JPPIPA 11(7) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

The Influence of 4G Providers in the Honor of Kings Game on Player Performance in Modes (Custom, Skin Visualization, and Ranked)

Enrico Ananta Pratama[1*], Djul Fikry Budiman[1], Made Sutha Yadnya[1]

[1] Electrical Engineering Department University of Mataram, Mataram, Indonesia.

Received: May 13, 2025
Revised: June 12, 2025
Accepted: July 25, 2025
Published: July 31, 2025

Corresponding Author:
Enrico Ananta Pratama
rikolaos67@gmail.com

DOI: 10.29303/jppipa.v11i7.11327

Abstract: This study aims to analyze the effect of internet service quality from three 4G providers (Telkomsel, XL, and Tri) on player performance in the Honor Of Kings game in three different modes, namely Custom, Skin Visualization, and Ranked. Measurements were made using Quality Of Service parameters such as throughput, packet loss, and delay with the help of Wireshark software and processed using statistical methods by calculating the average Quality Of Service parameters from each provider by playing the Honor Of Kings game in Custom, Skin Visualization, and Ranked modes. The average of the results showed that Telkomsel consistently recorded the best performance with the highest throughput (7.59 Kbps in custom mode, 7.27 Kbps in visual skin, and 6.84 Kbps in Ranked mode), the lowest packet loss (0.94%, 1.21%, and 1.43%), and the fastest delay (55 ms in Custom mode, 59 ms in Visual Skin, and 63 ms in Ranked mode). This study concludes that the choice of internet provider has a significant impact on the comfort and performance of playing online games, with Telkomsel as the optimal choice to support competitive and visual activities in Honor Of Kings. This finding can be a reference for players in choosing internet services that suit gameplay needs.

Keywords: Game online; Honor of kings; Modes; Provider; Quality of service

Introduction

Honor of Kings is a modern online game that has become a global phenomenon, relying significantly on player skills and a stable, responsive internet connection. The network quality provided by various companies such as Telkomsel, Tri, and XL has shown a marked improvement in performance within this competitive gaming environment. The game features three modes: Custom mode with varying traffic characteristics, Ranked mode that requires high precision, and a premium Visual Skin mode that demands intensive graphic rendering. Each aspect of the game is influenced by Quality of Service (QoS) parameters, including Throughput, Delay, and Packet Loss. These parameters affect the accuracy of skill shots in Ranked mode, the flexibility of rule-making in Custom mode, and the graphical rendering quality of premium skins across different network conditions. Several issues can arise, such as rubberbanding during team fights in Ranked mode, input lag in Custom tournament mode, and broken graphics rendering when using premium skins. These problems directly impact QoS parameters and can disrupt the gaming experience, affecting both the outcomes of competitive matches and player satisfaction with visual elements. It is essential to understand how these three providers differ across various game modes. This knowledge can benefit players seeking the best performance for their gaming needs, assist game developers in refining netcode and

How to Cite:
Pratama, E. A., Budiman, D. F., & Yadnya, M. S. (2025). The Influence of 4G Providers in the Honor of Kings Game on Player Performance in Modes (Custom, Skin Visualization, and Ranked). *Jurnal Penelitian Pendidikan IPA*, *11*(7), 1153–1164. https://doi.org/10.29303/jppipa.v11i7.11327

optimizing graphics, and guide internet service providers in offering specialized gaming services that cater to the diverse demands of interaction and visual quality in different Honor of Kings scenarios.

The need for online games by achievement continues to grow with the appearance of new hero updates. The need to play these games is increasingly requiring smartphones to increase specifications and a stable internet connection is needed for optimal performance. A strong path or link that is in accordance with the standard of the game is necessary for some modes (Yadnya et al., 2020).

Physiologists have utilized investigation analysis, and physicians, along with biomedical engineers, have been responsible for collecting, processing, and interpreting electroencephalogram (EEG) signals. This work involves modeling systems and algorithms for signal manipulation. Various sweep techniques, including Ping sweep, TCP sweep, and Null sweep, have been analyzed using a widely used database of brain signal and image collections. The results of the Ping sweep provide status information, while the TCP and Null sweeps offer timing data on different servers (Bagyalakshmi et al., 2018).

Physiologists have been utilizing neurological signals for research purposes, and recently, doctors have also begun to adopt these signals in their studies. This research focuses on the time it takes to access databases that contain collections of brain signals, images, and other neurological data. The study includes sixteen servers located in the United States, ten servers in the United Kingdom, and five servers from other countries. The analysis primarily examines the request/response times of the Domain Name System (DNS), Hypertext Transfer Protocol (HTTP), and Internet Control Message Protocol (ICMP) using a popular packet sniffer called Wireshark (Elamaran et al., 2018). .

We utilized Linux times as the attack machine and Wireshark for data capture to collect a dataset of Server-Based Network Attacks (SNA), which includes UDP, SYN, and HTTP flooding network attacks. Our primary goal is to provide a publicly accessible dataset focused on modified servers for network attack research. Additionally, we employ modern AI technology to detect network attacks in real time. Our meta-RF-GNB (MRG) model combines Gaussian Naive Bayes and Random Forest methods for prediction, achieving an impressive accuracy score of 99.99%. We validated the efficiency of MRG through cross-validation, resulting in a remarkable average accuracy of 99.94% with a very small standard deviation of 0.00003. Finally, we conducted a statistical t-test to assess the significance of MRG compared to other broadcast models (Rustam et al., 2024).

University data centers and large enterprises often face challenges in efficiently managing traffic flow. In some cases, they depend on limited hardware resources for this purpose. Even when they have access to high-performance equipment, these centers may still struggle when experiencing a sudden surge in traffic. This issue is mainly due to memory limitations in the devices, which can negatively impact overall network performance (Gómez et al., 2023). This paper discusses some of the open-source tools we developed for further analysis and research into the security aspects of PCOM. These tools include a Wireshark PCOM splitter, an Nmap NSE PCOM scan, some Metasploit PCOM modules, a Snort PCOM rule set, and some network traffic datasets containing some samples of different types of PCOM operations (Rosa et al., 2019).

Vehicular ad hoc networks (VANETs) have developed a range of services, including safety applications and information provision. A key aspect of these services is ensuring quality of service (QoS), particularly concerning reliability and availability (Eiza et al., 2015).

Various studies have been conducted to improve QoS capabilities, but some fundamental issues remain unresolved. In this paper, we analyze these issues and propose a new scheme called Priority Access based on Busy Tone (PABT), which is designed to improve QoS performance (Zhou et al., 2019). In the context of large-scale service-oriented Internet of Things (IoT), Quality of Service (QoS)-based service selection becomes a critical aspect along with the proliferation of heterogeneous services with various QoS parameters. Existing approaches often face limitations such as low selection accuracy or high computational complexity (such as exponential time complexity), which are impractical for large-scale IoT implementations (Xiang et al., 2015).

The authors develop a user experience-based framework for traffic management and QoS/QoE support in Service-Oriented Software-Defined Networking (SOSDN) architecture. The proposed solution facilitates end-to-end QoS assurance across network and computing domains through monitoring and adaptation mechanisms to system dynamic conditions (Beshley et al., 2024). The research findings indicate that while WiFi Offloading offers a greater offloading capacity, it compromises minimum throughput guarantees. In contrast, Licensed Assisted Access (LAA) with a Call Admission Control (CAC) mechanism is better able to maintain stable Quality of Service (QoS) under different traffic loads. Based on this analysis, we recommend using WiFi Offloading only in light traffic conditions, whereas scheduling-based LAA demonstrates greater robustness across various operational scenarios (Markova et al., 2019).

In the competitive world of mobile MOBAs like Honor of Kings, excitement comes not only from Ranked or Classic modes but also from the Custom Mode feature. This mode allows players to design their gaming experience according to their imagination. Custom Mode provides a platform for the community to experiment, practice, or simply have fun with unique rules. Whether it's for refining team strategies, hosting internal tournaments, or taking on unconventional challenges, this feature greatly enhances the gameplay experience.

In the ecosystem of MOBA mobile games like Honor of Kings, skins are much more than just cosmetic features; they have become status symbols and valuable commodities. However, behind their stunning visual appeal, the role of the provider both internet service providers and hardware significantly impacts the player's experience with these premium skins. Factors such as graphic rendering quality, smoothness of skill effect animations, and consistency of in-game displays are all influenced by the performance of network providers and devices. This performance ultimately determines whether legendary class skins look perfect or appear blurry due to lag and frame drops (Jumani et al., 2024; Zadtootaghaj, 2022).

As more competitive online games emerge, an increasing number of players are seeking to achieve high rankings. Online gaming service platforms offer a reliable way to connect with trustworthy players for gaming sessions. Often, when inviting friends to play, many of them are too busy, leaving us without companions for our favorite games. Since most online games rely on teamwork and collaboration, players often face a dilemma: to play solo or not at all. Playing alone can be frustrating, as it is typically more challenging, and players might find that their rankings either do not improve or may even decline (Glenegles et al., 2023).

Research on online gaming continues to evolve alongside advancements in technology. A key aspect of evaluating wireless communication networks is the Quality of Service (QoS) parameter. QoS is a method used to assess networks based on fundamental performance characteristics and standards, allowing for the measurement of up to a hundred networks. Its primary purpose is to enhance user experience by ensuring that network-based applications perform at established levels. The measurable QoS parameters include throughput, packet loss, delay, and jitter. The results of QoS measurements for a particular network provide insights into the performance criteria for a given service. These results help determine whether the network meets the standard levels set by the service provider based on user requirements (Haidar, 2023).

Wireshark is a software application commonly used to measure and analyze networks. Originally developed by Gerald Combs and introduced by Ethereum, Wireshark began to gain widespread development in 1998. This tool enables network administrators and IT professionals to conduct in-depth analyses of the data packets flowing through computer networks. According to a report from Network World (2022), Wireshark has been downloaded over 50 million times and is used by more than 500,000 IT professionals worldwide, highlighting its importance in network security. Wireshark allows for real-time capture and analysis of data packets, supports more than 2,000 network protocols, and features a user-friendly interface for detailed examination (Orebaugh et al., 2023). Wireshark's advantage lies in its ability to conduct deep packet inspections, which allow administrators to see the detailed content of each packet passing through the network.

One important factor that impacts the experience of playing online games is the quality of the internet connection provided by the service provider (ISP). High latency, insufficient download and upload speeds, and fluctuations in connection quality can significantly affect player performance (Nakulo et al., 2021). Research with different games has been conducted previously by M. Ridho Alfarizqa by comparing the Mi-Fi network configuration using three different providers in playing the Mobile Legends: Bang Bang game during sunny and rainy weather conditions by comparing the QoS parameters of each provider used (Alfarizqa et al., 2025).

In this context, internet service providers (ISP) play a crucial role in enhancing the quality of the gaming experience. Factors such as data transmission speed and connection stability offered by the provider significantly impact players' comfort and performance during gameplay. ISPs often advertise their ability to deliver fast and stable connections tailored for online gaming. In the case of "Honor of Kings," the Ranked mode demands high connection speed and stability due to its competitive nature. The quality of the connection is influenced not only by internet speed but also by Quality of Service (QoS) parameters, which include latency, packet loss, and throughput. QoS is essential in assessing whether the internet service can deliver an optimal gaming experience, especially in modes requiring quick responses, such as Ranked.

The game Honor of Kings has distinct data traffic characteristics, as each match demands continuous data exchange between the user's device and the game server. Therefore, the stability of the 4G network is crucial, since fluctuations in network performance can significantly impact gameplay and the overall user experience.

This study analyzes how provider influence affects player performance in the Custom, Skin Visualization

Variation, and Ranked modes of the game Honor of Kings. We will examine how variations in service quality from three different providers assessed through QoS (Quality of Service) parameters impact the playing experience and match outcomes across these modes. We utilized Wireshark software to collect detailed and accurate data on network performance for our measurements.

Method

This research was conducted due to the growing popularity of the Honor of Kings game among online gamers. The primary focus of this study is to help players choose the best mode, skin, and provider options while playing the game. The research involves statistical data analysis, where we calculate the average results from three different providers, assessing the Custom, Visual Skin, and Ranked modes. This evaluation is done using TIPHON standard QoS measurements, utilizing the Mi-Fi 4G03 N300 device produced by Tenda.

Mi-Fi Tenda 4G03 N300

The 4G03 N300 Tenda Mi-Fi supports the 802.11 b/g/n Wi-Fi standard, which allows devices to connect via a Wi-Fi network. This Mi-Fi can support multiple devices simultaneously, making it a flexible solution for internet access across multiple devices. The data specifications of the Mi-Fi Tenda 4G03 N300 are as follows:

Figure 1. Mi-fi tenda 4G03

This device supports multi-generational mobile networks, including 4G LTE for high-speed connections, 3G UMTS as an alternative in areas with limited coverage, and 2G GSM for basic compatibility. Under optimal conditions, the device can achieve download speeds of up to 150 Mbps and upload speeds of up to 50 Mbps, making it suitable for HD streaming, online gaming, and transferring large data files smoothly.Equipped with Wi-Fi 802.11 b/g/n operating at a frequency of 2.4 GHz, the device allows you to stay connected to a wireless network with a broad range, even when multiple devices are in use. Designed for homes, small offices, or shared workspaces, it can support up to 32 devices simultaneously.

In this study, there are three providers used in this Mi-Fi device, namely Telkomsel, XL and Tri, which will be measured for performance in playing Honor of Kings games with Custom, Visual Skin, and Ranked modes.

QOS

Quality of Service is a method of measuring how good a network is and is an attempt to define the characteristics and properties of a service (Tatama et al., 2022). The QOS parameters used in this research include:

Throughput

Throughput is defined as the effective data transfer rate, measured in bits per second (bps). It refers to the total number of packets that are successfully received at the destination over a specific period, divided by the duration of that period. You can calculate throughput using the following formula (Yadnya et al., 2018).

$$\text{Throughput} = \frac{\text{package received}}{\text{lenght of time observed}} \quad (1)$$

Tabel 1. Throughput Standardization According to TIPHON Version ETSI TR 101 329-7 v2.1.1

Index	Throughput	Throughput Categories
4	> 2.1 Mbps	Very Good
3	1.2 – 2.1 Mbps	Good
2	700 – 1200 kbps	Normal
1	338 – 700 kbps	Not Good
0	0 – 338 kbps	Bad

Packet Loss

Packet loss refers to the situation where data packets fail to reach their destination, often due to collisions or congestion in the network. This issue impacts all applications, as the need for retransmissions can significantly reduce overall network efficiency. The packet loss rate can be calculated using a specific equation (Yadnya et al., 2020).

$$\text{Packet Loss} = \frac{\text{data packets sent} - \text{data packet received}}{\text{data packets sent}} \quad (2)$$

Table 2. Packet Loss standardization according to TIPHON version ETSI TR 101 329-7 v2.1.1

Index	Packet Loss (%)	Packet Loss Categories
4	0 – 2	Very Good
3	3 – 14	Good
2	15 – 24	Normal
1	25	Bad

Delay

Delay is a quality of service (QoS) parameter that indicates the total time it takes for packets to travel from the source to the destination. Several factors can influence delay, including hardware, distance, and network congestion. The delay value can be calculated using the following equation (Yadnya et al., 2020).

$$\text{Delay} = \frac{\text{Time Span}}{\text{Total Packet}} \quad (3)$$

Table 3. Delay Standardization According to TIPHON Version ETSI TR 101 329-7 v2.1.1

Index	Delay (ms)	Delay Categories
4	< 150	Very Good
3	150 – 300	Good
2	300 – 450	Normal
1	> 450	Bad

Research Scheme

Figure 2. Research scheme

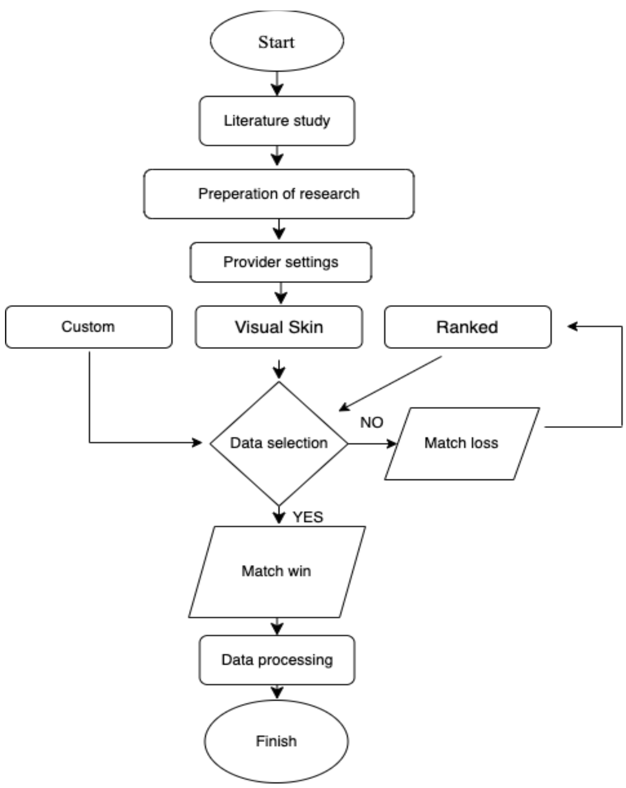

Figure 3. Research flowchart

Result and Discussion

This study evaluates the performance of various service providers using the Tenda 4G03 N300 Mi-Fi device while playing the game Honor of Kings. The assessment focuses on three modes: Custom, Skin Visualization, and Ranked. The measurements were conducted in the BTN Griya Seruni area of Mataram City.

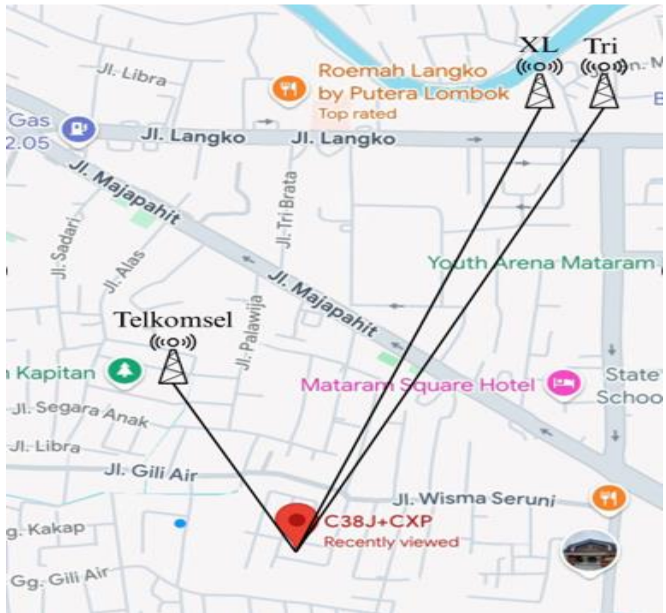

Figure 4. Measurement location

Figure 3 shows the location of data collection at BTN Griya Seruni in Mataram City. The measurement point is approximately 500 meters from the Telkomsel BTS, while it is about 950 meters from the BTS for XL and Tri.

The measurement period is set from 12:00 to 20:00, as this coincides with working hours when there is an increase in the number of users accessing the network simultaneously.

Figure 5. Data capture and measurement process

Figure 5 illustrates the data collection process to acquire the empirical information necessary for the research. During this stage, measurements and data recording are conducted based on the predetermined variables.

The research data is visualized through graphs comparing QOS parameters such as throughput, packet loss, and delay, which were recorded using software like Wireshark while playing the game Honor of Kings.

Table 4. Custom Mode Measurement Results

Measurement Results of Custom Mode Provider Telkomsel			Measurement Results of Custom Mode Provider Tri			Measurement Results of Custom Mode Provider XL		
Throughput (Kbps)	Delay (Ms)	Packet loss (%)	Throughput (Kbps)	Delay (Ms)	Packet loss (%)	Throughput (Kbps)	Delay (Ms)	Packet loss (%)
8.3	65	1.6	5.7	95	3.4	6.1	68	1.7
8.2	64	1.5	5.6	94	3.3	5.8	73	2
8.1	63	1.4	5.6	93	3.2	6.3	65	1.5
8	62	1.3	5.5	92	3.1	5.9	71	1.9
8	62	1.3	5.5	91	3.1	6.2	67	1.6
7.9	61	1.2	5.4	90	3	5.7	75	2.1
7.9	60	1.2	5.4	89	2.9	6.4	63	1.4
7.9	60	1.2	5.3	88	2.9	6	69	1.8
7.9	59	1.1	5.3	88	2.8	5.8	72	2
7.8	59	1.1	5.2	87	2.8	6.2	66	1.6
7.8	58	1	5.1	86	2.8	6	70	1.8
7.8	58	1	5	86	2.8	6.3	64	1.5
7.7	57	1	5	85	2.7	5.7	74	2.1
7.7	57	1	5	84	2.7	6.1	68	1.7
7.7	56	0.9	4.9	84	2.7	5.9	71	1.9
7.6	55	0.9	4.9	83	2.6	6.3	65	1.5
7.5	54	0.9	4.8	82	2.5	5.8	73	2
7.5	54	0.8	4.8	81	2.5	6.3	67	1.6
7.5	54	0.8	4.8	81	2.5	5.6	76	2.2
7.5	53	0.8	4.7	80	2.5	6.4	64	1.4
7.4	53	0.8	4.7	79	2.4	5.8	72	2
7.4	52	0.7	4.7	79	2.4	6	69	1.8
7.3	52	0.7	4.6	78	2.3	6.3	66	1.6
7.3	51	0.7	4.6	78	2.3	5.9	70	1.9
7.2	51	0.7	4.5	77	2.2	5.5	77	2.3
7.1	50	0.6	4.4	76	2.2	6.3	65	1.5
7.1	50	0.6	4.3	75	2.2	5.9	72	1.9
7	49	0.6	4.3	75	2.1	6.1	68	1.7
6.9	48	0.5	4.2	74	2.1	5.8	73	2
6.8	47	0.4	4.1	72	2	6.2	67	1.6

Table 5. Skin Visualization Measurement Results

Measurement Results of Visualisation Skin Provider Telkomsel			Measurement Results of Visualisation Skin Provider Tri			Measurement Results of Visualisation Skin Provider XL		
Throughput (Kbps)	Delay (Ms)	Packet loss (%)	Throughput (Kbps)	Delay (Ms)	Packet loss (%)	Throughput (Kbps)	Delay (Ms)	Packet loss (%)
7.9	75	2.2	5.5	97	3.6	7.3	94	3.3
7.9	74	2.1	5.4	96	3.5	7.1	93	3.2
7.9	73	2	5.4	95	3.4	7	92	3.1
7.9	72	1.9	5.4	94	3.3	6.9	90	3
7.8	71	1.8	5.4	94	3.3	6.8	89	2.9
7.8	64	1.6	5.3	90	3	6.4	83	2.5
7.7	64	1.5	5.3	89	2.9	6.3	82	2.5
7.6	63	1.5	5.3	89	2.9	6.3	81	2.4
7.5	62	1.5	5.3	89	2.9	6.2	79	2.3
7.5	61	1.5	5.2	88	2.9	6.2	78	2.3
7.4	61	1.4	4.9	88	2.8	6.2	77	2.3
7.4	60	1.4	4.9	88	2.8	6.1	76	2.2
7.3	60	1.3	4.9	88	2.8	6	75	2.1

Measurement Results of Visualisation Skin Provider Telkomsel			Measurement Results of Visualisation Skin Provider Tri			Measurement Results of Visualisation Skin Provider XL		
Throughput (Kbps)	Delay (Ms)	Packet loss (%)	Throughput (Kbps)	Delay (Ms)	Packet loss (%)	Throughput (Kbps)	Delay (Ms)	Packet loss (%)
7.3	60	1.3	4.8	87	2.8	6	74	2.1
7.2	60	1.3	4.8	87	2.8	6	73	2
7.2	60	1.2	4.7	86	2.7	5.9	73	2
7.1	59	1.2	4.7	86	2.7	5.9	72	2
7.1	59	1.2	4.7	85	2.7	5.9	72	2
7.1	59	1.1	4.7	85	2.7	5.8	72	2
7.1	59	1.1	4.7	84	2.6	5.8	72	1.9
7	53	0.8	4.7	79	2.4	5.8	71	1.9
7	52	0.7	4.6	79	2.4	5.8	70	1.9
6.9	52	0.7	4.6	78	2.3	5.7	69	1.8
6.9	51	0.7	4.6	78	2.3	5.7	69	1.8
6.9	51	0.7	4.5	77	2.2	5.5	68	1.7
6.8	50	0.6	4.4	76	2.2	5.5	67	1.6
6.8	50	0.6	4.3	75	2.2	5.4	66	1.6
6.8	49	0.6	4.3	75	2.1	5.4	66	1.6
6.7	48	0.5	4.2	74	2.1	5.3	65	1.5
6.6	47	0.4	4.1	72	2	5.2	63	1.4

Table 6. Ranked Mode Measurement Results

Measurement Results of Ranked Mode Provider Telkomsel			Measurement Results of Ranked Mode Provider Tri			Measurement Results of Ranked Mode Provider XL		
Throughput (Kbps)	Delay (Ms)	Packet loss (%)	Throughput (Kbps)	Delay (Ms)	Packet loss (%)	Throughput (Kbps)	Delay (Ms)	Packet loss (%)
7.8	75	2.2	5.5	97	3.6	7.3	94	3.3
7.7	74	2.1	5.4	96	3.5	7.1	93	3.2
7.6	73	2	5.4	95	3.4	7	92	3.1
7.5	72	1.9	5.3	94	3.3	6.9	90	3
7.5	71	1.8	5.3	94	3.3	6.8	89	2.9
7.4	69	1.8	5.2	93	3.2	6.7	88	2.9
7.3	69	1.7	5.2	93	3.2	6.6	87	2.8
7.3	68	1.7	5.1	92	3.1	6.5	86	2.7
7.2	67	1.7	5.1	91	3	6.4	85	2.7
7.2	65	1.6	5	90	3	6.3	84	2.6
7.2	64	1.6	4.9	89	2.9	6.2	83	2.5
7.1	64	1.5	4.9	89	2.9	6	82	2.5
7.1	63	1.5	4.9	88	2.8	5.9	81	2.4
7	62	1.5	4.8	88	2.8	5.8	79	2.3
6.9	61	1.5	4.8	87	2.8	5.7	78	2.3
6.9	60	1.4	4.7	86	2.7	5.5	76	2.2
6.8	60	1.4	4.7	86	2.7	5.4	74	2.1
6.8	60	1.3	4.7	85	2.7	5.4	73	2
6.7	59	1.3	4.7	85	2.7	5.3	72	2
6.6	59	1.3	4.6	84	2.6	5.2	71	1.9
6.5	58	1.3	4.5	83	2.6	5.1	70	1.8
6.4	58	1.2	4.5	82	2.5	5	69	1.8
6.3	57	1.2	4.4	81	2.5	5	68	1.7
6.3	57	1.1	4.4	81	2.4	4.9	67	1.7
6.3	56	1.1	4.3	80	2.4	4.8	66	1.6
6.2	56	1	4.3	79	2.4	4.7	65	1.6
6.1	55	1	4.2	79	2.3	4.6	64	1.5
6	55	0.9	4.1	78	2.3	4.5	63	1.5
5.9	53	0.8	4	76	2.2	4.3	61	1.4
5.8	52	0.7	3.8	40	0.1	4.2	59	1.2

Measurements indicate that the quality of internet services, based on QoS metrics using the TIPHON standard, varies among providers.

Table 7. Average of Custom Mode Measurement Results

Provider	Throughput (kbps)	Packet Loss (%)	Delay (ms)
Telkomsel	7.59	0.94	55
XL	6.02	1.78	69
Tri	4.93	2.63	83

Table 7 presents the average measurement results for custom mode across three internet providers: Telkomsel, XL, and Tri. Telkomsel stands out with the highest throughput value of 7.59 Kbps, which offers a significant advantage for custom mode especially for players experimenting with heroes and strategies that rely on smooth data transmission. XL follows in second place with a throughput of 6.02 Kbps, still providing decent performance for training sessions and team scrimmages. Tri, with the lowest throughput of 4.93 Kbps, demonstrates limitations in handling complex visual game mechanics in custom mode. In terms of packet loss, Telkomsel achieves the lowest rate at 0.94%, ensuring excellent data consistency for game mechanics and techniques in Honor of Kings. XL has a packet loss of 1.78%, which is acceptable for practice sessions, while Tri's packet loss is 2.63%. This higher rate can disrupt the consistency of the gaming experience, particularly when practicing combos or team strategies that require precise timing. Regarding delay, Telkomsel provides the best responsiveness at 55 ms. XL has a delay of 69 ms, which is relatively good but still higher than Telkomsel's. Tri experiences the highest delay at 83 ms, which can hinder the practice of mechanics that demand precise timing when executing skills.

Table 8. Average of Skin Visualisation Measurement Results

Provider	Throughput (kbps)	Packet Loss (%)	Delay (ms)
Telkomsel	7.27	1.21	59
XL	6.04	2.16	75
Tri	4.85	2.71	84

Skin visualization in MOBA games, such as Honor of Kings, is a crucial aspect that affects not only the aesthetics of the game but also the overall gaming experience. Based on the data from Table 9, which displays the results of skin visualization measurements from three internet providers Telkomsel, XL, and Tri. Telkomsel stands out with the highest throughput value of 7.27 Kbps. This provides a significant advantage in rendering skins with perfect visual details, particle effects, and special animations commonly found in certain skins. XL follows in second place with a throughput of 6.04 Kbps, offering adequate performance for displaying the visual elements of skins. However, it does experience a slight decline in quality when it comes to skins with highly detailed visual effects. Tri, with a throughput of 4.85 Kbps, shows limitations in handling skin visualizations that involve detailed skill effects and complex transformation animations. When it comes to packet loss, Telkomsel exhibits the lowest rate at 1.21%, ensuring excellent visual consistency, especially for transformation effects and special animations on legendary or mythic skins. XL has a packet loss of 2.16%, which is still within an acceptable range for standard skin visualizations, though it may exhibit some minor visual flaws on skins with special effects. Tri, on the other hand, has the highest packet loss at 2.71%, which can lead to visual disturbances such as interrupted animations, imperfect textures, and skill effects that do not appear as intended.

Table 9. Average of Ranked Mode Measurement Results

Provider	Throughput (kbps)	Packet Loss (%)	Delay (ms)
Telkomsel	6.84	1.43	62
XL	5.70	2.24	76
Tri	4.75	2.73	85

Table 9 presents the average results of ranked mode measurements across three internet providers: Telkomsel, XL, and Tri. Telkomsel leads with the highest throughput of 6.84 Kbps, which is crucial for multiplayer online battle arena (MOBA) games like Honor of Kings, as it allows for smoother transmission of game data, responsive character movement, and more detailed visual effects. XL follows in second place with a throughput of 5.70 Kbps, which is sufficient for standard gameplay but may experience reduced visual quality during intense 5v5 battles. Tri, with the lowest throughput of 4.75 Kbps, is likely to exhibit visual lag when many actions or skills are used simultaneously, significantly impacting competitive gameplay. In terms of stability, Telkomsel stands out with a packet loss rate of 1.43%, minimizing the risk of character attacks or skills failing to register during combat. XL has a packet loss rate of 2.24%, indicating a moderate level of disruption in game data communication, which may result in occasional glitches. Tri experiences the highest packet loss at 2.73%, which can be frustrating for competitive players, as it can lead to inconsistencies in input registration and responsiveness. Regarding delay, Telkomsel excels with a low latency of 63 ms, providing a significant responsiveness advantage that is critical in reflex-based games like Honor of Kings. XL shows a delay of 76 ms, still acceptable for competitive gameplay, while Tri has the highest delay at 85 ms, which may result in noticeable lag in game responses and affect skill timing as well as the player's ability to react to opponents' attacks.

Jitter is a crucial factor in Quality of Service (QoS) assessments for online games like Honor of Kings. However, it might not always be highlighted in the measurements provided by the service provider or the game itself. This could be because Honor of Kings, like many mobile games, tends to prioritize more easily understood metrics such as ping/latency and packet loss over jitter.

Throughput

Figure 6 shows a comparison chart of throughput values in custom mode for three mobile network service providers, namely Telkomsel, Tri, and XL. Telkomsel gets the highest throughput value of 8.3 Kbps and the lowest value is obtained by provider Tri with a throughput value of 4.1 Kbps.

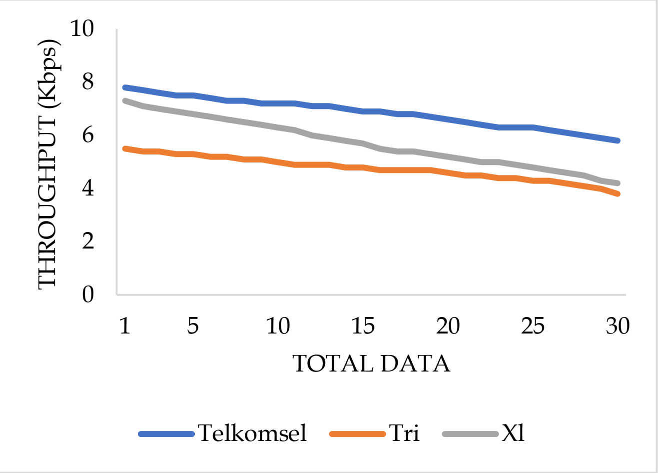

Figure 6. Custom mode throughput comparison chart

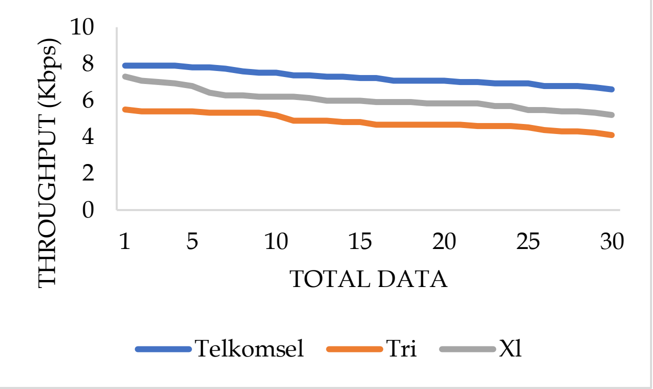

Figure 7. Visual skin throughput comparison chart

Figure 7 shows a comparison graph of throughput values on Viusualization Skin for three mobile network service providers, namely Telkomsel, Tri, and XL. Telkomsel gets the highest throughput value of 7.9 Kbps and the lowest value is obtained by provider Tri with a throughput value of 4.1 Kbps.

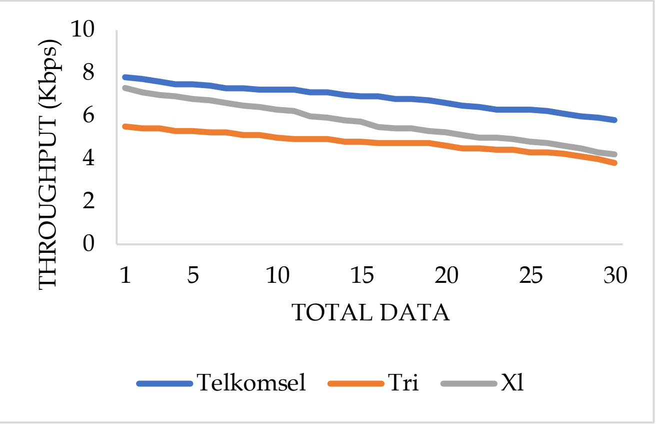

Figure 8. Ranked mode throughput comparison chart

Figure 8 shows a comparison graph of throughput values in Rankded mode for three mobile network service providers, namely Telkomsel, Tri, and XL. Telkomsel gets the highest throughput value of 7.8 Kbps and the lowest value is obtained by provider Tri with a throughput value of 3.8 Kbps.

Below is an example of how to analyze the measured throughput values on Ranked mode :

$$\text{Throughput} = \frac{\text{package received}}{\text{length of time observed}}$$

$$= \frac{395580}{813.149}$$

$$= 486.47\text{x } 8$$

$$= 3891.23 \text{ bits/s}$$

$$= 3.891 \text{ kbps}$$

Packet Loss

Figure 9 shows a comparison chart of packet loss values in custom mode for three mobile network service providers, namely Telkomsel, Tri, and XL. Tri gets the highest packet loss value of 3.4% and the lowest value is obtained by Telkomsel provider with a packet loss value of 0.4%.

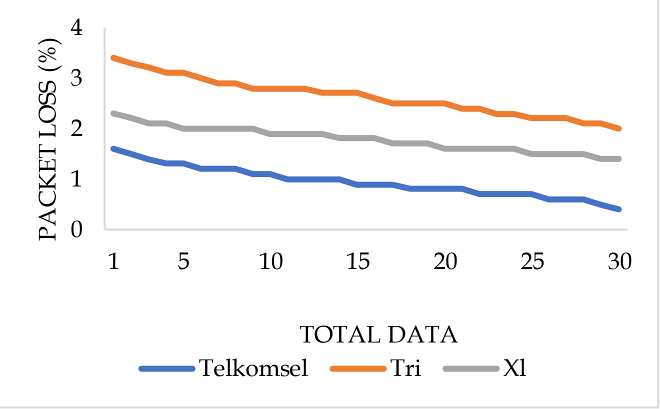

Figure 9. Custom mode packet loss comparison chart

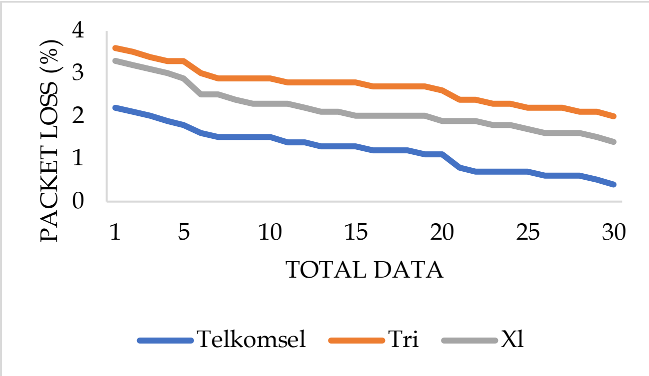

Figure 10. Visual skin packet loss comparison chart

Figure 10 shows a comparison graph of packet loss values in Skin Visualization for three mobile network service providers, namely Telkomsel, Tri, and XL. Tri gets the highest packet loss value of 3.6% and the lowest value is obtained by Telkomsel provider with a packet loss value of 0.4%.

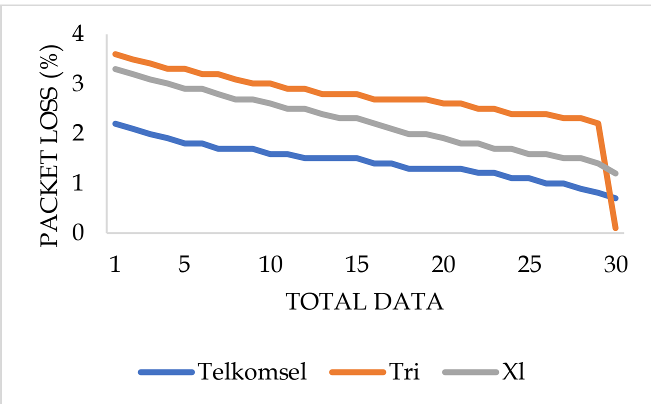

Figure 11. Ranked mode packet loss comparison chart

Figure 11 shows a comparison graph of packet loss values in Ranked mode for three mobile network service providers, namely Telkomsel, Tri, and XL. Tri gets the highest packet loss value of 3.6% and the lowest value is obtained by Telkomsel provider with a packet loss value of 0.7%.

Below is an example of how to analyze the measured packet loss values on Ranked mode:

$$\text{Packet Loss} = \frac{\text{data packet sent} - \text{data packet received}}{\text{data packet sent}}$$

$$= \frac{2003-2000}{2003}$$

$$= 0.00149 \times 100\%$$

$$= 0.149\%$$

$$= 0.1\%$$

Delay

Figure 12 shows a comparison chart of Delay values in custom mode for three mobile network service providers, namely Telkomsel, Tri, and XL. Tri gets the highest Delay value of 95 ms and the lowest value is obtained by Telkomsel provider with a Delay value of 47 ms.

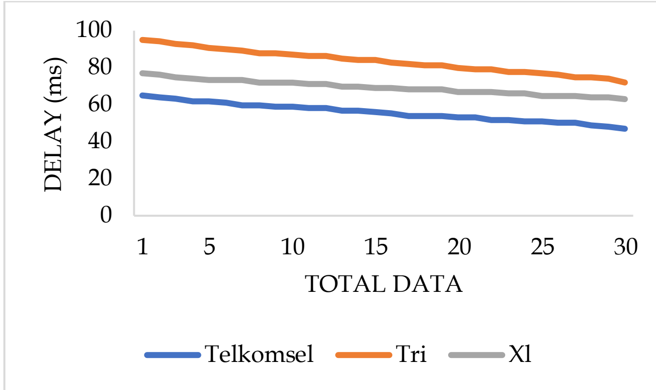

Figure 12. Custom mode delay comparison chart

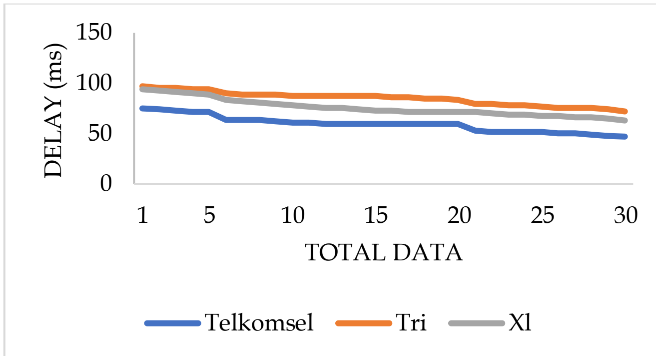

Figure 13. Skin visual delay comparison chart

Figure 13 shows a comparison graph of Delay values in Skin Visualization for three mobile network service providers, namely Telkomsel, Tri, and XL. Tri gets the highest Delay value of 97 ms and the lowest value is obtained by Telkomsel provider with a Delay value of 47 ms.

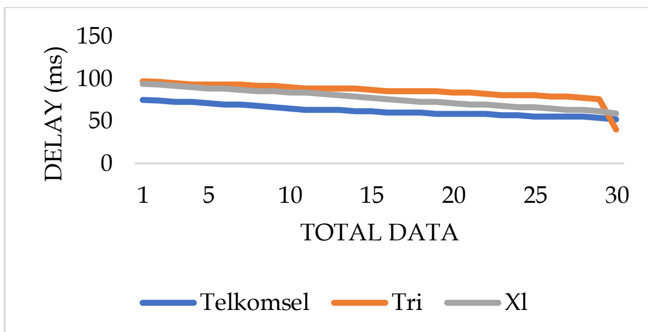

Figure 14. Ranked mode delay comparison chart

Figure 14 shows a comparison chart of Delay values in Ranked mode for three mobile network service providers, namely Telkomsel, Tri, and XL. Tri gets the highest Delay value of 97 ms and the lowest value is obtained by provider Tri with a Delay value of 40 ms.

Below is an example of how to analyze the measured delay values on Ranked mode:

$$\text{Delay} = \frac{\text{Time Span}}{\text{total packet}}$$

$$= \frac{813.149}{2003}$$

$$= 0.40 \times 100$$

$$= 40 \text{ ms}$$

The throughput measurement in this study was more dominant in presenting good range parameters, as many as 270 samples using Mi-Fi matches had a smaller range of 512 kbps with a percentage of 21.67%.

Conclusion

The conclusion is derived from the average results of three different providers across Custom, Visual Skin, and Ranked modes. In Custom mode, while it may not be as competitive as Ranked mode, network quality is still essential for practicing strategies. Telkomsel stood out by achieving the highest throughput of 7.59 Kbps, the lowest packet loss at 0.94%, and the shortest delay of 55 ms. When it comes to using skins, network quality also affects the rendering of visual effects and skin animations. Here, Telkomsel again delivered an excellent experience, with a high throughput of 7.27 Kbps, low packet loss of 1.21%, and a delay of 59 ms. In Ranked mode, network quality becomes even more critical because high responsiveness is crucial. Telkomsel also performed exceptionally well in this mode, achieving a throughput of 6.84 Kbps, the lowest packet loss at 1.43%, and the shortest delay of 63 ms, ensuring a smooth experience for players during competitive matches. Overall, these results demonstrate that Telkomsel offers superior service quality for Honor of Kings gaming activities in both Custom Mode and Ranked Mode, as well as for skin visualization.

Acknowledgments
My first and most sincere gratitude goes to my examining lecturers who have provided valuable suggestions, criticisms, and evaluations in improving this thesis. To my beloved parents, thank you for all the support and never-ending prayers that have been my source of strength all this time. I would also like to thank my friends from the MAYOUNG Honor of Kings NTB community and my friends in arms at the University of Mataram, especially the Class of 2018. Finally, I would also like to express my respect and gratitude to all parties who have helped directly or indirectly.

Author Contributions
Conceptualization, E.A.P., D. F. B., and M. S. Y.; methodology, E.A.P., D. F. B., and M. S. Y.; formal analysis, E.A.P., D. F. B., and M. S. Y.; data acquisition, E.A.P., D.F.B., and M. S. Y.; writing—original draft preparation, E.A.P., D.F.B., and M.S.Y.; writing—review and editing, E.A.P., D. F. B., and M. S. Y.; All authors have read and agreed to the published version of the manuscript.

Funding
No external funding.

Conflicts of Interest
No conflict of interest.

References

Alfarizqa, M. R., Yadnya, M. S., & Zainuddin, A. (2025). Analysis of the Use of Provider and Mi-Fi Devices on Game Performance in Mobile Legends: Bang Bang Ranked Mode. *Jurnal Penelitian Pendidikan IPA*, *11*(4), 1169–1178. https://doi.org/10.29303/jppipa.v11i4.10429

Bagyalakshmi, G., Rajkumar, G., Arunkumar, N., Easwaran, M., Narasimhan, K., Elamaran, V., Solarte, M., Hernandez, I., & Ramirez-Gonzalez, G. (2018). Network Vulnerability Analysis on Brain Signal/Image Databases Using Nmap and Wireshark Tools. *IEEE Access*, *6*, 57144–57151. https://doi.org/10.1109/ACCESS.2018.2872775

Beshley, M., Kryvinska, N., Beshley, H., Panchenko, O., & Medvetskyi, M. (2024). Traffic engineering and QoS/QoE supporting techniques for emerging service-oriented software-defined network. *Journal of Communications and Networks*, *26*(1), 99–114. https://doi.org/10.23919/JCN.2023.000065

Eiza, M. H., Owens, T., Ni, Q., & Shi, Q. (2015). Situation-Aware QoS Routing Algorithm for Vehicular Ad Hoc Networks. *IEEE Transactions on Vehicular Technology*, *64*(12), 5520–5535. https://doi.org/10.1109/TVT.2015.2485305

Elamaran, V., Arunkumar, N., Venkat Babu, G., Balaji, V. S., Gomez, J., Figueroa, C., & Ramirez-Gonzalez, G. (2018). Exploring DNS, HTTP, and ICMP Response Time Computations on Brain Signal/Image Databases using a Packet Sniffer Tool. *IEEE Access*, *6*, 59672–59678. https://doi.org/10.1109/ACCESS.2018.2870557

Glenegles, & Fauzi, M. (2023). Aplikasi Pemesanan Jasa Rank Game Online Berbasis Android. *Information System and Data Science (InSeDS)*, *2*(1), 20–29. https://doi.org/10.59840/inseds.v2i1.177

Gómez, J., Riaño, V. H., & Ramirez-Gonzalez, G. (2023). Traffic Classification in IP Networks Through Machine Learning Techniques in Final Systems. *IEEE Access*, *11*, 44932–44940. https://doi.org/10.1109/ACCESS.2023.3272894

Haidar, R. (2023). *Peranan Mobile Adhoc Dalam Komunikasi Data*. Penerbit Yayasan Prima Agus Teknik.

Jumani, A. K., Shi, J., Laghari, A. A., Estrela, V. V., Sampedro, G. A., Almadhor, A., Kryvinska, N., & ul Nabi, A. (2024). Quality of Experience That Matters in Gaming Graphics: How to Blend Image Processing and Virtual Reality. *Electronics*, *13*(15), 2998. https://doi.org/10.3390/electronics13152998

Markova, E., Moltchanov, D., Gudkova, I., Samouylov, K., & Koucharyavy, Y. (2019). Performance Assessment of QoS-Aware LTE Sessions Offloading Onto LAA/WiFi Systems. *IEEE Access*, *7*, 36300–36311. https://doi.org/10.1109/ACCESS.2019.2905035

Nakulo, B., Setiawan, C. B., Sahtyawan, R., & Al Badawi, M. A. A. (2021). Analisis Quality of Service (QOS) pada Akses Game Online Menggunakan Standar Tiphon. *Teknomatika: Jurnal Informatika Dan Komputer*, *15*(1), 17–22. https://doi.org/10.30989/teknomatika.v15i1.1130

Orebaugh, A., Davidson, J., Johnson, D., Graham, D., & Martin, W. (2023). Virginia Cyber Navigator Internship Program (VA-CNIP). *Journal of The Colloquium for Information Systems Security Education*, *10*(1), 6. https://doi.org/10.53735/cisse.v10i1.175

Rosa, L., Freitas, M., Mazo, S., Monteiro, E., Cruz, T., & Simoes, P. (2019). A Comprehensive Security Analysis of a SCADA Protocol: From OSINT to Mitigation. *IEEE Access*, *7*, 42156–42168. https://doi.org/10.1109/ACCESS.2019.2906926

Rustam, F., Raza, A., Qasim, M., Posa, S. K., & Jurcut, A. D. (2024). A Novel Approach for Real-Time Server-Based Attack Detection Using Meta-Learning. *IEEE Access*, *12*, 39614–39627. https://doi.org/10.1109/ACCESS.2024.3375878

Tatama, V., Pontia W, F. T., Imansyah, F., Saleh, M., & Marpaung, J. (2022). Analisis Quality of Service Pada Jaringan Iconnet Menggunakan Aplikasi Wireshak. *Jurnal Digital Teknologi Informasi*, 1–9. https://doi.org/10.26418/j3eit.v10i2.58059

Xiang, C., Yang, P., Wu, X., He, H., & Xiao, S. (2015). QoS-based service selection with lightweight description for large-scale service-oriented internet of things. *Tsinghua Science and Technology*, *20*(4), 336–347. https://doi.org/10.1109/TST.2015.7173450

Yadnya, M. S., & Sudiarta, I. W. (2018). Synthesis of 4G outdoor femtocells under rain conditions in Mataram. *AIP Conference Proceedings*, 020017. https://doi.org/10.1063/1.5080036

Yadnya, M. S., Wahyudi, L. A., & Sasongko, S. M. al. (2020). Pengukuran Performansi Game On Line di Daerah Rural dalam Variasi Waktu dan Karakter Hero pada Mobile Legends Bang Bang. *DIELEKTRIKA*, *7*(1), 25–29. Retrieved from https://dielektrika.unram.ac.id/index.php/dielektrika/article/view/235

Zadtootaghaj, S. (2022). *Quality of Experience Modeling for Cloud Gaming Services*. Springer International Publishing. https://doi.org/10.1007/978-3-030-98249-2

Zhou, X., & Zheng, C. (2019). Priority access for QoS support in distributed wireless networks. *JSEE*, *30*(6), 1202–1211. https://doi.org/10.21629/JSEE.2019.06.14