Mapping Access Points in the PT PLN (Persero) UIP SUMBAGSEL Archive Building Using NetSpot and WiFi Analyzer

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Abstract

The rapid advancement of information and communication technology in the digital era has significantly transformed connectivity infrastructures, with Wi-Fi networks becoming essential for supporting mobility and facilitating high-speed data access across diverse sectors. As a leading state-owned energy enterprise in Indonesia, PT PLN (Persero) relies heavily on stable and reliable Wi-Fi networks to enhance operational efficiency, enable interdepartmental communication, and support access to corporate information systems throughout its organizational units. However, the Wi-Fi network in the PT PLN (Persero) UIP SUMBAGSEL Archive Building exhibited uneven signal distribution, with several areas experiencing weak signal strength and substantial speed degradation. This study was conducted to resolve these issues by mapping coverage areas and installing additional access points using NetSpot and WiFi Analyzer. The study employed the Action Research method, consisting of Diagnosing, Action Planning, Action Taking, Evaluating, and Learning. The results demonstrate that installing supplementary access points effectively improved Wi-Fi coverage across previously underserved areas. Post-installation measurements revealed excellent overall signal distribution, ensuring strong, stable, and consistent connectivity for users within the Archive Building of PT PLN (Persero) UIP SUMBAGSEL.

Keywords

Access Point Mapping; NetSpot; WiFi Analyzer; Wireless Network Optimization; Action Research

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Introduction

The digital era is characterized by rapid and continuous developments in information and communication technology, which have transformed the way individuals and organizations access, manage, and distribute information. This evolution enables broader and more efficient communication channels, supporting various operational activities in both public and private sectors (Khotimah & Hendra, 2023). In contemporary work environments, wireless networks—particularly Wi-Fi—have become essential infrastructure, playing a vital role in ensuring seamless connectivity, mobility, and uninterrupted access to digital resources.

Organizations of different scales—including government institutions, educational facilities, private enterprises, and state-owned companies—rely heavily on Wi-Fi networks to support workflow automation, data exchange, and remote collaboration. As Indonesia's national electricity provider, PT PLN (Persero) requires highly reliable network infrastructure to manage operational activities and strategic decision-making. Within PT PLN (Persero) Unit Induk Pembangunan (UIP) South Sumatra, Bangka, and Belitung (SUMBAGSEL), the availability of secure and stable wireless connectivity is particularly critical due to the agency's responsibility for overseeing the development and monitoring of electrical infrastructure projects across the region.

One of the key facilities under UIP SUMBAGSEL is the Archive Building, a central repository for confidential, historical, and strategic documents that support administrative, technical, and managerial functions. Efficient access to digital information in this building is indispensable for supporting data retrieval, internal communication, project coordination, and document management. Consequently, robust Wi-Fi performance is not merely a convenience but a necessity to ensure operational continuity and organizational productivity.

However, initial assessments in the Archive Building revealed several technical issues that hinder optimal utilization of the wireless network. These issues include poor signal coverage in certain zones, fluctuating connection speeds, and unstable signal strength, all of which negatively impact workflows that depend on timely access to digital documents. The root cause of these problems was attributed to suboptimal placement and an insufficient number of access points, leading to dead zones, overlapping channels, and inefficient bandwidth distribution.

To resolve these challenges, a comprehensive access point mapping process was conducted using specialized diagnostic tools such as NetSpot and WiFi Analyzer. These tools provide detailed heatmaps, signal distribution graphs, channel interference analysis, and performance metrics that help identify problematic areas within the building. By leveraging these technologies, PT PLN (Persero) UIP SUMBAGSEL can optimize access point placement, minimize interference, improve signal propagation, and enhance overall network performance.

This study adopts the Action Research method, which emphasizes iterative diagnosis, planning, implementation, evaluation, and refinement. Through this approach, the research not only identifies the root causes of Wi-Fi performance issues but also develops practical solutions that can be directly implemented in the field. The ultimate objective is to establish a reliable, secure, and high-performance Wi-Fi infrastructure that supports the operational needs

of the Archive Building at PT PLN (Persero) UIP SUMBAGSEL and contributes to improved organizational effectiveness.

Methodology

Research Method

This study adopts the Action Research method, which enables the researcher to describe, interpret, and explain a given condition while simultaneously implementing interventions for improvement (Wiranda & Dasmen, 2021). This method is well-suited for practical problem-solving in organizational settings, allowing researchers to participate actively in diagnosing problems, implementing improvements, and evaluating outcomes. The Action Research framework used in this study consists of five stages:

Diagnosing

This phase involves identifying existing problems within the wireless network in the PT PLN (Persero) UIP SUMBAGSEL Archive Building. Direct observation and interviews with employees revealed that several areas had weak Wi-Fi signals or experienced significant speed drops, suggesting uneven access point coverage.

Action Planning

Based on the identified issues, the researcher collaborated with relevant personnel to design a plan to improve Wi-Fi coverage. This included selecting new access point locations and developing a coverage expansion strategy.

Action Taking

The planned improvements were implemented, including installing additional access points and adjusting network topology. NetSpot was used to analyze signal strength and identify critical coverage gaps.

Evaluating

Following implementation, Wi-Fi coverage was re-measured using NetSpot to assess improvements in signal distribution. Evaluation focused on determining whether the installed access points effectively enhanced network performance.

Learning

The final step involved documenting the outcomes, analyzing lessons learned, and evaluating the overall effectiveness of the intervention.

Results

Diagnosing

Initial assessment revealed that the Archive Building was equipped with only two access points: one in the Executive Audit Sector Room and one in the Auditor SUMBAGSEL Room.

NetSpot analysis confirmed that several adjacent rooms had poor Wi-Fi coverage due to limited access point reach and physical obstructions such as room partitions.

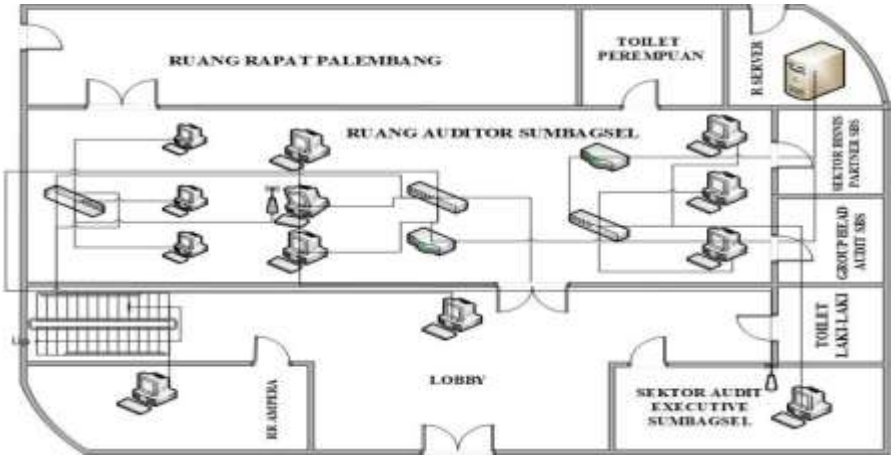

Figure 1. Mapping of Old Access Points in the Archives Building

Initial Wi-Fi Measurement Using NetSpot

NetSpot measurements on the first floor indicated inconsistent signal distribution. Signal strength ranged from –85 dBm (poor) to –51 dBm (moderate). The heatmap revealed several red and yellow zones, representing weak or insufficient coverage areas

Table 1. Initial Wi-Fi Signal Strength Measurements (Floor 1)

Room	Signal Strength (dBm)
Auditor SUMBAGSEL	–65
Group Head Audit SBS	–66
Rapat Palembang	–55
Rapat Ampera	–57
Lobby	–51
Sektor Audit Executive	–45
Sektor Bisnis Partner SBS	–67

These results demonstrate that several areas experienced inadequate coverage and required additional access points.

Action Planning

The improvement plan consisted of two key actions:

1. Determining Additional Access Point Locations

Based on signal measurements, four additional access points were planned for installation in the following rooms:

- Auditor SUMBAGSEL (right side of the room)
- Group Head Audit SBS
- Palembang Meeting Room
- Ampera Meeting Room

2. Re-measuring Wi-Fi Signal Strength
   After installation, measurements were repeated to verify improvements. Measurements were collected consistently by walking through each room and capturing RSSI values using NetSpot.
3. Action Taking
   During the implementation phase, new access points were installed according to the planned design. NetSpot was again used to map signal distribution and document improvements in coverage. The installation of four additional access points expanded Wi-Fi coverage and reduced previous dead zones.
4. Re-Measurement After Access Point Installation
   Post-installation testing revealed significant improvements in signal strength across the first floor. Signal distribution became more uniform, with stronger coverage indicated by dominant green and blue heatmap regions.

Table 2. Wi-Fi Signal Strength After Additional Access Point Installation

Room	Improved Signal Strength (dBm)
Rapat Ampera	–37
Auditor SUMBAGSEL	–41
Rapat Palembang	–41
Sektor Audit Executive	–36
Lobby	–48
Group Head Audit SBS	–41
Sektor Bisnis Partner SBS	–45

Signal improvements ranged from 15 dBm to 30 dBm compared to initial measurements, indicating a robust enhancement.

5. Signal Coverage Validation Using WiFi Analyzer
   To validate the NetSpot results, WiFi Analyzer measurements were conducted for six SSIDs across distances ranging from 2 to 37 meters. The results aligned closely with NetSpot findings, confirming improved stability and signal consistency.

Table 3. Wi-Fi Analyzer Signal Measurements

SSID	Distance Range (m)	Signal Strength (dBm)
SPI SUMBAGSEL	3–27	–41 to –75
SHK_SUMSEL	2–30	–36 to –82
RR_PALEMBANG	3–37	–41 to –85
RR_AMPERA	2–35	–37 to –68
YAN HC SUMSEL	2–25	–41 to –66
VP YAN HC	3–33	–41 to –78

These results validated the improvements in network performance and overall reliability.

Discussion

The comparison between initial and post-installation signal measurements shows substantial improvement in Wi-Fi coverage throughout the Archive Building. The installation of four additional access points successfully addressed weak-signal areas and eliminated dead zones.

For example:

- The Ampera Meeting Room improved from –57 dBm to –37 dBm.
- The Auditor SUMBAGSEL Room improved from –65 dBm to –41 dBm.
- The Sektor Bisnis Partner SBS Room improved from –67 dBm to –45 dBm.

The improvements were consistent across all measured rooms and validated by both NetSpot and WiFi Analyzer, demonstrating that the chosen tools and implementation strategy were appropriate and effective. The enhanced Wi-Fi network supports improved work efficiency, faster data access, and better interdepartmental communication for staff at the PT PLN (Persero) UIP SUMBAGSEL Archive Building.

Conclusion

Three conclusions were derived from this study:

1. Mapping and optimizing access points using NetSpot and WiFi Analyzer significantly improved the accessibility, speed, and service quality of the Wi-Fi network in the PT PLN (Persero) UIP SUMBAGSEL Archive Building.
2. After installing additional access points, previously weak areas experienced substantial improvements in signal strength, with increases ranging from 14 dBm to 30 dBm across multiple rooms.
3. The Action Research approach was effective in systematically diagnosing network problems, implementing practical improvements, and evaluating outcomes through iterative measurements. The final results confirm that the enhanced distribution of access points has improved overall network stability and performance for all users.

Disclosure Statement

The authors declare no conflicts of interest associated with this study.

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Biographical Notes

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