

Analysis of Wi-Fi Network Usage with Cellular Data Packages on Video Call Service Quality

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Abstract

Video calls have now become an important part of daily activities, from personal communication to work meetings and online learning. However, the quality of video calls is highly dependent on the internet network used. This study aims to analyze the comparison of the quality of video call services when using Wi-Fi networks and cellular data packet networks. Testing was carried out by utilizing several main parameters of network quality, such as data transfer speed (throughput), data packet loss, delay, and signal interference (jitter). In addition, signal quality was also analyzed using the SINPO (Signal, Interference, Noise, Propagation, Overall) parameters, and signal strength was measured using the GNetTrack application. Testing was carried out using the Telegram video call application at three different times—morning, afternoon, and evening—for three consecutive days. The results of the study showed that the quality of video call services with Wi-Fi networks tends to be more stable and consistent compared to cellular data packets, especially during times of heavy internet usage. However, in conditions of a strong cellular signal, the quality of video call services can match or even approach the quality of Wi-Fi. This study concludes that network type and usage time have a significant impact on video call quality, and it is important for users to choose a network that suits environmental conditions and communication needs.

Keywords: Video call, Wi-Fi, Mobile data, Network quality, SINPO, QoS

1. Introduction

Today, long-distance communication is no longer a problem for individuals who own a smartphone. Many people from children, teenagers, and young adults to the elderly already possess smartphones. With the widespread availability of various smartphone brands across different countries, users can access multiple service features, one of which facilitates long-distance communication: video call services. [1] – [6].

Video calling is one of the evident results of technological and informational advancements, offering services that simplify long-distance telecommunications. Video call services allow real-time transmission of data in the form of images and audio. These services require a reliable network to function properly [7] – [11]. Smartphone-based video call services can be application-based or web-based. Common problems in video calls include delay and high packet loss, which affect service quality, such as reduced video resolution or frames per second (FPS), and disrupted, robotic-sounding audio that is not synchronized with the video [12] – [14].

Quality of Service (QoS) is a method used to measure how reliably a network performs for a given service. The network parameters tested include packet loss, delay, throughput, and jitter. The quality of a network's QoS is influenced by both internal and external factors. Based on these issues, research is needed to assess the quality of internet networks, particularly their performance in video call services. This study compares the service quality of cellular data networks and Wi-Fi networks using QoS parameters determined by the Telecommunication and Internet Protocol Harmonization Over Network (TIPHON). Additionally, the video call process is evaluated using the SINPO approach [15].

2. Methods

This study uses a quantitative experimental method to analyze and compare the quality of video call services using Wi-Fi and cellular data networks. Data collection was conducted directly at the Faculty of Engineering, Universitas Tanjungpura, over three days, with testing divided into three time intervals: morning, afternoon, and evening. Researchers conducted five-minute video calls using the Telegram and WhatsApp applications, recording network performance using tools such as G-NetTrack to measure signal strength and Wireshark for real-time network packet analysis [16], [17].

The collected data includes Quality of Service (QoS) parameters: delay, jitter, packet loss, and throughput. These were analyzed based on the TIPHON quality standard and evaluated using the SINPO method to assess overall user experience. The research process began with a literature review, followed by field testing, data collection, analysis, and conclusion. All steps were designed to provide an objective and measurable picture of network performance in supporting video call services [18].

3. Result and Discussion

This study aims to compare the quality of video calls using the Indihome Wi-Fi network and Telkomsel cellular data packages. Testing was conducted over three consecutive days during morning, afternoon, and evening sessions. Throughout the tests, signal strength was measured, network performance was analyzed based on Quality of Service (QoS) parameters, and video call service quality was assessed using the SINPO approach.

3.1. Signal Strength Analysis

3.1.1. Day One

On the first day, the Wi-Fi signal showed moderate to weak quality. The RSSI value reached -54 dB in the afternoon. Meanwhile, the cellular network displayed a low RSRP value of around -100 dB, indicating an unstable signal. This affected the video call quality, as the video sometimes appeared blurry and the audio was frequently choppy.

3.1.2. Day Two

On the second day, the Wi-Fi signal slightly improved, although it was still not optimal. The cellular network remained within the moderate signal range. At certain times, interference and a decline in video quality were observed, particularly in the afternoon, likely due to increased user traffic.

3.1.3. Day Three

The Wi-Fi signal tended to be more stable on the third day, especially in the morning and afternoon. According to the SINPO analysis, the assessment yielded a score of 44434, which falls under the good category. For the cellular network, the signal remained strong in the morning and evening, but quality decreased during the afternoon due to high interference and heavy data traffic.

3.2. Analysis of QoS Parameters and SINPO

3.2.1. QoS Parameters (Throughput, Delay, Jitter, Packet Loss)

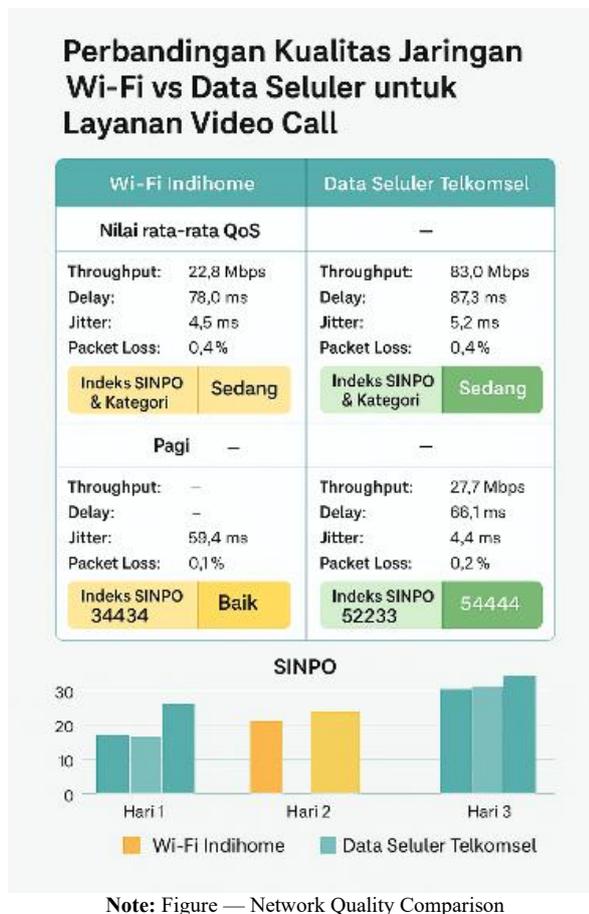
The test results showed that Wi-Fi throughput values were generally higher than those of the cellular network, although still within the low category (e.g., 230 kbps on the second morning). However, packet loss values were extremely high, reaching up to 100% in many test sessions, both on Wi-Fi and cellular networks. Delay and jitter tended to be good and stable during the afternoon and evening sessions.

3.2.2. Evaluation Using SINPO

The SINPO method provides an overview of quality from the user's perspective. On the third day, video calls using the Wi-Fi network achieved the highest SINPO score (44434), indicating good signal quality and network stability. On the other hand, the cellular network showed fluctuating results: good in the morning, declining in the afternoon, and improving again in the evening.

3.3. Interim Conclusion

Based on the three-day testing period, Wi-Fi consistently delivered better video call quality than the cellular network. Cellular network performance was heavily influenced by the number of users and time of use (with peak hours reducing quality). The SINPO parameter effectively provided a comprehensive overview of service quality. Overall, Wi-Fi is more recommended for video calls due to its more stable performance, especially in the morning.



Source: Narwastu D.P., Fitri Imansyah, Dedy Suryadi, Redi R. Yacoub, Jannus Marpaung. (2022)

4. Conclusion

Based on the results of the study, it can be concluded that the quality of video call services tends to be better when using Wi-Fi networks, especially in the morning when network interference is relatively low. In contrast, cellular networks experienced a decline in service quality during the afternoon and evening due to high user traffic. Based on the measurement results of Quality of Service (QoS) parameters and the SINPO approach, Wi-Fi networks are more recommended for video call activities because they offer more stable performance. Therefore, users are advised to consider the timing and signal conditions before making a video call. Additionally, it is important for cellular service providers to improve their network infrastructure to support the growing demand for real-time communication services optimally

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