



A Comparison QoS Indihome in Tangerang and Palu

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Abstract

This study investigates the Quality of Service performance of IndiHome internet services in Tangerang and Palu, Indonesia, through a comparative empirical evaluation. The research integrates bandwidth assessment with multidimensional Quality of Service measurements to examine network performance under comparable operational conditions. Data were collected using Wireshark and NetWorx during controlled streaming activities employing identical content, service providers, and observation periods. The evaluated parameters included delay, jitter, packet loss, throughput, and bandwidth utilization. The findings reveal notable differences between the two locations. Tangerang exhibited superior performance in terms of delay and jitter, indicating better network responsiveness and transmission stability. Palu achieved higher throughput values, demonstrating stronger data transfer capacity under the observed conditions. Both locations recorded zero packet loss, reflecting reliable packet delivery and stable communication quality. The results indicate that throughput should not be interpreted independently because overall service quality is influenced by the interaction among latency characteristics, resource utilization efficiency, traffic management, and infrastructure conditions. The study further highlights the importance of network architecture effectiveness and bandwidth optimization in maintaining broadband service quality. These findings provide practical insights for infrastructure planning, service improvement, and digital connectivity development across geographically diverse regions.

Keywords : Quality Of Service, Broadband Network, Throughput Analysis, Bandwidth Utilization, Network Infrastructure.



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INTRODUCTION

The accelerating expansion of digital transformation across the world has fundamentally altered the role of internet connectivity from a complementary technological resource into a critical infrastructure that supports economic productivity, public services, social interaction, and knowledge exchange. Within this context, the assessment of Quality of Service (QoS) has emerged as a central concern in both academic research and industrial practice because the effectiveness of digital ecosystems is increasingly determined not merely by network availability but by the consistency and reliability of data transmission performance. Recent developments in fiber optic deployment, passive optical network architectures, and broadband service optimization have significantly enhanced network capabilities in many regions, while substantial disparities remain evident across different geographical settings and levels of infrastructural maturity. Research on fiber optic network enhancement demonstrates that network design and transmission architecture substantially influence QoS outcomes, particularly in terms of throughput stability and latency performance (Wismiana et al., 2024). Similar findings have been reported in investigations of Gigabit Capable Passive Optical Network systems, which reveal that service quality is closely associated with infrastructure efficiency and traffic management mechanisms (Wardana et al., 2024). As broadband penetration continues to expand throughout developing economies, including Indonesia, the need to understand spatial variations in QoS performance has become increasingly important because digital inclusion depends not only on access but also on the quality of user experience delivered through network services (Telkomsel, 2024).

Existing studies have generated valuable insights into the measurement and comparison of network quality across diverse technological environments, although their findings reveal several important patterns that extend beyond simple performance evaluation. Comparative analyses of Internet

Service Providers have consistently shown that throughput, packet loss, jitter, and delay are sensitive to differences in network architecture, bandwidth allocation, and service management strategies (Saputra et al., 2025). Investigations conducted within residential wireless environments similarly demonstrate that QoS indicators vary considerably across providers despite operating under comparable user conditions, suggesting that service quality is influenced by complex interactions between infrastructure and operational practices rather than by bandwidth capacity alone (Simanjuntak & Asri, 2023). Research focusing on WLAN performance comparisons has further highlighted that technological configurations significantly affect transmission stability and latency outcomes, indicating that user experience cannot be adequately explained through isolated network metrics (Slameto & Asror, 2023). Complementing these findings, studies examining queue management mechanisms in Mikrotik based networks reveal that traffic control approaches produce measurable differences in packet delivery efficiency and overall service quality, emphasizing the importance of network management decisions in determining QoS performance (Zulfia et al., 2023). Collectively, these studies suggest that QoS should be interpreted as a multidimensional construct shaped by infrastructure characteristics, traffic behavior, and operational governance.

Despite the growing body of literature, significant conceptual and empirical limitations remain evident. Much of the existing research concentrates on comparisons between service providers, network configurations, or technical architectures within relatively homogeneous environments, resulting in limited understanding of how identical broadband services perform across geographically distinct regions. Current studies frequently prioritize technological variables while underexamining the influence of broader contextual factors such as urban development intensity, regional infrastructure distribution, environmental conditions, and disparities in network demand. Investigations conducted in institutional settings have demonstrated that network performance is often shaped by localized operational conditions and user behavior patterns that cannot be generalized across regions (Syam et al., 2025). At the same time, previous comparative studies have largely focused on short term measurements without adequately addressing the spatial dimension of QoS variability within the same service ecosystem (Saputra et al., 2025). This limitation creates an important gap because the growing expansion of broadband networks has increased expectations regarding service uniformity, while empirical evidence regarding regional consistency remains fragmented and insufficiently theorized.

The unresolved nature of this issue carries substantial scientific and practical implications. From a scientific perspective, the absence of robust evidence concerning regional QoS disparities restricts the development of explanatory models capable of linking infrastructure characteristics, network traffic conditions, and service outcomes across heterogeneous environments. From a practical standpoint, unequal service quality may contribute to digital inequality by affecting access to online education, electronic commerce, remote work, telemedicine, and other digitally mediated activities that increasingly depend on stable connectivity. The challenge becomes particularly relevant in Indonesia, where rapid internet expansion has occurred alongside persistent differences in infrastructure concentration between metropolitan and peripheral regions. Previous studies indicate that network performance is highly sensitive to deployment quality, traffic distribution, and infrastructure optimization practices (Wardana et al., 2024; Wisniana et al., 2024). Simultaneously, service quality perceptions are influenced not only by technical parameters but also by provider policies and customer service frameworks that shape the overall user experience (Telkomsel, 2024). These considerations underscore the importance of investigating whether a single provider can deliver comparable QoS performance across regions characterized by distinct developmental and geographical conditions.

Within the contemporary research landscape, the present study positions itself at the intersection of network performance analysis and regional digital infrastructure assessment by focusing specifically on the comparison of IndiHome QoS performance between Tangerang and Palu. Unlike previous studies that predominantly compare different providers, routing techniques, wireless configurations, or traffic management schemes, this research examines how the same broadband service performs across two cities representing contrasting levels of urbanization, infrastructural concentration, and network utilization intensity. Such positioning enables a more nuanced understanding of the extent to which QoS variability reflects broader contextual conditions rather than purely technological factors. The study also extends prior comparative approaches by integrating bandwidth analysis with the core QoS parameters of throughput, packet loss, jitter, and delay, thereby providing a multidimensional evaluation framework capable of capturing both transmission efficiency and service stability. Through

this perspective, regional performance differences can be interpreted within a broader socio technical context that has received limited attention in earlier investigations.

This study aims to compare the Quality of Service performance of IndiHome internet services in Tangerang and Palu through a comprehensive assessment of throughput, packet loss, jitter, delay, and bandwidth characteristics. The research seeks to identify the extent to which regional conditions influence service quality and to provide empirical evidence regarding the consistency of broadband performance across contrasting urban environments. Theoretically, the study contributes to the advancement of QoS research by incorporating spatial variability as an analytical dimension in network performance evaluation. Methodologically, it offers an integrated comparative framework that combines multiple QoS indicators with bandwidth measurements to generate a more holistic understanding of internet service quality. The findings are expected to enrich discussions on digital infrastructure equity, support evidence based network optimization strategies, and contribute to the development of more inclusive broadband connectivity policies.

RESEARCH METHODS

This study employs an empirical comparative research design to evaluate the Quality of Service performance of IndiHome internet services in Tangerang and Palu. The methodological innovation of this research lies in the integration of bandwidth assessment with a multidimensional QoS evaluation framework, enabling a comprehensive examination of network performance across geographically distinct environments. Data collection was conducted through controlled network observations under comparable operational conditions in both cities using the same Internet Service Provider, identical streaming content from YouTube at 2K resolution, and equivalent measurement periods to minimize contextual bias. Network traffic data were captured using Wireshark, while bandwidth utilization was recorded using NetWorx. The experimental procedure involved repeated traffic monitoring sessions during predefined observation intervals to obtain packet transmission records, data volume, and communication time spans. The collected raw data were subsequently processed to calculate throughput, packet loss, jitter, delay, and bandwidth values based on established QoS measurement formulas. This design enables the isolation of regional performance characteristics while maintaining consistency in service type, application workload, and measurement configuration, thereby strengthening the robustness of cross regional comparisons.

The validity of the findings was ensured through methodological triangulation involving multiple QoS indicators that collectively represent network efficiency, reliability, stability, and responsiveness. Throughput was employed to assess effective data transmission capacity, packet loss was used to evaluate transmission reliability, jitter measured temporal variation in packet delivery, delay quantified end to end transmission latency, and bandwidth represented the overall network carrying capacity. The use of Wireshark as a packet level monitoring platform follows established network performance evaluation practices and has been widely recognized as a reliable instrument for QoS analysis in communication networks (Hamidah et al., 2024). To enhance measurement credibility, all parameters were obtained under standardized testing conditions and analyzed using comparative statistical interpretation across the two study locations. The methodological uniqueness of this study resides in its focus on evaluating the consistency of a single broadband provider across contrasting urban contexts, allowing a more rigorous assessment of how infrastructure conditions, traffic intensity, and environmental characteristics influence service quality. Compliance with service operation and user data protection principles was maintained throughout the study in accordance with the privacy and security framework established by IndiHome services (Telkomsel, 2024).

RESULTS AND DISCUSSION

Comparative Analysis of Delay and Jitter Performance

The comparative evaluation of delay and jitter reveals substantial differences in network responsiveness between Tangerang and Palu. The measurement results indicate that Tangerang achieved a delay value of 348 ms while Palu recorded 462 ms under identical testing conditions. These findings suggest that data transmission in Tangerang experiences shorter travel times across the network path. Lower latency values are generally associated with improved service responsiveness and enhanced user experience in broadband environments (Hamidah et al., 2024).

Delay performance represents one of the most important indicators of network efficiency because it directly affects the speed of communication between end users and destination servers. The observed difference between the two cities indicates that geographical conditions and infrastructure maturity may contribute to transmission efficiency variations. Previous studies reported that network topology and infrastructure quality strongly influence latency characteristics within broadband networks (Wisniana et al., 2024). Similar observations were documented in fiber based internet services where transmission distance and network congestion affected end to end performance (Rachman et al., 2023).

The delay value observed in Palu exceeded the threshold commonly associated with optimal service quality according to TIPHON based assessments. Such conditions may affect real time applications including video conferencing and interactive multimedia services. Research conducted on educational and organizational networks demonstrated that elevated delay values reduce communication effectiveness and service satisfaction (Lathifah & Musyaffa, 2023). Network performance studies have consistently identified latency as a critical determinant of perceived service quality (Balafif & Aini, 2022).

Jitter analysis produced additional evidence regarding network stability differences between the two locations. Tangerang achieved a jitter value of negative 4.61 ms while Palu recorded 0 ms during the observation period. The lower jitter variation indicates a more stable packet arrival pattern and greater consistency in transmission timing. Stable jitter conditions are particularly important for streaming applications because they reduce interruptions and synchronization problems (Pangestu, 2022).

The relationship between delay and jitter provides a broader understanding of service quality performance. Networks characterized by lower delay frequently exhibit more consistent packet delivery behavior because congestion effects remain limited. Investigations involving wireless and wired infrastructures reported similar interactions between latency and packet timing variation (Naim et al., 2022). The consistency observed in Tangerang suggests a more balanced traffic management environment.

Table 1. Comparative Results of Delay and Jitter Performance

QoS Parameter	Tangerang	Palu	Better Performance
Delay (ms)	348	462	Tangerang
Jitter (ms)	-4.61	0	Tangerang

Source: Primary Data Processed from Wireshark Measurements, 2026.

The results presented in Table 1 demonstrate that Tangerang consistently outperformed Palu across both latency related indicators. The magnitude of the difference is sufficiently large to suggest the presence of structural rather than incidental performance variations. Network performance literature indicates that sustained differences of this scale are often associated with disparities in infrastructure deployment and traffic distribution (Wardana et al., 2024). The evidence supports the interpretation that network conditions in Tangerang provide a more favorable operational environment.

A deeper interpretation can be derived by considering the role of metropolitan infrastructure development. Tangerang benefits from its integration within the Greater Jakarta digital ecosystem where broadband investments and network expansion have historically been concentrated. Earlier comparative studies found that urban regions frequently achieve superior QoS outcomes because of higher infrastructure density and redundancy (Saputra et al., 2025). Such characteristics reduce bottlenecks and improve overall transmission efficiency.

The findings also align with studies examining wireless and ISP network comparisons across different operational contexts. Research involving comparative QoS assessments revealed that latency and jitter often deteriorate in environments characterized by limited infrastructure scalability and increasing user demand (Simanjuntak & Asri, 2023). Comparable trends were identified in analyses of WLAN performance under varying network loads (Slameto & Asror, 2023). The observed results reinforce the importance of infrastructure adequacy in maintaining stable service delivery.

Another plausible explanation concerns traffic management effectiveness within the service architecture. Studies focusing on bandwidth allocation and queue management mechanisms have shown that efficient traffic prioritization can substantially reduce delay and packet timing variation (Zulfia et

al., 2023). Similar conclusions were reported in investigations of bandwidth management strategies employing MikroTik based environments (Fadli & Asis, 2025). The stronger performance observed in Tangerang may reflect more efficient resource allocation under operational loads.

The empirical evidence demonstrates that latency related QoS dimensions remain unevenly distributed between the two study locations despite being served by the same provider. These findings indicate that service consistency cannot be evaluated solely through provider identity because regional infrastructure conditions significantly shape network outcomes. Comparative investigations conducted in rural and remote network environments reported analogous disparities resulting from differences in infrastructure accessibility and operational capacity (Herdianzah et al., 2025). The results establish delay and jitter as key indicators explaining the superior QoS performance observed in Tangerang relative to Palu.

Comparative Analysis of Throughput and Packet Loss Performance

The comparative evaluation of throughput and packet loss provides an important perspective on network efficiency beyond latency oriented indicators. Throughput represents the effective volume of data successfully transmitted within a given observation period and reflects the practical transfer capability experienced by users. Comparative QoS studies frequently identify throughput as a critical indicator for assessing communication effectiveness under real operational conditions (Saleh et al., 2022). The measurements obtained in this study revealed observable differences between Tangerang and Palu despite the use of identical service providers, applications, and testing configurations.

The empirical results indicate that Palu achieved a throughput value of 0.728, whereas Tangerang recorded 0.587 under equivalent streaming activities. This outcome suggests that a larger amount of application data was successfully transferred within the observation interval in Palu. Previous investigations have reported that throughput variation may emerge even when service providers remain identical because traffic engineering policies and local network conditions influence transmission efficiency (Christanto & Aji, 2023). The observed difference therefore requires interpretation within a broader network performance framework rather than through isolated numerical comparison.

A higher throughput value is often associated with improved data carrying capacity, yet this relationship is not always linear with perceived service quality. Network performance literature emphasizes that throughput should be interpreted together with other QoS indicators because efficient transmission capacity does not automatically guarantee superior responsiveness or stability (Alfarizi, 2026). The findings of the present study illustrate this principle because Tangerang demonstrated stronger performance in latency related parameters while Palu exhibited a higher throughput value. Such a pattern indicates the presence of distinct network operating characteristics across the two locations.

One plausible explanation for the throughput difference relates to traffic distribution and resource allocation mechanisms within the access network. Variations in subscriber density and utilization intensity may influence how available capacity is distributed among active users during observation periods. Similar patterns were identified in comparative ISP investigations where throughput fluctuations emerged despite equivalent service subscriptions and application workloads (Saputra et al., 2025). The result suggests that network efficiency is shaped by local operational dynamics rather than by provider identity alone.

Another relevant consideration concerns buffering and transmission control mechanisms operating within broadband infrastructure. Adaptive traffic management processes can increase the amount of successfully delivered data while simultaneously producing different temporal delivery characteristics. Studies examining wireless and broadband QoS environments have shown that network devices may prioritize transmission continuity through internal buffering strategies that influence throughput outcomes (Farabi & Sutanto, 2025). Such mechanisms may contribute to the throughput advantage observed in Palu.

Table 2. Comparative Throughput and Packet Loss Results

QoS Parameter	Tangerang	Palu	Better Performance
Throughput	0.587	0.728	Palu
Packet Loss	0%	0%	Equivalent

Source: Primary Data Processed from Wireshark Measurements, 2026.

The results presented in Table 2 reveal a contrasting performance pattern between throughput and packet delivery reliability. While Palu recorded a higher throughput value, packet loss remained identical across both locations at zero percent. This outcome indicates that neither network experienced measurable packet discard during the controlled streaming sessions. Similar findings have been reported in QoS evaluations where stable broadband infrastructure maintained complete packet delivery despite differences in other performance indicators (Putra et al., 2025).

The absence of packet loss carries important implications for network reliability. Packet loss is commonly interpreted as evidence of congestion, transmission errors, or routing inefficiencies that disrupt successful communication processes. Research on QoS assessment consistently identifies packet loss as a primary determinant of service dependability because lost packets often degrade application performance and user experience (Syam et al., 2025). The zero percent results observed in both cities indicate that the communication paths remained highly reliable throughout the observation period.

Although packet loss values were equivalent, the throughput difference demonstrates that reliability alone does not fully explain network behavior. Two networks may deliver all packets successfully while exhibiting different capacities for transferring data within the same timeframe. Comparative QoS studies have highlighted that throughput variation can emerge from routing efficiency, scheduling policies, and bandwidth utilization patterns without necessarily producing packet loss events (Zulfia et al., 2023). The findings align with this perspective and suggest that transfer efficiency and delivery reliability represent complementary dimensions of performance.

The coexistence of higher throughput in Palu and stronger latency related performance in Tangerang illustrates the multidimensional nature of QoS evaluation. A network that transfers more data is not automatically superior when responsiveness and temporal consistency are considered simultaneously. Contemporary QoS frameworks recommend integrating multiple indicators because isolated metrics may produce incomplete conclusions regarding actual service quality (Saleh et al., 2022). The present findings reinforce the importance of multidimensional interpretation when comparing broadband services across geographically distinct environments.

From an empirical standpoint, the results demonstrate that IndiHome maintained excellent packet delivery reliability in both cities while exhibiting different levels of transfer efficiency. The throughput advantage observed in Palu may reflect localized network management conditions, bandwidth utilization patterns, or routing characteristics that facilitate greater data transmission volume. Evidence from comparative network performance studies suggests that such variations are common in geographically separated service environments even under standardized testing procedures (Christanto & Aji, 2023). These findings contribute to a more nuanced understanding of QoS performance by showing that throughput and packet loss reveal different yet equally important aspects of broadband service quality.

Infrastructure Efficiency and Bandwidth Utilization Implications

The comparative findings indicate that the observed Quality of Service differences between Tangerang and Palu cannot be interpreted solely through individual performance metrics. Network performance emerges from the interaction between infrastructure architecture, bandwidth allocation strategies, traffic management mechanisms, and regional operational conditions. The coexistence of lower bandwidth requirements in Tangerang and higher throughput values in Palu suggests that network efficiency is influenced by factors extending beyond raw transmission capacity. Similar observations have been reported in broadband infrastructure studies where service quality is strongly associated with network design and resource optimization practices (Wardana et al., 2024).

The empirical measurements reveal that Tangerang achieved more favorable service responsiveness despite requiring lower bandwidth resources during the testing process. This pattern indicates that network efficiency may be associated with the effectiveness of packet forwarding mechanisms and the optimization of access network infrastructure. Research on fiber optic based broadband systems has demonstrated that efficient network architectures can deliver superior service quality even when bandwidth consumption remains relatively moderate (Wismiana et al., 2024). The

present findings support the argument that infrastructure efficiency plays a central role in determining user experience.

Geographical characteristics represent another important dimension influencing network service quality across the two locations. Tangerang is situated within a highly connected metropolitan environment that benefits from dense telecommunications infrastructure and extensive interconnection facilities. Palu operates within a different geographical context where transmission routes and access network distribution may require additional operational resources to maintain service continuity. Previous comparative studies have shown that regional disparities in infrastructure deployment frequently contribute to variations in broadband service performance (Herdianzah et al., 2025).

The relationship between bandwidth utilization and Quality of Service requires careful interpretation within broadband network environments. Higher bandwidth consumption does not automatically indicate a more efficient network because greater resource usage may reflect increased protocol overhead, longer transmission paths, or adaptive buffering processes. Studies on wireless and broadband bandwidth assessment emphasize that effective bandwidth utilization depends on how efficiently network resources are converted into stable service delivery rather than on the volume of bandwidth consumed alone (Basri & Yuliadi, 2023). This perspective provides an important framework for interpreting the differences observed between Tangerang and Palu.

Traffic management mechanisms may also contribute to the performance patterns identified during the measurements. Modern broadband networks rely on dynamic resource allocation, congestion control, queue management, and traffic prioritization techniques to maintain service quality under varying operational loads. Investigations of bandwidth management strategies demonstrate that effective traffic control can improve service responsiveness while simultaneously reducing unnecessary resource consumption (Fadli & Asis, 2025). Such mechanisms may partially explain why Tangerang exhibited stronger efficiency indicators despite lower bandwidth requirements.

Table 3. Comparative Bandwidth Utilization and Infrastructure Implications

Indicator	Tangerang	Palu
Bandwidth Requirement	Lower	Higher
Delay Performance	Better	Lower
Jitter Stability	Better	Lower
Throughput	Lower	Higher
Infrastructure Efficiency	Higher	Moderate

Source: Primary Data Processed from NetWorx and Wireshark Measurements, 2026.

The comparison presented in Table 3 highlights an important distinction between transmission capacity and operational efficiency. Palu demonstrated greater throughput performance, whereas Tangerang exhibited indicators that suggest more efficient utilization of network resources. This outcome implies that network quality should be evaluated through a multidimensional framework rather than through a single QoS parameter. Similar conclusions have been reported in network architecture evaluations where infrastructure optimization produced substantial service improvements without requiring proportional increases in bandwidth consumption (Wardana et al., 2024).

Access network technologies such as Fiber To The Home and Gigabit Passive Optical Network architectures provide a useful perspective for understanding these observations. The effectiveness of FTTH and GPON deployments depends not only on available capacity but also on network configuration, optical distribution design, and traffic engineering practices. Research examining GPON based performance evaluation indicates that infrastructure efficiency can significantly influence latency behavior, bandwidth utilization, and overall service stability (Wardana et al., 2024). Differences in implementation maturity across locations may therefore contribute to the performance variations identified in this study.

Network management practices constitute another factor that may influence service outcomes under comparable provider conditions. Adaptive routing policies, channel utilization strategies, and traffic scheduling mechanisms are frequently employed to maintain service continuity across heterogeneous network environments. Studies involving channel management and protocol performance analysis have shown that management efficiency can affect service quality even when

underlying bandwidth resources remain comparable (Mutu et al., 2024; Dinbirru & Trianto, 2024). The findings suggest that operational management effectiveness should be considered alongside infrastructure capacity when evaluating broadband service performance.

From an operational perspective, the results provide several implications for IndiHome service development. Infrastructure enhancement initiatives in regions with higher bandwidth requirements should focus on improving transmission efficiency and traffic optimization rather than solely increasing available capacity. Service providers are increasingly expected to integrate performance monitoring, resource allocation control, and security management into a unified operational framework to maintain service consistency across geographically diverse areas (Telkomsel, 2024). Strategic investment in infrastructure optimization may therefore generate greater service improvements than capacity expansion alone.

The broader implication of this study is that broadband quality should be interpreted as an outcome of infrastructure efficiency rather than a reflection of individual QoS indicators. The comparative evidence demonstrates that favorable network performance emerges when bandwidth resources, traffic management, and infrastructure architecture operate in a coordinated manner. Network environments that achieve efficient resource utilization are more likely to deliver stable and responsive services across varying operational conditions (Wismiana et al., 2024; Fadli & Asis, 2025). These findings reinforce the importance of adopting a holistic network management approach for sustaining broadband service quality in geographically diverse regions.

CONCLUSION

This study evaluated the Quality of Service performance of IndiHome internet services in Tangerang and Palu through a comparative empirical approach using bandwidth, delay, jitter, packet loss, and throughput measurements. The findings reveal that Tangerang demonstrated superior network responsiveness and transmission stability, reflected in lower delay and jitter values, while Palu achieved higher throughput under the same testing conditions. Both locations recorded zero packet loss, indicating a high level of transmission reliability and consistent packet delivery performance. The results further indicate that higher throughput does not necessarily correspond to superior overall Quality of Service because network quality is influenced by the interaction between transmission capacity, latency characteristics, traffic management, and infrastructure efficiency. Comparative analysis of bandwidth utilization suggests that Tangerang achieved more efficient resource utilization despite lower bandwidth requirements, whereas Palu required greater network resources to sustain data transmission performance. These findings highlight the importance of infrastructure optimization, traffic management strategies, and network architecture effectiveness in shaping broadband service quality across different geographical environments. Continuous monitoring and infrastructure improvement remain essential to support consistent digital connectivity and sustainable broadband service development.

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