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Internet Network Monitoring Information System Between Government Agencies of Payakumbuh City

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ARTICLE INFO

Article History:

Received: 26 May 2026

Final Revision: 30 May 2026

Accepted: 01 June 2026

Online Publication: 02 June 2026

KEYWORDS

Information System, Network Monitoring, Internet Network, Payakumbuh City Government, E-Government

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ABSTRACT

The Payakumbuh City Government utilizes internet networks as a key infrastructure to support the implementation of electronic-based government services among government agencies. However, the current monitoring and management of inter-agency internet networks are still conducted manually and are not yet integrated, making it difficult to monitor network conditions in real time, document network disturbances, and coordinate troubleshooting among related agencies. These conditions may reduce service quality and hinder the performance of government institutions. To address these issues, an Inter-Agency Internet Network Monitoring Information System for the Payakumbuh City Government was developed to enable centralized network monitoring, disturbance reporting and documentation, and the provision of historical data for evaluation and decision-making purposes. The system development was carried out through the stages of requirements analysis, system design, implementation, and testing. The implementation of this system is expected to improve the effectiveness of network monitoring and disturbance handling, enhance inter-agency coordination, and support the improvement of electronic-based government services in Payakumbuh City.

Contribution to Sustainable Development Goals (SDGs):

SDG 9: Industry, Innovation and Infrastructure

SDG 11: Sustainable Cities and Communities

SDG 16: Peace, Justice and Strong Institutions

1. INTRODUCTION

1.1. Research Background

The rapid development of information and communication technology (ICT) has become a fundamental driver in the digital transformation of government services, particularly in local government administration. The implementation of e-government requires reliable, secure, and well-managed internet network infrastructure to ensure that digital public services can operate effectively. Without adequate infrastructure, various government applications such as administrative systems, financial reporting, and public service platforms cannot function optimally, leading to reduced service quality and efficiency [1][2].

In the Payakumbuh City Government, internet networks serve as a critical infrastructure connecting multiple government agencies to support daily administrative operations and public services. However, the current monitoring of network conditions is still conducted manually and is not yet integrated across agencies. Network disturbances are reported through informal communication channels such as phone calls or messaging applications, which often results in delays in detection, inaccurate reporting, and the absence of structured historical data for further analysis [3].

Network disruptions that are not handled promptly can significantly impact government performance, including delays in administrative processes, slow data access, and temporary disruption of web-based systems. In addition, the lack of centralized monitoring reduces transparency and coordination between agencies, making it difficult for the Department of



Communication and Informatics (Diskominfo) to manage and evaluate network performance effectively [4].

The challenges faced highlight the need for an integrated and real-time network monitoring system that can improve coordination, documentation, and decision-making processes. Web-based information systems provide advantages in accessibility, scalability, and centralized data management. Real-time monitoring and automated reporting features have been proven to improve operational efficiency and network reliability in various studies [5].

Previous research has shown that network monitoring systems using tools such as The Dude, Spiceworks, and API-based monitoring systems are effective in improving fault detection, reporting efficiency, and infrastructure management [6][7][8]. These systems demonstrate that centralized and real-time monitoring significantly enhances the responsiveness of network administration.

Based on these conditions, this study proposes the development of a web-based Inter-Agency Internet Network Monitoring Information System for the Payakumbuh City Government. The system is designed to provide real-time network status monitoring, structured disturbance reporting, historical data storage, and improved coordination between agencies and Diskominfo. This system also supports the implementation of Electronic-Based Government Systems (SPBE) in accordance with Presidential Regulation No. 95 of 2018 [9].

1.2. Literature Review

Network monitoring systems are an important component in managing and maintaining the performance of computer networks, especially in organizations that rely heavily on internet-based services. Monitoring systems allow administrators to observe network conditions, detect failures, and respond quickly to disruptions in order to maintain service availability and stability [1].

Several studies have been conducted regarding web-based network monitoring systems. Research on the implementation of web-based monitoring using MikroTik shows that such systems can help administrators manage bandwidth usage and monitor network status more effectively, particularly in environments where network traffic is high and needs to be controlled [2]. Similarly, other research demonstrates that MikroTik-based monitoring systems combined with tools such as The Dude can provide real-time information regarding device status, enabling faster detection of network failures and improving response time in handling network issues [3].

In addition, the use of The Dude as a network monitoring tool has been widely studied. It has been proven that The Dude can visualize network topology, monitor device availability, and send notifications when network disruptions occur. This improves the efficiency of network management and reduces dependency on manual monitoring methods [4]. Furthermore, the integration of network monitoring systems with web-based dashboards provides better accessibility and allows administrators to monitor network performance remotely in real time [5].

Other studies also highlight the importance of Quality of Service (QoS) parameters such as latency, packet loss, throughput, and jitter in evaluating network performance. Monitoring these parameters helps organizations identify network problems more accurately and improve overall service

quality [6]. The combination of QoS analysis with real-time monitoring tools has been shown to enhance the reliability and stability of network infrastructure [7].

Based on previous studies, it can be concluded that web-based network monitoring systems integrated with tools such as MikroTik and The Dude are effective in improving network management efficiency, accelerating fault detection, and supporting better decision-making processes in network administration. Therefore, this study develops a web-based Inter-Agency Internet Network Monitoring System for the Payakumbuh City Government to provide real-time monitoring, centralized reporting, and historical data analysis to support better network governance [8].

1.3. Research Objective

The objectives of this research are as follows.

1. To analyze the current condition of internet network monitoring at the Payakumbuh City Government, particularly the challenges faced by the Department of Communication and Informatics (Diskominfo) in managing inter-agency network infrastructure
2. To design a web-based Inter-Agency Internet Network Monitoring Information System that enables real-time monitoring of network status across government institutions.
3. To develop a centralized system for reporting, documenting, and managing network disturbances in order to improve data accuracy and historical record availability.
4. To implement a web-based monitoring system that improves coordination between agencies and Diskominfo in handling network issues.
5. To evaluate the effectiveness of the developed system in improving efficiency, transparency, and responsiveness of network management within the Payakumbuh City Government.

2. MATERIALS AND METHODS

This research adopts a structured approach in system development to design and implement a web-based information system for monitoring inter-agency internet networks within the Payakumbuh City Government. The development process is carried out using a combination of literature study, system analysis, and object-oriented modeling techniques supported by UML (Unified Modeling Language). UML is used to describe system behavior and structure through various diagrams, including class diagrams and interaction diagrams, which help in visualizing system components and their relationships. In this study, UML plays an important role in defining system architecture, class structure, and interaction flows between objects such as sending messages (send), returning results (return), and object termination processes (destroy), which are essential in modeling system behavior.

The system is designed based on the principles of database management systems, where data is stored in a structured and integrated manner to avoid redundancy and ensure data consistency. A database is defined as a collection of related data stored systematically so it can be accessed and managed efficiently using database management software. In this research, MySQL is used as the database management system due to its reliability, performance, and support for multi-user operations.

MySQL is a relational database management system (RDBMS) that uses Structured Query Language (SQL) to manage data and supports large-scale data processing with high efficiency.

The application development is implemented using PHP as the main server-side programming language. PHP is a scripting language designed for web development that enables dynamic and interactive web applications. It processes data on the server side and generates web pages that can interact with databases such as MySQL and PostgreSQL. PHP is chosen because it is open-source, flexible, and widely supported across different operating systems and web servers. The use of PHP allows rapid development of web-based applications with efficient server-side processing capabilities.

To accelerate development and improve system structure, the Laravel framework is utilized. Laravel is a PHP-based framework that follows the Model-View-Controller (MVC) architecture, which separates application logic, user interface, and data handling. This structure enhances code maintainability, scalability, and security. Laravel also provides built-in features such as routing, authentication, database migration, and the Eloquent ORM, which simplify database interactions. Despite its advantages, Laravel requires higher system resources and has a steeper learning curve compared to simpler frameworks.

The system is deployed as a web-based application, which allows users to access it through a web browser over a network. A website is a collection of interconnected web pages that contain information in various formats such as text, images, audio, and video, and are accessed through protocols such as HTTP or HTTPS. Web applications consist of several key components, including client-side scripting (HTML, CSS, JavaScript), server-side scripting (PHP), web servers, and web browsers, which work together to deliver dynamic content to users.

In terms of functionality, the developed web-based system serves as an information platform that supports data storage, distribution, and communication between government agencies. The system is designed to provide real-time network monitoring, centralized reporting of network disturbances, and historical data management to support decision-making processes. Additionally, the system improves communication efficiency between the Department of Communication and Informatics (Diskominfo) and other government agencies by providing transparent and structured network information. The system development process is expected to align with the implementation of Electronic-Based Government Systems (SPBE) and support digital transformation in public sector services [9].

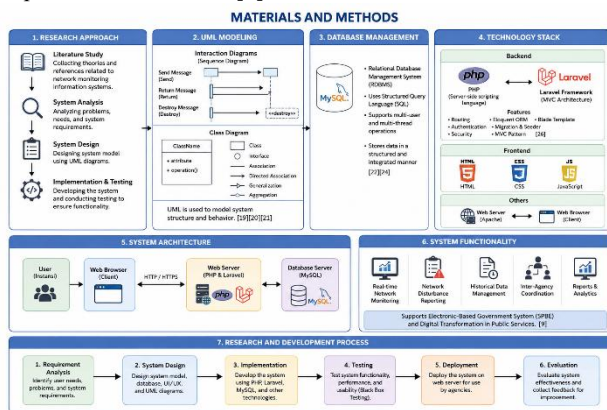


Figure 1. Materials and Methods Flowchart of the Web-Based Inter-Agency Internet Monitoring Information System

3. RESULT AND DISCUSSION

3.1. System Implementation Results

The implementation phase resulted in a web-based Network Monitoring Information System designed to monitor inter-agency internet connectivity within the Government of Payakumbuh City. The system was developed based on previously designed UML models, including use case diagrams, activity diagrams, sequence diagrams, and class diagrams, ensuring that each system function aligns with user requirements and business processes.

The developed system provides a centralized dashboard that displays real-time network status, connectivity conditions, and disruption information across government institutions. In addition, the dashboard is equipped with graphical visualizations that present network quality performance trends, enabling administrators to observe network conditions more effectively and systematically. The system successfully integrates several core components, including:

1. Network device data management (routers, switches, and access points)
2. Internet connection status monitoring for each institution
3. Incident and disruption reporting features
4. Data visualization through charts and summary dashboards

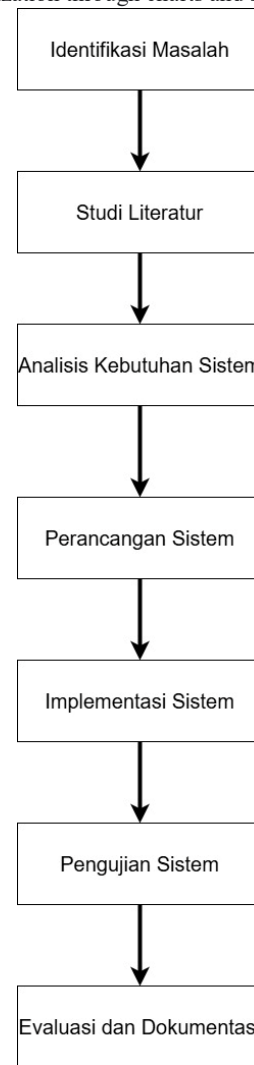


Figure 2. Research Framework

3.2. System Functionality and Performance

Based on implementation testing, the system functions according to the designed requirements. All main features, including data management, monitoring display, and reporting modules, operate correctly within a web-based environment. The system is accessible by administrators from the Department of Communication and Informatics (Diskominfo) as well as relevant operators in each connected government institution.

The system demonstrates good responsiveness in displaying network status updates and provides structured information that improves the efficiency of monitoring activities. Previously, network monitoring was conducted in a more fragmented manner, making it difficult to obtain centralized information. With the implemented system, data is now consolidated into a single platform, reducing manual monitoring efforts and improving response time to network issues.

3.3. Discussion

The results indicate that the development of a web-based network monitoring system significantly improves the management of inter-agency internet infrastructure. The use of a centralized dashboard allows network administrators to quickly identify network disruptions and evaluate connectivity performance across different government offices.

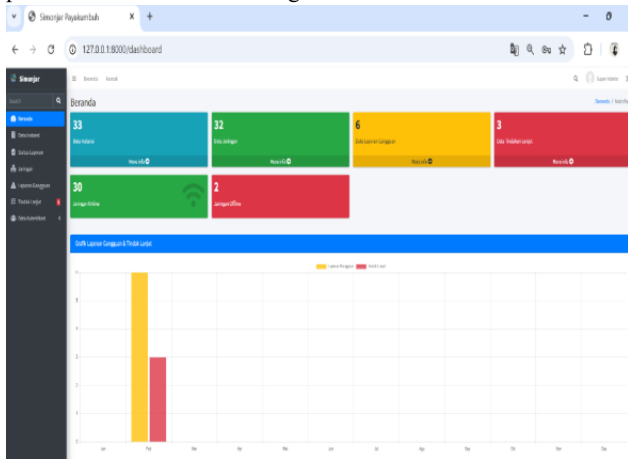


Figure 3. Dashboard Monitoring

Furthermore, the implementation of graphical data visualization enhances the interpretability of network conditions, making it easier for technical staff and decision-makers to analyze system performance trends over time. This aligns with the objective of improving transparency and efficiency in network management.

From an operational perspective, the system also supports better coordination between Diskominfo and other government agencies. By providing standardized and centralized information, communication gaps in handling network issues can be minimized.

4. CONCLUSION

Based on the discussion and analysis presented in the previous chapters, it can be concluded that the development of a web-based internet network monitoring information system significantly improves the efficiency and effectiveness of

network supervision within the Government of Payakumbuh City. The system enables real-time monitoring of network conditions, allowing stakeholders to access accurate and timely information regarding network status. In addition, the system supports the digital documentation of network disturbance reports, ensuring that historical data related to incidents and maintenance activities is systematically stored in a database. This structured data availability enhances the ability to conduct continuous analysis and evaluation of network performance. Furthermore, the transparency provided by the system improves coordination among government agencies in handling network disruptions, both in terms of communication and response time. Overall, the implemented system is capable of presenting comprehensive information, including network status, disruption reports, and maintenance history, thereby contributing to the improvement of internet network service quality across government institutions in Payakumbuh City.

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