# CHAPTER I
# INTRODUCTION

## 1.1 Background

Considering that every telecommunications user has equal rights to use telecommunications networks and telecommunications services as regulated in Article 14 of the Law of the Republic of Indonesia Number 36 of 1999 concerning Telecommunications[1] is a factor that shapes the importance of frequency spectrum in the implementation of wireless technology and broadcasting services. Along with the rapid development of cellular telecommunications technology, the demand for data traffic for cellular phone users is also high. Therefore, 5G technology is expected to be a solution that can provide data speeds of up to 10 Gb/s to meet the demands of high data traffic[2]. Many key players and technologies are involved in 5G networks to support this capability, such as higher frequency bandwidth and massive MIMO. At the same time, more competitive network performance is driving MNOs to deploy more 5G Base Stations (BS). During this time, BTS consumes most of the energy in the cellular network. 5G network base stations with broader bandwidth and massive MIMO will produce high network power consumption. This certainly can increase the OPEX operator[3].

In addition to triggering an increase in OPEX for carriers, the technical specifications targeted for 5G wireless technology are listed in[4], which states that the required bandwidth is at least 100 MHz to 1 GHz (if using frequencies above 6 GHz). At the same time, the best frequency for mobile communication is below 6 GHz, especially for high range and mobility[5]. However, controlling a single operator's spectrum up to 100 MHz at < 6 GHz is difficult. Previous generation technologies were allocated frequencies of less than 45 MHz, which had to be shared among several telecommunications operators. In addition, frequencies < 6 GHz have traditionally been occupied by military communications, radar, and television, making it challenging to refarming the frequency. This makes it

challenging to provide a minimum bandwidth of 100 MHz for 5G technology. Therefore, spectrum sharing becomes necessary to be realized[5].

Based on Article 33 Paragraph 6 of the Law of the Republic of Indonesia Number 11 of 2020 concerning Job Creation, it is stated that the Holder of a Business License related to the radio frequency spectrum as referred to in paragraph (1) for the operation of telecommunications may undertake: (a) cooperation in the use of a radio frequency spectrum for the application of new technologies; and/or (b) transfer of use of radio frequency spectrum with other telecommunications operators[6]. The birth of this new regulation is a sign that the government has given the green light for cooperation in using the radio spectrum in new technologies[7].

Network sharing is needed because Indonesia is preparing to deploy 5G services required by the community and industry. The government also needs 5G services to support national digital transformation. Meanwhile, there is no comprehensive (100 MHz) and sequential (contiguous) frequency spectrum. Network sharing may not be necessary if the government can allocate radio frequency spectrum according to the deployment of 5G networks, such as the 2.6 GHz radio frequency spectrum band currently used for satellite TV operations. Other countries, such as South Korea, have allocated a 2.6 GHz radio frequency spectrum band for 5G. The use of the 2.6 GHz radio frequency spectrum band for 5G has also been supported by the availability of a device ecosystem.

The research[8] is motivated by increasingly fierce competition, which spurs telecommunications service companies to take strategic steps for business development to meet customer needs. This study offers a solution by benchmarking countries that have implemented MOCN regulations. Based on their respective cellular penetration and coverage, the results show that MOCN in Indonesia lags behind Denmark, Finland, India, and Malaysia. Research on the techno-economy of MOCN has been studied in[9], the telecommunications industry is interpreted to experience a decline in the future, so this study sees an opportunity to apply MOCN. The results show that MOCN is effectively used in rural areas because the main focus is coverage. Research[10] examines the technical aspects of MOCN, which is motivated by the significant investment in 5G telecommunications infrastructure

and the density of 5G BTS, which is much higher than 4G BTS due to their smaller coverage. The test results show that data service scheduling between cellular operators has good performance, and the 200 Mbps shared bandwidth can be used effectively. Research[3] also conducted a technical review of MOCN, which began by introducing new technologies in 5G networks, such as massive frequency bandwidth and MIMO, leading to increased network energy consumption and CAPEX OPEX MIMO. 5G network and support more operators to implement 5G MOCN. Based on this research, this study analyzes the technical, economic, and regulatory aspects of the Multi-Operator Core Network (MOCN) in 5G technology. The technical aspect in this research is using capacity dimensioning and overage dimensioning for areas with dense urban and suburban types . Then the results from these technical aspects become input for the business aspects to be calculated using the evaluation method, namely NPV, IRR, PP, and PI. The feasibility evaluation in this study was evaluated by comparing the IRR with the Minimum Acceptable Rate of Return (MARR). MARR is the lowest rate of return that the project must earn in order to offset the cost of the investment. In the legal aspect, the network sharing regulations that have been implemented in Indonesia are reviewed.

## 1.2 Problem Identification

5G technology is not just an evolutionary step towards a new generation of technology. It is also a fundamental transformation of the role of mobile technology in society. As demand for connectivity continues to grow, the adoption of 5G is an opportunity for MNOs to go beyond connectivity and collaborate across sectors, such as finance, transportation, retail, and healthcare, to deliver new services[11]. Regarding the need for 5G technology and the obstacles faced in implementing 5G, this research focuses on spectrum sharing from a techno-economic point of view. The sharing model used is the Multi-Operator Core Network (MOCN). In addition, network sharing is also a solution to overcome the scarcity of the spectrum.

Concerning this background, the problems discussed in this study are the need for telecommunications network infrastructure in dense urban and suburban areas, the economic aspects of network sharing development, and regulatory recommendations related to network sharing in Indonesia.

## 1.3 Objective

Based on identifying these problems, this study focuses on analyzing the implementation of MOCN on MNO for 5G technology in Indonesia. Therefore, the results of this study are expected to be used as recommendations in determining spectrum distribution policies in Indonesia.

## 1.4 Assumption and Problem Limitation

The assumptions and limitations of the problem used in this study are as follows.

1. The network sharing model analyzed in this study is the Multi-Operator Core Network (MOCN).
2. The cellular technology access network shared is the 5G NR network at 2300 MHz.
3. The areas used in this study are dense urban and suburban areas.
4. The object of this thesis research is the Mobile Network Operator (MNO).
5. Techno-economic calculations are carried out using Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PP), and Profitability Index (PI). So that can be determined the profit range for MNO-A, MNO-B, and MNO-C when implementing and not implementing network sharing.
6. Payment of BHP by frequency owners based on the revised plan of PP No. 53/2000.
7. This study uses a 5G standalone (SA) scheme. The main reason for choosing the 5G SA scheme compared to 5G NSA is because this study proposes a network sharing scheme. Although NSA makes it easy for operators to implement 5G networks, 5G SA involves a 5G core that can deliver a super-fast and flexible network, ultra-low latency, thus reducing operational cost. In addition, based on Law no. 11 of 2020, network sharing is only allowed for new technology (5G SA). Therefore, although this research aims to

accelerate 5G services, the authors also consider network quality when implementing network sharing and network sharing regulations.

## 1.5 Hypothesis

The application of spectrum sharing with the MOCN model can reduce operational costs and be implemented in Indonesia according to applicable regulations.

## 1.6 Research Methodology

The research steps used in this study are as follows.

1. Literature Study

   The literature study conducted observations by examining references such as research papers, academic journals, papers, textbooks, association analysis surveys, reports from the government, and others that supported this research.

2. Data Collection

   Data collection includes data on existing infrastructure, market share, subscribers, and several things the operator owns. In addition, several things need to be compiled regarding the applicable regulations and plans for revisions related to this research.

3. Techno-Economic Calculation and Analysis

   Perform calculations and techno-economic analysis by looking at the market, assets, and matters related to the MOCN case from the operator's side.

4. Conclusion

   The conclusion summarizes the result analysis from the research to be carried out, along with suggestions for operators.

## 1.7 Research Method

The method technique used in this research is as follows.

1. Multi-Operator Core Network (MOCN)

   The Multi-Operator Core Network (MOCN) is shared by RAN and spectrum[12].

2. Capital Budgeting

   Capital Budgeting is a method of estimating the financial viability of capital investment over the life of the investment.

3. Benchmarking

   Benchmarking method is an activity carried out by an organization or agency to determine the performance achieved and improve that performance. This activity is carried out by comparing existing work processes and practices with other organizations or institutions with the same work process.