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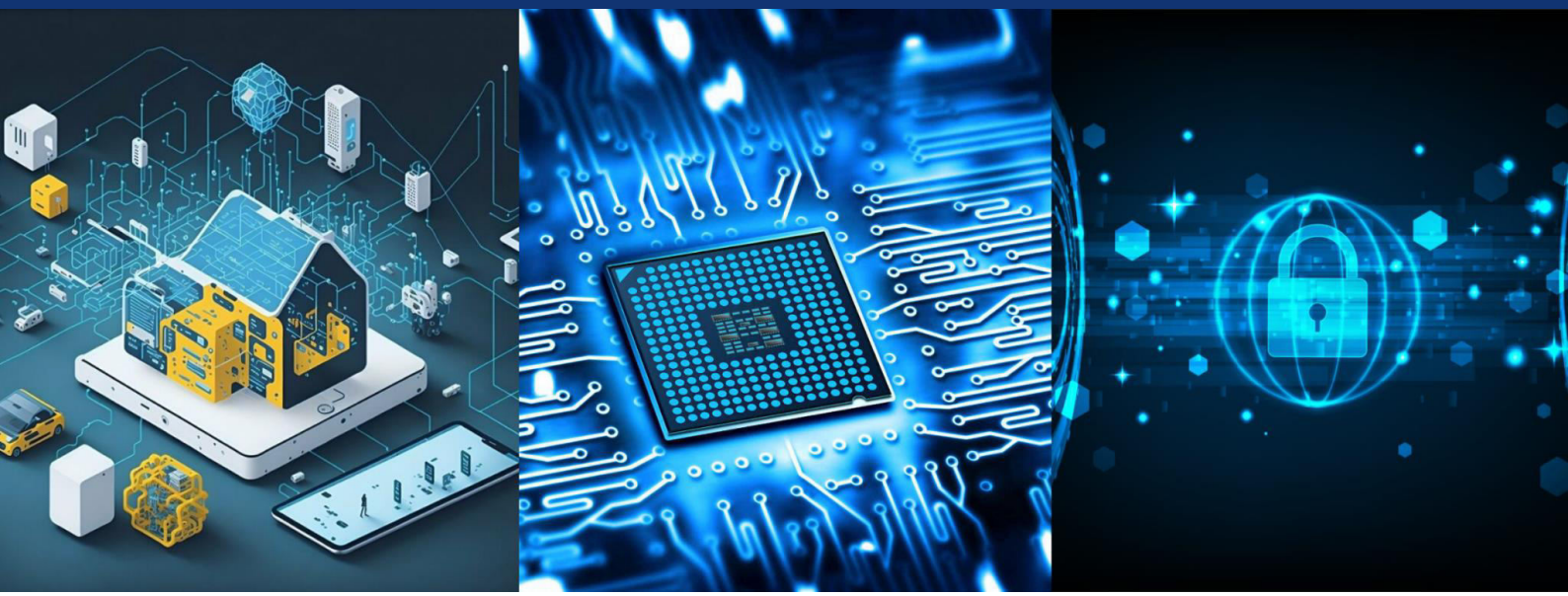

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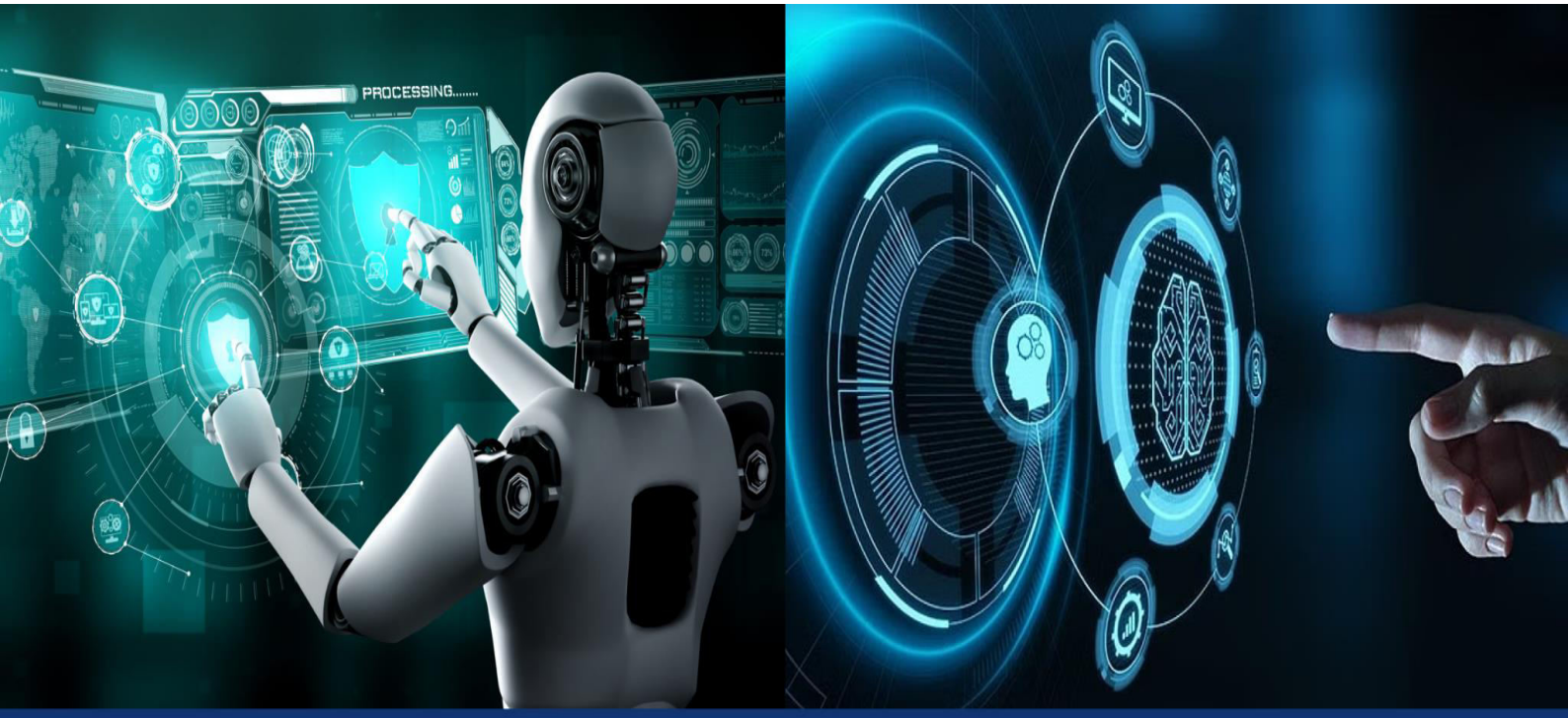

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International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

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ThermoSecure Bluetooth-LAN Data System with Enhanced Speed and Error Reduction

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ABSTRACT: In today's digital age, secure and efficient data communication is essential across various applications. The Implimented Word, ThermoSecure Bluetooth-LAN Data System with Enhanced Speed and Error Reduction, offers a reliable and high-speed data transfer solution by integrating Bluetooth and LAN technologies. Traditional systems often face challenges like high latency, data loss, and weak security during transmission. To overcome these issues, our system ensures seamless data exchange between Bluetooth-enabled devices and LAN networks using a custom-designed hardware and software architecture.A major innovation of this system is its advanced error detection and correction mechanism, which minimizes Error and enhances data reliability. It further boosts transmission speed through efficient protocol handling and adaptive switching based on network conditions.Notably, the system operates without requiring a constant internet connection, making it ideal for industrial and IoT environments. It also supports real-time monitoring and control, enabling effective data management. A built-in temperature-sensing feature ensures device stability by preventing overheating and maintaining performance under varying environmental conditions.This Works provides a robust, secure, and high-performance communication system applicable in industrial automation, healthcare, and smart cities for seamless, error-free data transmission.

KEYWORDS: Bluetooth communication, LAN connectivity, PIC32 microcontroller, Ethernet IC, Data security, Error reduction, High-speed transmission.

I.INTRODUCTION

In today's digital era, secure and high-speed data communication is essential, particularly in industrial and IoT environments where reliability and efficiency are critical. The Implimented System ThermoSecure Bluetooth-LAN Data System with Enhanced Speed and Error Reduction offers a hybrid communication model that integrates Bluetooth and LAN technologies to ensure seamless, uninterrupted data transmission. Traditional systems relying solely on Bluetooth or LAN often suffer from latency, data loss, and security vulnerabilities. By enabling dynamic switching based on real-time network conditions, our system maintains continuous data flow and reduces communication delays.India's rapidly growing digital infrastructure faces persistent challenges in secure data handling, especially in sectors like healthcare, logistics, and automation. Studies indicate that nearly 30% of data loss incidents in these areas stem from network failures and cyber threats. Our system tackles this with advanced error detection and correction algorithms for improved accuracy, providing a reliable, high-performance solution for critical applications.

Key Features of the Proposed System:

1. **Intelligent Network Switching** Automatically switches between Bluetooth and LAN based on real-time network stability and speed requirements, ensuring optimal performance.
2. **Error Detection and Correction** Incorporates advanced techniques to minimize packet loss and maintain data integrity during transmission.
3. **Enhanced Data Security** Utilizes encryption and secure communication protocols to safeguard against cyber threats and unauthorized access.
4. **Real-Time Monitoring and Thermal Management** Continuously monitors system parameters, including temperature, to maintain device stability and prevent overheating

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II.LITERATURE SURVEY

Title	Author	Methodology	Microcontroller Used	Sensors Used
Secure Data Transmission Using Bluetooth and LAN for IoT Applications	R. Sharma, et al.	Uses Bluetooth and LAN for hybrid communication. Implements error detection algorithms to minimize data loss and improve reliability.	ESP32	Bluetooth module, Ethernet module
IoT-Based High-Speed Data Communication System	P. Verma, et al.	Develops an IoT-enabled data transfer system with a microcontroller for real-time monitoring. Reduces latency using optimized data routing.	PIC18F4550	Wi-Fi module, Bluetooth module
Optimized Error Reduction in Wireless Data Transmission	S. Kumar, et al.	Implements advanced error correction codes to minimize packet loss in data transfer between Bluetooth and LAN networks.	STM32	Wireless transceiver, Ethernet module
Enhanced Security in Bluetooth-LAN Integrated Systems	T. Patel, et al.	Focuses on securing data transmission between Bluetooth and LAN using encryption algorithms to prevent unauthorized access.	ATmega328	Bluetooth module, Ethernet controller
Real-Time Industrial Data Monitoring Using Bluetooth and LAN	M. Reddy, et al.	Uses a microcontroller with Bluetooth and LAN for industrial automation, ensuring reliable communication with minimal delay.	PIC32MX550F256L	W5100 Ethernet IC, HC-05 Bluetooth module

III. METHAOLOGY

Fig.1 shows The ThermoSecure Bluetooth-LAN Data System ,developed to provide efficient, high-speed, and low-error data communication. The system architecture integrates modules that handle wireless and wired communication, real-time monitoring, and environmental sensing. It ensures smooth data flow between components while operating independently of continuous internet connectivity, making it suitable for industrial and IoT applications.A major feature

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of the system is its dual-mode communication capability, which enables automatic switching between Bluetooth and LAN based on current network conditions. This adaptive approach ensures stable and fast data transmission by utilizing Bluetooth for short-range communication and LAN for higher-speed, long-distance connections.To maintain data accuracy and minimize packet loss, the system implements optimized error detection and correction techniques. Environmental parameters, such as temperature, are constantly monitored to maintain system stability. If any abnormalities are detected, alerts are generated to prevent overheating or hardware issues.Additionally, a display interface provides real-time updates on network status, temperature readings, and data transmission logs, offering users clear and immediate feedback. To ensure data privacy and protection, the system incorporates encryption methods, securing all transmitted information against unauthorized access.By combining hybrid communication, real-time monitoring, and enhanced security, the system offers a reliable and adaptable solution for modern digital communication need

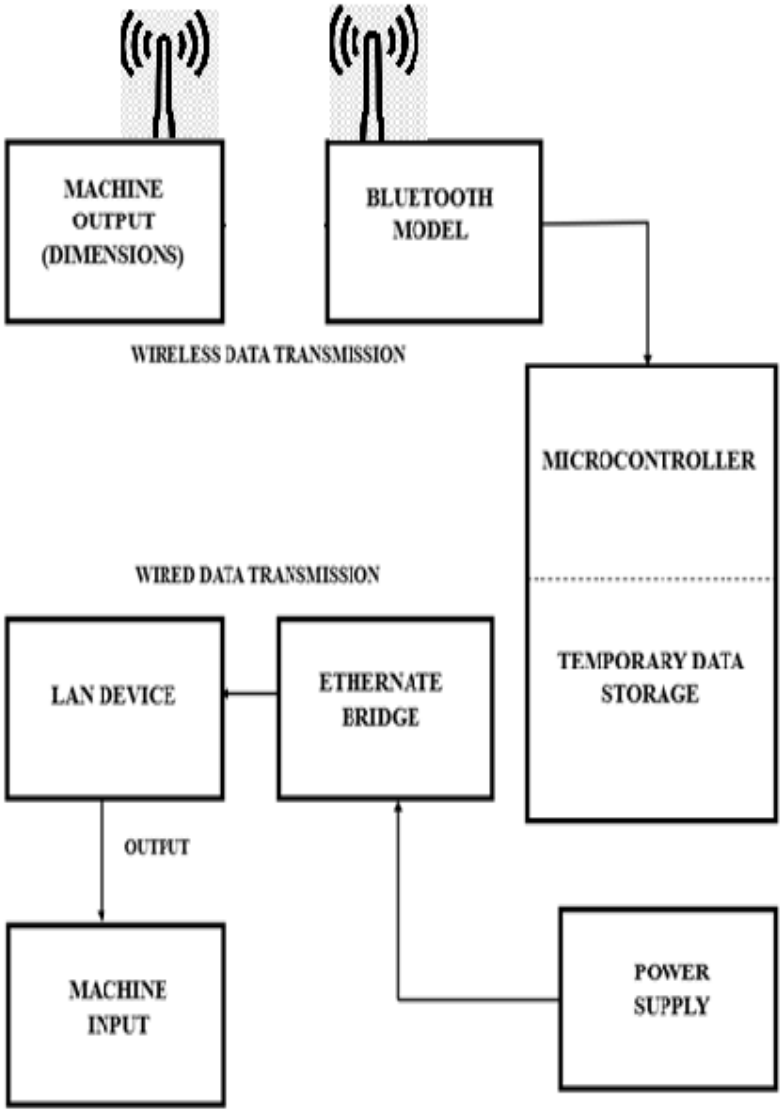

Fig : Block Diagram of ThermoSecure Bluetooth-LAN Data System with Enhanced Speed and Error Reduction

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Flowchart

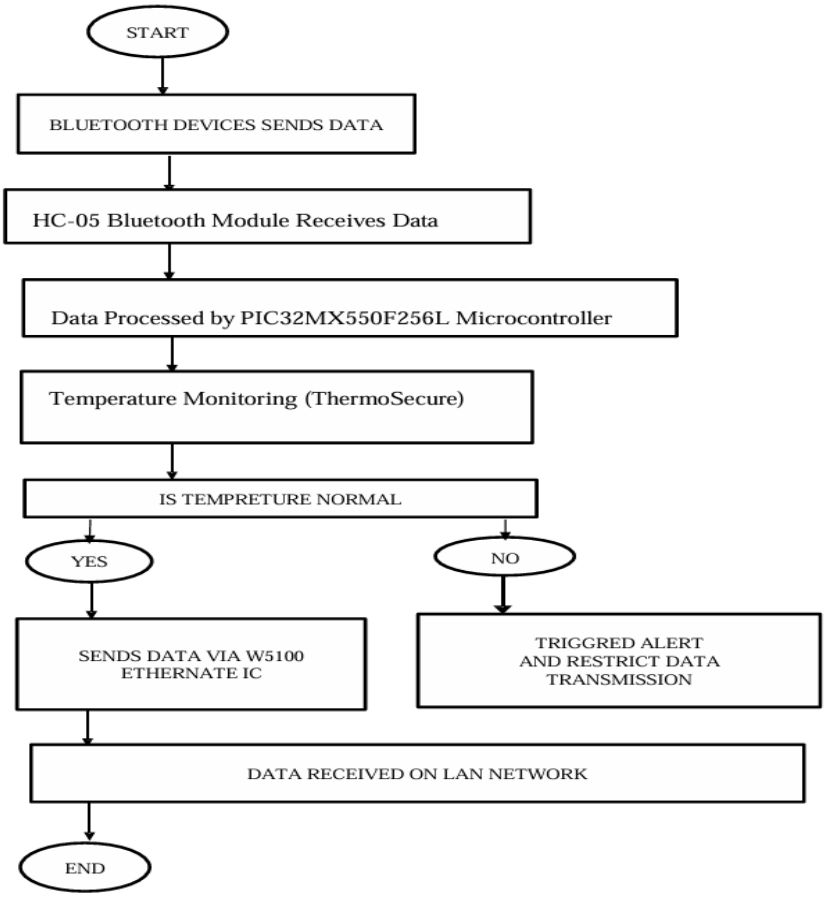
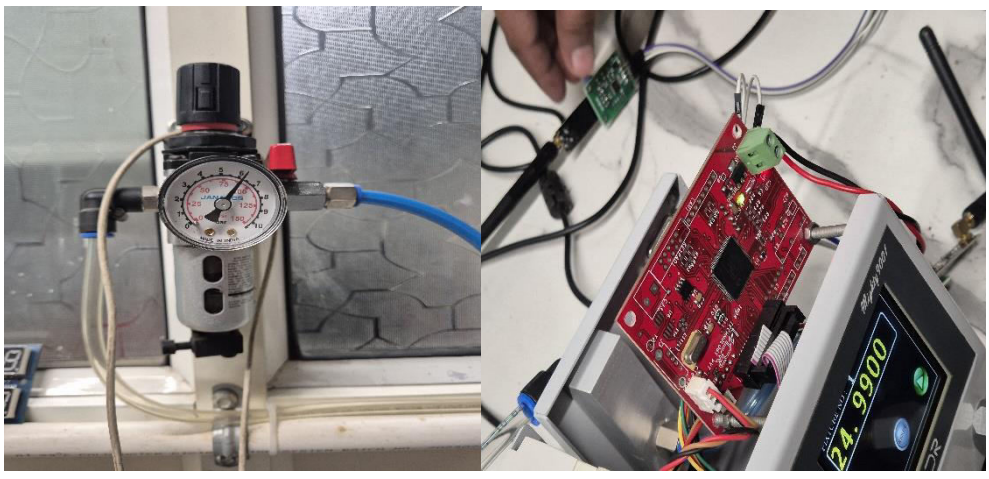


Fig.2 shows Flowchart

IV.RESULTS

4.1 HARDWARE RESULTS



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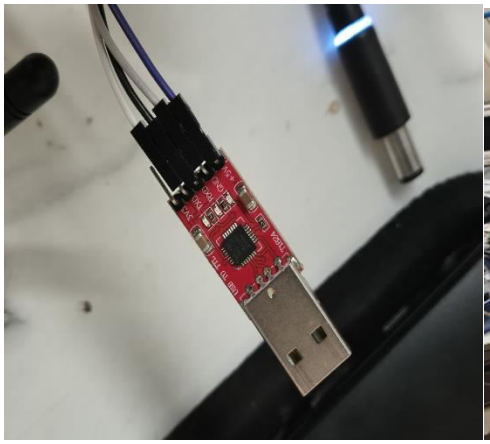
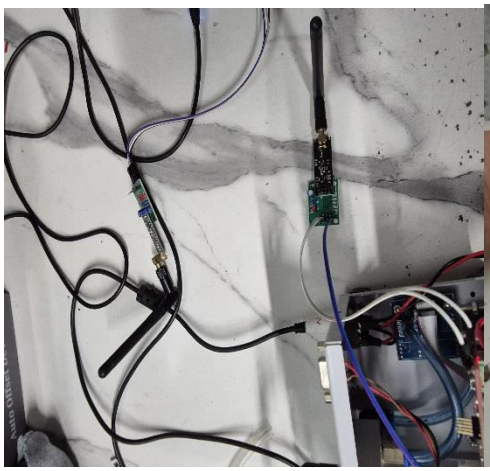
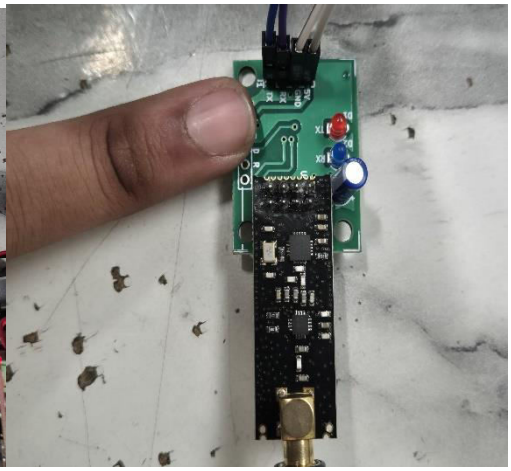
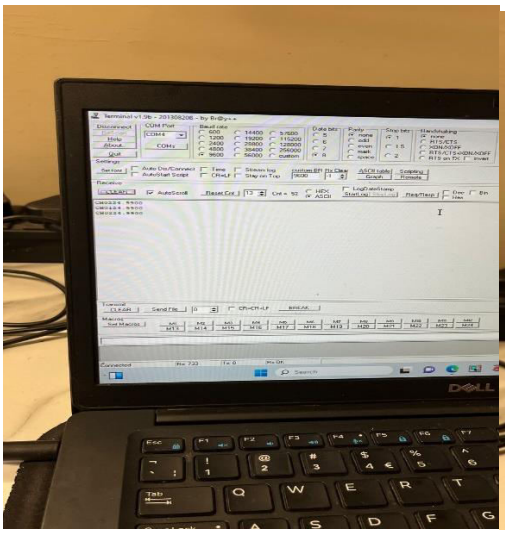
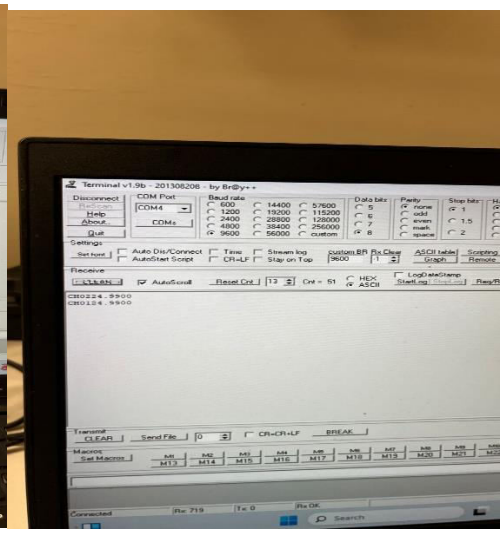


4.2 SOFTWARE RESULTS

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V. CONCLUSION

The ThermoSecure Bluetooth-LAN Data System effectively integrates Bluetooth and LAN technologies to deliver fast, secure, and reliable data transmission. By combining wireless and wired communication within a unified framework, the system ensures efficient data exchange with low latency and Minimum Error.This hybrid approach significantly enhances transmission speed, reliability, and overall system performance. Designed for critical applications, the system is highly suitable for use in industrial automation, healthcare, smart homes, and military communication, where dependable and secure data flow is essential. The implementation of error detection and correction mechanisms further improves data integrity and operational stability, ensuring accurate communication between Bluetooth-enabled devices and LAN-based networks. Overall, ThermoSecure presents a robust and scalable solution for bridging wireless and wired networks, enabling real-time, error-free data transmission across diverse environments. Future developments may include advanced encryption for enhanced security, AI-driven error prediction, and integration with cloud platforms for intelligent data storage and analytics.

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REFERENCES

[1]. K. V. S. S. S. S. Sairam, N. Gunasekaran and S. R. Redd, “Bluetooth in wireless communication,” IEEE Communications Magazine, vol. 40, no. 6, pp. 90–96, June 2002. DOI: 10.1109/MCOM.2002.1007414.
[2]. B. Pang, T. Claeys, K. T’Jonck, H. Hallez and J. Boydens, “Bluetooth Low Energy Reliability and Throughput under Wi-Fi Interference,” Proceedings of the 2022 XXXI International Scientific Conference Electronics (ET), Sozopol, Bulgaria, pp. 1–4, 2022. DOI: 10.1109/ET55967.2022.9920206.
[3]. T. M. Triet Pham and J. Yang, “Exploring Bluetooth Communication Protocols in Internet-of-Things Software Development,” Proceedings of the IEEE International Conference on Software Maintenance and Evolution (ICSME), Adelaide, SA, Australia, pp. 792–793, 2020. DOI: 10.1109/ICSME46990.2020.00093.
[4]. M. M. Ali, S. J. Hashim, M. A. Chaudhary, G. Ferré, F. Z. Rokhani and Z. Ahmad, “A Reviewing Approach to Analyze the Advancements of Error Detection and Correction Codes in Channel Coding With Emphasis on LPWAN and IoT Systems,” IEEE Access, vol. 11, pp. 127077–127097, 2023. DOI: 10.1109/ACCESS.2023.3331417.
[5]. D. Pérez-Díaz-De-Cerio, Á. Hernández-Solana, M. García-Lozano, A. V. Bardají and J. -L. Valenzuela, “Speeding Up Bluetooth Mesh,” IEEE Access, vol. 9, pp. 93267–93284, 2021. DOI: 10.1109/ACCESS.2021.3093102.

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