

Challenges in the Migration to 6G Mobile Systems

Ajeng Wulandari^{1,*}, Aurelius Elvin¹, Jonathan Albert Purnawan¹, Reynaldi Ishaka¹

¹ School of Computer Science, Bina Nusantara University, Jakarta, Indonesia

*Corresponding author. Email: ajeng.wulandari@binus.ac.id

ABSTRACT

Implementation of 6G has been done in many countries. Expert said that 6G have more advantages than its predecessors. However, there will be challenges when we migrate to 6G. This paper review several technologies that has been used to migrate mobile system to 6G.

Keywords: 6G, Cellular IoT, Artificial Intelligence.

1. INTRODUCTION

We use several references related to our topic. According to the Symmetry 2020 journal, if 6G is compared to its predecessors, namely LTE, 5G, and B5G (beyond 5G), then there are several advantages supported by 6G, such as eMBB-plus which is an upgrade from 5G's eMBB, BigCom, SURLLC, 3D- InteCom, UCDC, holographic communication, tactile and human-bond communication [1]. At this time there is an increase in technology so that it has many factors whether the technology can support and can help the 6G network become better or even cannot apply 6G to the technology [2]. For now, the practical application of 4G and 5G networks shows advantages so that the future trend is to be beam-space multiplexing in 6G networks [3]. The communication system continues to generate a new generation every 10 years since it was first discovered in the 1980s until now it has reached 6G which aims to increase capabilities more than the previous generation [4]. Combined with the observations that can be obtained with a little additional complexity on the transmitters make modern RA very attractive for IoT scenarios in 6G resulting in outstanding results [5]. 6G which is a new generation has several uses such as increasing data flow and connectivity, reducing latency, guaranteed power, guaranteed security, etc.[6]. The AI method has several models such as Deep Neural Network (DNN), Markov Decision Process (MDP), and many more. These models have their respective uses. It is expected that many models increase the efficiency of the use of AI methods [7].

Several countries such as China, South Korea, and Finland have designed 6G which can promise significant QoS improvements and a sustainable future [8]. In this

day and age technology is growing rapidly and technology companies are competing fiercely to be the first to launch the latest technology, with the development of this technology it has its own positive and negative impacts so that it becomes the talk of many circles. Technology itself develops following the times and the needs are increasing so that not a few technologies cannot keep up with the increasing needs of the times, resulting in fewer enthusiasts or even the company going bankrupt / out of business, with the development of technology it becomes more effective, optimal, faster, and much more [9]. belief about the expected outcome for the decision to communicate with remote parties and derive positive value from communication and hacked in a certain way [10]. The cellular data in this world is interested in more than 5G and started doing 6G after the project [11]. In this case example, the development of networking technology, namely migration to the 6G network, the 6G network itself is very complex and there are also many new challenges emerging for the development of the 6G network, so it is hoped that this taxonomy provided can open up the potential for the realization of 6G networks throughout the country [12].

It is hoped that by adopting AI in the 6G network development process, it is able to overcome the obstacles or challenges in migrating to the 6G network [13]. further focuses on mobility management approaches in cellular networks that have energy efficiency scalability, mobility, and routing interoperability, standardized security for 6G networks defined by software [14]. In addition, in other journals, there are challenges that can occur in the air, named with High Maneuverability, Doppler Frequency Shift, Frequent Handovers, and Narrow Base Station Coverage which causes high costs

[15]. It is possible that this 6G network supports various kinds of technological features in the future such as VR, robotics, holographic communication, and many more that can be connected to the 6G network. Apart from technology, there are also features such as security, applications, and much more so that it can open your eyes. Society will benefit from migration to 6G networks [16]. Various methods were discussed such as the AI method, Decentralization, Big Data, Blockchain and Deep Learning (DL), but not much discussed Deep Learning, Deep Learning itself is superior to Machine Learning in the field of wireless networks such as reducing processing time in running improve the process of graphing algorithms and tensors, even if mixing Deep Learning with Quantum Computing (QC) can strengthen and more efficiently meet the needs of 6G networks, so Deep Learning methods also deserve to be discussed further [17].

6G is expected to connect trillions of people who are far apart so as to bring the world closer [18]. In developing 6G, there are various challenges that will be faced. Judging from some of the existing research, there are various kinds of challenges that will be faced. One of them is the need for various kinds of requirements in the process of implementing B5G and 6G [19]. Meanwhile, in order to speed up the 6G network, there are several methods such as using M-MIMO technology, New Radio (NR), CA, CR and HetNet. However which is the proposed solution can overcome the existing problems and limitations to facilitate wireless networks for 6G design in the future because M-MIMO technology can provide good performance. In avoiding error problems [20].

In addition to AI, there is also a decentralized mechanism method that is used to reduce the potential that can interfere with the 6G manufacturing mechanism, when compared to the centralized mechanism method, the decentralized mechanism is superior so that decentralization is preferred for 6G network development and decentralization is expected to be realized in 6G development [21]. Quoted from the journal about 6G, 6G also uses a large frequency. Therefore, research is needed on the implementation of 6G with frequencies above 100 GHz [22].

6G can also use sub-terahertz and VLC methods in its implementation [23]. 6G must address new challenges that are critical for networks as well as for a constantly changing society that requires new architectures and new technical solutions [24]. 6G networks are judged by their flexibility, as well as their versatility. The 6G network sketch is a highly regulated scientific arena [25]. Research attention is now turning to next-generation wireless communications such as 5G to 6G [26]. So that some of their journals are more likely to use AI methods as their development method to solve the complexity of migration to 6G networks [27].

2. LITERATURE REVIEW

In this day and age technology is growing rapidly and technology companies are competing to be the first to launch the latest technology, with the development of this technology it has its own positive and negative impacts so that it becomes the conversation of many circles. Technology itself develops according to the times and needs are increasing so that not a few technologies cannot keep up with the increasing needs of the times resulting in reduced enthusiasts or even the company goes bankrupt, with the development of technology becoming more effective, optimal, fast, and many more [9].

The communication system continues to bring up a new generation every 10 years since it was first discovered in the 1980s until now it has reached 6G which aims to increase capabilities more than the previous generation [4]. 6G which is a new generation has several uses such as increasing data flow and connectivity, lowering latency, guaranteed reliability, guaranteed security, etc. [6]. Therefore, we use several references related to our topic. According to the journal *Symmetry* 2020, if 6G is compared to its predecessors, namely LTE, 5G, and B5G (beyond 5G), then there are several advantages supported by 6G, such as eMBB-plus which is an upgrade to eMBB belonging to 5G, BigCom, SURLLC, 3D-InteCom, UCDC, holographic communication, tactile and human-bond communication [1]. The 6G network is judged on its flexibility as well as its versatility. 6G grid sketching is a highly regulated scientific arena [25]. 6G is expected to be able to connect trillions of people who are far away so that they can bring the world closer together [18].

In the development to the 6G network, many complex challenges arise in the development of the 6G network with this taxonomic method, which is expected to help realize the 6G network in the future [12]. So some of their journals are more likely to use AI methods as their development method to solve the complexities of migrating to 6G networks [27]. The AI method has several models such as Deep Neural Network (DNN), Markov Decision Process (MDP), and many more. These models have their respective uses which are expected with many models increasing the efficiency of using the AI method [7]. It is hoped that by adopting AI in the process of developing this 6G network, it is able to overcome obstacles or challenges in migration to the 6G network [13]. In addition to AI, there is also a decentralized mechanism method that is used to reduce the potential that can interfere with the 6G manufacturing mechanism, when compared to the centralized mechanism method, the decentralization mechanism is superior so that decentralization is preferred for 6G network development and decentralization is expected to be realized in 6G development [21]. Meanwhile, in order to speed up the 6G network, there are several methods such as using M-MIMO technology, New Radio (NR),

CA, CR and HetNet. However, Massive Multiple-Input-Multiple-Output (M-MIMO) which is a solution that has been proposed can address existing problems and limitations to facilitate the design of future 6G wireless networks because M-MIMO technology can provide good performance. in avoiding error problems [20]. It is possible that this 6G network supports various technological features in the future such as VR, robotics, holographic communication, and many more that can be connected to the 6G network besides technology, there are also features such as security, applications, and many more so that they can open up views. the public will benefit from migrating to the 6G network [16].

Therefore, 6G promises a significant increase in QoS and a sustainable future [8]. For now, the practical application of 4G and 5G networks shows an advantage so that the future trend is multiplexing beam-space on 6G networks [3]. Furthermore, it focuses on mobility management approaches in cellular networks that have energy efficiency, scalability, mobility, and routing interoperability, standardization of security for 6G networks that are determined by software [14]. But for now it is still unknown what driver will be used for the 6G network[2].

In developing 6G, there are various kinds of challenges that will be faced. If we look at some of the existing research, there are various kinds of challenges that will be faced. One of them is the need for various kinds of requirements in the process of implementing B5G and 6G. [19] Quoted from the journal about 6G, 6G also uses a large frequency. Therefore, research is needed on the implementation of 6G with a frequency above 100 GHz [22]. In addition, in other journals, there are challenges that can occur in the air, namely high maneuverability, shifting of the Doppler, Handovers and narrow base frequency of station coverage which causes high costs [15]. 6G can also use sub-terahertz and VLC methods in its implementation [23].

There are various methods discussed such as the Ai method, Decentralization, Big Data, Blockchain and Deep Learning (DL), but not many discuss Deep Learning, Deep Learning itself is superior to Machine Learning in the field of wireless networks such as reducing processing time in running improve the process of graphing algorithms and tensor, even if mixing Deep Learning with Quantum Computing (QC) can strengthen and more efficiently meet the needs of 6G networks, so the Deep Learning method also deserves further discussion [17].

Beliefs about the expected results for decisions to communicate with remote parties and get positive value from communication and being hacked in certain ways [10]. Combined with the observations that can be obtained with the slight added complexity of the transmitter to make modern RA very attractive for the IoT scenario in 6G resulting in excellent results. 6G must

address new challenges that are critical to networks as well as for changing societies that require new architectures and new technical solutions. [24] As the wireless and cellular world changed its interest to more than just developing 5G and started doing 6G development after the project [11]. To use the network in the future, research will be carried out so that it can use the 5G to 6G network [26].

3. METHODOLOGY

3.1. Time and Place of Research

- Time: 3 months
- Place: Online

3.2. Research Focus

To improve the specifications that were owned on the previous network which will then be combined with the latest technology to produce a new network that can cover various needs in the future.

3.3. Data Source

The data we use in the study is a collection of theories and the results of analyzing data from various research similar journals.

3.4. Research Scope and Methodology

This journal discusses network migration to 6G using several methods that are specifically for handling network development and combined with theories, methods, new technologies to maximize network migration to 6G which is expected to cover all technologies, regions, and higher and more stable speeds.

Methodology:

- Approach: Qualitative

By using analysis on existing data so as to produce a new idea or a new picture of migration to the 6G network

- Data Type: Secondary and Primary

The data used to conduct research is usually already available so there is no need to re-conduct research but it is still necessary to update the latest research data by researching related things to update existing research data.

- Data collection: Research and Observation

The data obtained from the research will be used as a reference for deeper research in order to obtain other supporting data.

By observing the existing data, you will get important points that can be developed from each of these studies.

- Research design



Figure 1 Research design.

4. RESULTS AND CONCLUSION

In our opinion, the most suitable method to use after reading several related journals is Machine Learning combined with Machine Learning, because Machine Learning can learn the mistakes and needs needed in developing a 6G network [23]. Because 6G technology allows bitrate to increase up to tbps (terabits per second) with latency less than 1 ms. In addition, 6G technology will provide energy in terms of dimensions, as well as spectral intelligence. Security and confidentiality are also more efficient [6]. 6G technology will meet most of the current demands for users to create the next one who wants things to be fast. 6G technology also provides new features, new services, and new technologies to satisfy users with new things. Coupled with technology that can support the implementation of 6G networks to be more optimal, several countries themselves have developed and tested 6G networks such as China, South Korea, and Finland, but the application is still used by the government because it assesses that there is still a lot of technology needed not yet compatible with 6G networks, so it cannot be published [8].

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