# CHAPTER 1
# INTRODUCTION

## 1.1 Background

The use of the internet is increasing due to the digitalization of technology, making traffic on a web server increase significantly [1]. According to Polling Indonesia, in collaboration with the Association of Indonesian Internet Service Providers, or APJII (2018), the overall number of internet users in Indonesia has reached 171.17 million individuals, representing approximately 64.8% of the country's population [2], and from 2022 until 2023, there will be 215.63 million internet users. If not resolved, it will result in crashes or overload, which will cause the server to go down. Increasing traffic will basically make server performance even harder. Website services are often provided via a server, commonly known as a web server [3]. The server's operating system is specific in order for the server to work properly. In general, the more traffic that enters a web server, the more the website service cannot run optimally or even be accessed because the web server cannot handle the large amount of incoming traffic [3]. When dealing with issues on this web server, load balancing, or a procedure that splits the traffic load into two or more connection lines evenly amongst numerous computers, network cables, hard drives, or other resources, is used to handle difficulties on this web server [4]. In this load-balancing process, the web server traffic paths are divided using a round-robin algorithm so that the workload of the web server will be reduced and the quality of the services provided will increase.

Research on load-balancing on web servers has also been carried out a lot before, such as in “RESEARCH ON THE IMPLEMENTATION OF LOAD BALANCING ON WEB SERVERS USING FUZZY ALGORITHMS IN SOFTWARE DEFINED” by Miftah Nur Fauziah. In addition, research on load balancing has also been carried out by Ariyani Abdullah regarding “THE IMPLEMENTATION AND ANALYSIS OF LOAD BALANCING ON WEB SERVERS”. Closer research on load balancing has also been carried out by Dhuka Dwi Cahyanto regarding “THE IMPLEMENTATION AND ANALYSIS OF WEB SERVER LOAD BALANCING USING THE RECEIVER PULL BASED DISPATCHER METHOD”. However, these studies have significant differences from the current study, where this study uses the Raspberry Pi 3B+ as a router used for media load balancing, which proves that the Raspberry Pi 3B+ can be used for various functions, including load balancing.

This research is important because it provides an update in load balancing research,

specifically the use of the Raspberry Pi 3B+ as a router for media load balancing using Nginx, which is also used as the main media web server and backup web server, proving that the Raspberry Pi 3B+ function can be used in a variety of situations. This research is essential for load balancing to make it more effective and adaptable, minimizing overload or server downtime, and other Raspberry Pi 3B+ tasks. Based on these considerations, research on "RESEARCH ON RASPBERRY PI 3B+ FOR LOAD BALANCING ON 2 WEB SERVERS" is feasible.

### 1.2 Problem Formulation

Based on the background, the research can generate three problem formulations:

1. How to design a load-balancing system using Nginx if it is implemented on the Raspberry Pi 3B+
2. How can the performance of the implemented load balancing be measured, and how effectively can the Raspberry Pi 3B+ manage existing online traffic?
3. How do CPU usage, RAM, and load balancing parameters compare between 2 web servers using the Round Robin and Least Connection algorithms?

### 1.3 Objectives

The following are the benefits and objectives of this thesis:

1. To determine if the Raspberry Pi 3B+ can be employed as an effective media load balancer.
2. Implementing Nginx for load balancing round robin and the least connection algorithm on a Raspberry Pi 3B+.
3. How tests were conducted to measure the performance of Raspberry Pi 3B+ for load balancing.

### 1.4 Scope of Works

The following are the limitations of this final project research problem:

1. Testing is done on the Local Area Network, or Ethernet.
2. The implementation involves the utilization of 2 web server units, 1 load balancer unit, 1 switchport unit, and 1 client unit.
3. The algorithm used for load balancing are Round Robin and Least Connection.
4. Using Nginx as an application of load balancer.
5. Using Django Virtual Environment as webservers.

6. On the Raspberry Pi 3B+, the CPU and RAM usage are used to measure performance and test efficiency.
7. Perform analysis of load balancing system performance with throughput, response time and delay.

### 1.5 Methods of Research

The stages of research evaluation methodology proposed in this thesis are as follows:

1. Literature study.
2. Was carried out by collecting literature and studies that were related to the problems that existed in this research, either in the form of articles, e-journals, or reference books related to load balancing using Nginx.
3. The design processes.
4. Describe the methodology for the design of the tool to be made to maximize the server work system and obtain optimal results.
5. Measurement.
6. This process was carried out using parameters such as packet loss, threshold, jitter, and latency as required in this final project.
7. Analysis and evaluation.

### 1.6 Summary

In writing this thesis consists of five chapters, with the following description:

- **CHAPTER 1 INTRODUCTION**

This chapter aims to elucidate the rationale behind the creation of this final report, delineate its objectives, and establish the scope that will be employed throughout the entirety of this project.

- **CHAPTER 2 BASIC CONCEPT**

This chapter provides an overview of the fundamental principles pertaining to hardware, software, frameworks, and algorithms involved in the load balancing procedure on the Raspberry Pi 3B+.

- **CHAPTER 3 SYSTEM DESIGNS**

This chapter aims to elucidate the many aspects of the system design, including the

flowchart, installation process, and load balancing testing, specifically focusing on the Raspberry Pi 3B+.

- **CHAPTER 4 RESULT AND ANALYSIS**

This chapter will elucidate the outcomes obtained from the experimentation of the parameters employing a pre-established methodology, as well as the operational capabilities of the Raspberry Pi 3B+ functioning as a load balancer.

- **CHAPER 5 CONCLUSION AND SUGGESTION**

This chapter will present an analysis of the findings and provide recommendations based on the collected results. In order to enhance the development of future final project reports, it is imperative to refine the specifications, parameters, or loads utilized, hence enabling the attainment of diverse outcomes.