connect with everyone else in the world. When they first came out, they changed a lot of things at work. Real people can do important work from home and quickly work together on their phones. These phones are helpful. Many businesses have done better and been more useful since they learned they can change. Business apps for phones can help them do things like talk to people, work on projects, and look at data more easily. That makes things better and helps people pick the right things. Everything has changed since computers were brought into schools. E-books, learning management systems, and apps for school are all simple for students to use and link to. You can learn anywhere with a phone. There are more options, and more people can go to school. From anywhere and at any time, students can read, watch videos of teachers teaching, and chat with other students. More people going to school is better for learning. Health care has changed a lot because of apps for phones. People can learn about their health, remember to work out, and keep an eye on it with health apps for phones. Smart phones are often used to keep an eye on people from away these days. Health care workers can get information in real time that helps them provide better, more individualized care. Telemedicine is one more thing you can do with your phone. People can talk to their doctor through video chat instead of going to the office in person. Cell phones have helped the movie and TV show business get their movies

and shows to people all over the world. People can have fun on the go with VR, mobile games, and live apps. People do things and spend their free time differently now that they have cell phones. Now they can watch movies, play games, and have fun in other ways. Cell phones have made it easy for people to get help from the government. People can easily get information, pay their bills, and use public services thanks to government websites and apps that work well on phones. There will be apps for phones that let people run for office. This is the best way to make democracy better. Apps for phones have changed the transportation business in a big way. Services that let people share rides, tracking apps, and real-time information about how to get around have changed how people get to work. You can now use your phone to pay for many things, like rides, parking, and public transit. Mobile computers should also be used to make "smart cities," which help with traffic and make cities run better in general. A lot of people now use apps on their phones to pay and bank. People can easily pay their bills; see how much money they have in each account, and move money between accounts. Digital payments and apps on phones make it safe and easy for people to handle their money. This moves us closer to a world without money. Plus, having a PC has helped me in times of trouble and to help people who need it. It is very important to use contact apps, emergency alert systems, and location-based services to get the word out quickly in an emergency. Cell phones let people who need help call for it and send important messages to people who are ready to assist. Cell phones are now a big part of modern life, and people are still using them for more and more things. The way we learn, get medical care, and have fun has all changed because of phones. They've also changed how we talk to each other and do business. Maybe phones will be able to do more as technology gets better. This will change how we live, work, and talk to each other.

7.6 FUTURE TRENDS AND INNOVATIONS

Our lives, jobs, and conversations are very different now that we have cell phones. A lot of big trends and new technologies are likely to change how people use their phones in the future. The spread of 5G technology is a big trend. In the fifth wave of cell networks, there are more lines, faster internet, and shorter wait times. Also, people can make new things and apps. Use the apps that come with your phone instead. Phones will be able to do a lot more with 5G. They can use augmented reality (AR) and virtual reality (VR) and work together. They can also talk to each other in real time. In the long run, AI and ML will be used in phones as well. This is another important picture piece. Smart phones and computers are getting smarter and can now figure out where people are, what they like, and how they use them.

People will like personal helpers that are run by AI more because they can offer personalized and preventative help. Our phones can only really do what we want them to do in this way. Also, this mix will help you understand everyday words better. This will make it easy for everyone to use our tools. Another big change in phones is the Internet of Things (IoT). Cell phones will be the main way we handle and talk to all of our smart things when more of them are linked together. We'll always be connected, so phones will be how we talk to each other. This is what will get things done better and faster.The most important things about phones will always be that they are safe and private to use. Phones are being used to store and handle more and more private information, so strict safety rules will need to be put in place. Mobile computers, fingerprint tracking, and self-service identity systems will need to get better in order to keep user data safe. Many people have apps for virtual reality (VR) and augmented reality (AR) on their phones. Virtual things will be shown on top of the real world with AR apps. After reading this, we'll see and deal with it in a different way. Going on trips with real people will be more fun, though, to learn, train, play, and act. 5G and high-tech AR/VR tools can be used together in new ways for work, school, and fun. "Edge computing" in mobile computers will become more and more popular. You can work on data that is close to where it was created with edge computing. This makes things go faster and better in real time. Moving apps from the cloud to your phone can make them faster and more useful. This is very important when you need to get somewhere quickly, like in smart cities or cars that drive themselves. As phones change, being green and taking care of the earth will become more important. The world changes a lot when things are taken away and new ones are added. Lots of new cell phones will probably come out in the future. These phones will probably use less power, be made from eco-friendly materials, and have recycling systems to get rid of more electronic trash. These are really cool new ideas that will change how people use cell phones in the future. These will change how we use technology. Your phone's features will get bigger, smarter, and better able to talk to each other. AI will get smarter, AR/VR will get better, and the Internet of Things will get bigger. That's why more people want 5G. As people care more about the environment and their safety and privacy, smart things will change over time. It looks like cell phones will be around for a long time based on these trends. The digital world is smarter, more linked, and better for the earth because of this.

7.7 CONCLUSION

The brand-new technology called Mobile Cloud Computing (MCC) is changing the way we use data, apps, and services in big ways. Not only have making cloud

computing and mobile devices work together solved problems, but it has also made it possible to use them in a huge range of new ways. This study taught us the basics of MCC. It showed how smart phones and the cloud can help each other. We looked at the MCC's different parts and learned how their complicated parts work. Problems with security, networks, and tools were brought up so that MCC could work well. After that, clever answers were given. It's possible to make it easier for the Internet of Things to talk to each other with MCC. It can also be used to make businesses more mobile and improve customer service. Thanks to MCC, people can be more effective, open, and easy to get in touch with in their work and personal lives. Coming soon: edge computing, 5G technology, server less computing, and the mix of MCC and augmented reality. These new technologies and trends could totally change the game. Now that these changes have been made, MCC will be an even more creative force online. They could improve the link, cut down on wait times, and give people more interesting experiences. Last but not least, we can say that mobile cloud computing is an area that often changes and grows. It's not going to go away like some other trends. The cloud and mobile devices are always adding new ways to work together, have fun, and get things done. We are still on the MCC trip, but it will soon change how we work, talk, and use technology. We need to accept and understand this new way of thinking if we want to do well in the field of mobile cloud computing, which is always changing.

7.8 REFRENCES

- Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., ... & Zaharia, M. (2010). A view of cloud computing. Communications of the ACM, 53(4), 50-58.
- AWS. (n.d.). Airbnb. Retrieved from https://aws.amazon.com/solutions/case-studies/airbnb/
- Barr, J. (2010). AWS Case Study: Netflix. Retrieved from https://aws.amazon.com/solutions/case- studies/netflix/
- Hwang, K., Dongarra, J., & Fox, G. C. (2013). Distributed and Cloud Computing: From Parallel Processing to the Internet of Things. Morgan Kaufmann.
- NITI Aayog. 2021. North Eastern Region District SDG Index & Dashboard Baseline Report 2021-22. https://www.niti.gov.in/sites/default/files/2021-08/NER_SDG_Index_NITI_26082021.pdf
- https://www.csr.gov.in/content/csr/global/master/home/home.html

- https://research.aimultiple.com/sustainability-case-studies/
- https://csrbox.org/Impact/description/Article_full_Top-50-Companies-in-CSR-Activities-Funding-in-India_36
- https://www.futurescape.in/responsible-business-rankings/
- https://www.activesustainability.com/sustainable-development/do-you-know-when-sustainability-first-appeared/?_adin=02021864894
- **https://emagazine.com/sustainability-in-business-adapting-to-a-greener-future/**
- https://www.greenmatch.co.uk/blog/sustainability-trends