

5G Networks and the Smart Warehouse System

Shaping the future of global military logistics awareness

by Mr. Keith Williams

The future of military logistics is undergoing a transformative shift, driven by advancements in technology that promise to revolutionize how the Marine Corps manages supply chains, assets, and operational efficiency. At the forefront of this transformation is the Marine Corps Logistics Command, Marine Force Storage Command's Smart Warehouse prototype, developed in collaboration with the Office of the Under Secretary of Defense Research and Engineering. This initiative leverages a private, secure 5G network to create a dynamic logistics environment designed to modernize the Marine Corps' operational support systems.

The full potential of the Smart Warehouse lies in the ability to create global logistics awareness. Enabled by 5G, the Marine Corps will have the capability to maintain realtime, end-to-end visibility of its supply chain, providing unprecedented asset tracking and operational awareness. This global logistics awareness is essential in meeting the increasingly complex challenges of modern warfare, ensuring that materials and assets are delivered accurately and quickly to warfighters—no matter where they are in the world.

This article explores how 5G networks, combined with the Smart Warehouse solution, can revolutionize military logistics by enabling realtime global awareness. We will examine the technologies and processes integrated into the Smart Warehouse prototype, and how these capabilities, if implemented, will enhance the Marine Corps' ability to respond swiftly and efficiently to logistical needs worldwide.

>Mr. Williams is an IT Specialist with Marine Force Storage Command, MARCOR-LOGCOM in Albany, GA. He is a GS-12, and his team has worked on the 5G Smart Warehouse project since the fall of 2021 in collaboration with the Office of the Under Secretary of Defense and Naval Information Warfare Center Atlantic.

The Impact of 5G on Global Logistics Awareness

At the core of the Marine Corps Smart Warehouse is the 5G network, a powerful technology that provides more than just increased speed. While faster data transmission is a key feature of 5G, its real value lies in its ability to handle high-density data streams, support massive device connectivity, and operate with low latency. These attributes are critical in transforming how logistics operations are conducted and monitored on a global scale.

5G networks allow the Smart Warehouse to become an essential node in a globally connected logistics network, where every asset and every shipment can be tracked and managed in realtime. From large logistics hubs in the United States to forward-deployed units around the globe, 5G enables instantaneous communication between devices, systems, and personnel. This provides the Marine Corps with unparalleled visibility into its supply chain, ensuring that warfighters get the supplies they need precisely when they need them.

In addition to asset visibility, 5G will enable the seamless flow of critical information throughout the logistics chain. This flow of data ensures that decision makers have the most up-to-date information on inventory, shipping status, and operational requirements. By providing realtime insights, 5G eliminates the delays and uncertainties

that often plague traditional logistics systems, creating a globally aware and highly responsive logistics network.

Key Technologies Driving Global Awareness in the Smart Warehouse

The Smart Warehouse's success is built on the integration of advanced technologies, all of which are enhanced by the power of 5G. Together, these systems create a seamless logistics ecosystem that offers comprehensive global visibility and operational awareness. The core technologies include:

Microsoft Dynamics 365 (D365)

Serving as the warehouse management system, Microsoft D365 can integrate seamlessly with key Marine Corps systems, such as the Defense Property Accountability System and Global Combat Support System—Marine Corps. This integration allows for a unified view of all logistics data, providing realtime updates on asset locations, inventory levels, and supply-chain movement. Marines no longer need to consult multiple systems to get a full picture of their logistics status; with D365, all relevant information is consolidated into one easy-to-use platform.

Autonomous Vehicles and Smart Conveyance Systems

The Smart Warehouse uses 5G-enabled autonomous vehicles, including laser-guided vehicles and very narrow

aisle forklifts, to automate material movement. These vehicles coordinate with a smart conveyance system to transport pallets and materials efficiently. Laser-guided vehicles transport pallets to designated storage areas, while very narrow aisle forklifts retrieve stored pallets for shipment or further processing. The use of 5G ensures that these systems operate with low latency, allowing for precise, realtime coordination between autonomous systems and warehouse personnel.

RFID-Enabled Realtime Asset Tracking

One of the most significant advancements within the Smart Warehouse is its use of radio frequency identification (RFID) technology for realtime asset tracking. Every asset entering the warehouse is tagged with a license plate number that includes an embedded RFID chip. These RFID tags allow for continuous, realtime tracking of the asset as it moves throughout the warehouse. The 5G network ensures that all data from RFID tags is transmitted instantly, providing immediate updates on the location and status of each item. This level of visibility is essential in creating global logistics awareness, ensuring that the Marine Corps has full knowledge of where its assets are.

High-Density Robotic Storage Systems (HDRSS)

Another key feature of the Smart Warehouse is the HDRSS, which offers a compact, high-efficiency storage solution. The HDRSS uses robotic systems to store and retrieve materials, dramatically increasing the storage capacity within the warehouse while minimizing the physical footprint. The 5G network enables these robotic systems to operate in realtime, reducing lead times and ensuring that items are retrieved and processed as quickly as possible. By maximizing storage efficiency and speeding up retrieval times, the HDRSS contributes to the Marine Corps' overall logistics readiness and agility.

Reducing Lead Times and Enhancing Response Capabilities

One of the greatest advantages of

the 5G-enabled Smart Warehouse is its ability to reduce lead times for logistics operations. By providing instantaneous updates on asset locations, inventory levels, and operational requirements, 5G allows logistics personnel to make decisions faster and with greater accuracy. This realtime awareness eliminates many of the bottlenecks that can slow down traditional logistics processes.

In a global logistics environment, reducing lead times can make a significant difference in the success of military operations. Whether it is fulfilling an urgent request for individual combat equipment or ensuring that critical equipment reaches a forward-deployed unit, the ability to respond quickly and accurately is crucial. The 5G-powered Smart Warehouse allows the Marine Corps to locate, process, and ship materials in a fraction of the time it would take using older systems.

Enhancing Decision-Making with Predictive Analytics and Artificial Intelligence

In addition to enabling realtime asset tracking and rapid response times, the 5G-enabled Smart Warehouse also leverages advanced technologies like predictive analytics and artificial intelligence (AI) to enhance decision making across the logistics chain. These tools help warehouse managers and commanders anticipate future supply needs and optimize inventory levels to prevent shortages.

By analyzing patterns in supply usage, delivery timelines, and battlefield requirements, predictive analytics can provide insights into future logistics demands. For instance, if historical data shows that certain materials are frequently requested in particular regions or during specific operations, predictive models can ensure that those items are pre-positioned in warehouses closer to the areas where they are most likely to be needed. This proactive approach reduces the need for emergency resupplies and minimizes the risk of operational delays.

Artificial intelligence-powered decision-making tools can also optimize warehouse operations in realtime. Using data from RFID tags, autonomous vehicles, and other connected systems,

AI algorithms can dynamically adjust workflows to improve efficiency. This level of automation and intelligence, made possible by 5G, enhances the Marine Corps' ability to respond to logistical challenges with speed and precision.

A Global, Scalable, and Deployable Logistics Network

The Marine Corps' Smart Warehouse system is designed to be scalable, adaptable, and deployable across a variety of environments and operational theaters. This flexibility allows the Marine Corps to extend the benefits of 5G-enabled logistics to any location, from large logistics hubs to small forward operating bases. With the 5G network as its backbone, the Smart Warehouse can function seamlessly across multiple sites, ensuring that global logistics awareness is maintained, no matter the location.

By adopting a hub-spoke-node distribution model, the Marine Corps can connect multiple Smart Warehouses within its logistics network, each acting as a hub for regional supply operations. This ensures that no matter where warfighters are located, they are never far from the materials and equipment they need to carry out their missions.

Conclusion: The Future of Global Military Logistics

The Marine Corps' Smart Warehouse prototype, powered by 5G networks, represents a fundamental shift in how military logistics will operate in the future. By having the capability to create realtime, end-to-end asset visibility, and reducing lead times, the Smart Warehouse enables global logistics awareness that is essential for modern military operations.

With 5G as the backbone, this logistics system offers enhanced decision-making capabilities, global scalability, and the ability to rapidly respond to changing operational needs. As the Marine Corps continues to expand its use of 5G and integrated technologies, the Smart Warehouse will serve as the foundation for a globally connected, agile logistics network that will ensure mission success in any environment.

