OPEN-SOURCE INNOVATION IN CROSS-DOMAIN IOT: STRATEGIES FOR INTEGRATION, INTEROPERABILITY, AND PLATFORM MANAGEMENT

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ABSTRACT

The Internet of Things (IoT) has driven major technological advancements, transforming how we live, work, and interact with devices. IoT connects various objects through the Internet, changing how we think about and use technology in daily life. This shift has led to new applications and opportunities in fields like smart cities, healthcare, industrial systems, and home automation, allowing for more advanced, responsive, and integrated services. However, a significant challenge remains in fully integrating IoT systems and ensuring they can work together across different sectors and fields, each with unique demands. Achieving seamless connectivity and functionality, known as interoperability, is essential for making IoT truly universal. One promising approach to improving IoT interoperability and integration is through open-source solutions. Open-source IoT platforms provide free access to frameworks, technologies, and tools, enabling developers and stakeholders to build upon established systems and adapt them to their needs. This paper explores the potential of open-source IoT frameworks and technologies, we aim to understand how these solutions can help achieve better connectivity and usability across various application areas. To assess the potential and usability of open-source IoT platforms, we examine them from the perspectives of different stakeholders, including device manufacturers, application developers, and end-users. Our study involves a gap analysis that considers several key factors affecting IoT integration. These factors include managing diverse types of sensors and actuators, handling and sharing data securely, addressing privacy concerns, and examining the overall readiness of the IoT ecosystem for widespread deployment. By identifying the gaps and limitations in current IoT systems, we aim to highlight areas where open-source solutions can offer practical improvements. Additionally, this paper addresses the importance of edge computing as a complement to IoT platforms, especially for applications that require real-time data processing. Edge computing enables data to be processed closer to the source, rather than sending it to a central server. This approach is crucial for time-sensitive applications where delays in data processing could affect performance, such as in healthcare monitoring or industrial automation. By incorporating edge computing into IoT systems, we can enhance the responsiveness and efficiency of these platforms, making them better suited for time- critical tasks. In summary, this paper aims to provide a comprehensive overview of how open-source IoT solutions can address the current challenges of cross-domain integration and interoperability. By examining the strengths and limitations of existing platforms, we hope to offer insights that will guide future development and adoption of open-source IoT frameworks. Through a deeper understanding of these platforms, we can foster a more connected, efficient, and adaptable IoT ecosystem, paving the way for further advancements across a wide range of applications

KEYWORDS: *Internet of Things (IoT), Open Source, IoT Platforms, Heterogeneous IoT, Integration, Interoperability, Management.*