

# A New Insight into Standardisation of Mine IoT

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## ABSTRACT

The widespread integration of the internet into various industrial sectors has led to the extensive adoption of Internet of Things (IoT) devices, thereby facilitating smooth communication, effective data aggregation, and prompt information dissemination. The mining industry has actively embraced this technological shift, integrating IoT devices and leveraging advanced technologies, including the deployment of autonomous robots, sensors, and other IoT-related devices to enhance safety measures during different risky mine explorations and operations. The utilization of advanced sensors has enabled the real-time transmission of data, enabling continuous monitoring of critical operational parameters, streamlining decision-making processes, and fostering a more flexible and responsive approach to mining operations. Nonetheless, the interconnection of devices across different facets within the mining industry gives rise to various complexities, leading to a noticeable lack of consistency. This inconsistency not only poses operational challenges but also underscores the critical necessity for a comprehensive framework that can harmonise the diverse components within the mining ecosystem, ensuring seamless integration and optimized functionality across all interconnected devices. Industry 4.0 is also indicative of this profound digital transformation across various industrial sectors. This era of advanced automation and data exchange in manufacturing technologies is reshaping conventional production and operational processes. This research aims to identify a suitable framework for integration into the mining industry, aligning it with the fundamental principles of Industry 4.0, known as RAMI 4.0, which stands for Reference Architecture Model Industry 4.0. It intends to establish a robust and adaptable structure that not only addresses the mining sector's specific requirements but also embodies the core tenets of Industry 4.0, emphasizing the seamless integration of digital and physical systems, data transparency, interoperability, and decentralized decision-making. By contextualising the concept of Industry 4.0 within the mining sector, this study strives to establish a comprehensive and customized framework that not only caters to the unique operational demands of the industry but also harnesses the transformative potential of advanced digital technologies. The current absence of standardization within this sector underscores a significant gap, with limited initiatives specifically tailored to address this pressing concern. The envisaged standardisation process aims to take a comprehensive approach, considering pivotal factors such as interoperability, scalability, security, safety, and repeatability, with a primary emphasis on promoting seamless interaction between various interconnected devices. It is crucial to emphasise that the introduction of a well-defined reference architecture holds the potential to effectively address these challenges, facilitating streamlined management and improved operational efficiencies within the mining sector's evolving IoT ecosystem.