World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:18, No:10, 2024

SynKit: A Event-Driven and Scalable Microservices-Based Kitting System

Authors : Bruno Nascimento, Cristina Wanzeller, Jorge Silva, João A. Dias, André Barbosa, José Ribeiro

Abstract : The increasing complexity of logistics operations stems from evolving business needs, such as the shift from mass production to mass customization, which demands greater efficiency and flexibility. In response, Industry 4.0 and 5.0 technologies provide improved solutions to enhance operational agility and better meet market demands. The management of kitting zones, combined with the use of Autonomous Mobile Robots, faces challenges related to coordination, resource optimization, and rapid response to customer demand fluctuations. Additionally, implementing lean manufacturing practices in this context must be carefully orchestrated by intelligent systems and human operators to maximize efficiency without sacrificing the agility required in an advanced production environment. This paper proposes and implements a microservices-based architecture integrating principles from Industry 4.0 and 5.0 with lean manufacturing practices. The architecture enhances communication and coordination between autonomous vehicles and kitting management systems, allowing more efficient resource utilization and increased scalability. The proposed architecture focuses on the modularity and flexibility of operations, enabling seamless flexibility to change demands and the efficient allocation of resources in realtime. Conducting this approach is expected to significantly improve logistics operations' efficiency and scalability by reducing waste and optimizing resource use while improving responsiveness to demand changes. The implementation of this architecture provides a robust foundation for the continuous evolution of kitting management and process optimization. It is designed to adapt to dynamic environments marked by rapid shifts in production demands and real-time decision-making. It also ensures seamless integration with automated systems, aligning with Industry 4.0 and 5.0 needs while reinforcing Lean Manufacturing principles.

Keywords : microservices, event-driven, kitting, AMR, lean manufacturing, industry 4.0, industry 5.0
Conference Title : ICCIT 2024 : International Conference on Computing and Information Technology
Conference Location : Lisbon, Portugal
Conference Dates : October 28-29, 2024