

Improving the Security of Wireless Sensor Networks

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Abstract

The capacity of Wireless Sensor Networks (WSNs) to autonomously detect and transmit data on temperature, humidity, sound, motion, and other environmental variables has made them indispensable in many industries, including healthcare, manufacturing, and environmental monitoring. Nevertheless, owing to their finite resources, dynamic topologies, and vulnerability to many types of assaults, the extensive use of WSNs has brought about substantial security concerns. The security risks to data confidentiality, integrity, and availability have been intensified by the integration of these networks into the Internet of Things (IoT), which has increased the attack surface. Ensuring dependable functioning, data correctness, and secrecy are the goals of this research, which seeks to investigate and suggest ways to improve WSN security. The paper highlights the need for lightweight, energy-efficient solutions targeted to WSNs through a comprehensive literature analysis that assesses existing security methods and their shortcomings. Intrusion detection systems, safe routing protocols, and advanced encryption methods are some of the possible solutions listed. To proactively identify and address new dangers, it is suggested that machine learning and artificial intelligence be used. Standardized security standards and encouraging collaboration among researchers, developers, and end-users are also highlighted in this study. This research aims to solve the problems of WSNs and ensure the secure deployment and operation of WSNs in critical applications by developing robust and adaptive security solutions that can survive the growing threat landscape.

Keywords

Wireless Sensor Networks (WSNs), WSN Security, Cryptographic Methods, Key Management Schemes, Intrusion Detection Systems, Secure Routing Protocols, Machine Learning, Anomaly Detection