

Enabling Resilient Automated Operations at APM Terminals Maasvlakte II



APM Terminals Maasvlakte II, one of the world’s most advanced automated container terminals, is expanding its automated operations to increase efficiency, safety, and scalability. To support this evolution, a highly resilient wireless communications layer is required to connect Automated Terminal Tractors (ATTs) operating across a complex and constantly changing container yard. Rajant’s Kinetic Mesh® technology, delivered in partnership with Navigation Solutions Europe, has been selected to provide a decentralized, high-performance network capable of maintaining continuous connectivity in a challenging RF environment. The deployment forms a critical part of APM Terminals’ long-term automation strategy.

The Challenge

Delivering reliable wireless connectivity in a container terminal presents significant technical challenges. The environment is highly dynamic, with constantly moving containers creating RF shadowing, reflection, and multi-path interference. Traditional infrastructure-based wireless solutions struggle to maintain consistent performance under these conditions, particularly when supporting mobile autonomous systems.

At Maasvlakte II, the requirement is to provide low-latency, high-availability connectivity for a fleet of Automated Terminal Tractors (ATTs), ensuring seamless roaming and uninterrupted operation across both the terminal’s existing operational areas and newly developed expansion zones. The solution must also integrate with existing IT and operational systems while meeting strict safety, security, and scalability requirements. Additionally, vehicle-mounted hardware introduces challenges around power stability, mounting, and environmental durability.

The Solution

To address the challenges of delivering resilient connectivity in a highly dynamic port environment, Rajant’s Kinetic Mesh® technology has been deployed as the wireless backbone for APM Terminals’ automated operations at Maasvlakte II.

Unlike traditional wireless networks that rely on fixed infrastructure and centralized control, Kinetic Mesh enables each node to act as both a client and

Customer Description

APM Terminals Maasvlakte II is a fully automated deep-sea container terminal located in the Port of Rotterdam. It is designed to handle some of the world’s largest container vessels and operates using advanced automation technologies to optimise throughput, safety, and operational efficiency

Partners

- **Navigation Solutions Europe** – Rajant partner responsible for solution design, deployment support, and ongoing technical consultancy
- **Embotech** – Provider of autonomous driving software for Automated Terminal Tractors
- **Terberg** – Manufacturer and integrator of the ATT vehicle platform
- **Batenburg Vision ISP** – Installation and infrastructure delivery partner
- **Rajant Corporation** - Pioneers of peer-to-peer radio communications enabling real-time voice, video, and data to connect machines, robots, and people together as part of a secure private mobile network.

Solution Components

- Rajant Hawk BreadCrumbs® (vehicle-mounted and static infrastructure)
- Dual 5 GHz MIMO radios
- Pole-mounted infrastructure nodes across terminal
- Mobile nodes installed on ATTs
- BC Commander network management platform

an access point, dynamically routing data across the network in real time. This decentralized architecture allows the network to adapt instantly to changes in the RF environment, ensuring continuous connectivity even as containers move and conditions evolve.

The solution consists of a combination of static infrastructure nodes mounted on light poles across the terminal and mobile nodes installed on Automated Terminal Tractors. This creates a fully meshed network where vehicles are not solely dependent on fixed infrastructure, but can also communicate with one another, improving redundancy and overall network resilience.

Navigation Solutions Europe has worked closely with APM Terminals and project partners to design a deployment strategy that supports a phased roll-out across both the existing terminal infrastructure and newly developed expansion areas. This includes careful planning of node placement, channel allocation, and RF coverage to ensure optimal performance as the number of ATTs increases over time and as the terminal footprint continues to grow.

The communication layer is designed to interface with Embotech's autonomous driving systems and Terberg's vehicle platforms, supporting stable connectivity for the ATT's as required for safe and efficient operations. The network is also designed to integrate seamlessly with APM Terminals' existing IT and OT infrastructure, meeting strict security and operational requirements.

“Delivering reliable wireless connectivity in an environment as dynamic as a container terminal requires a fundamentally different approach. With Rajant's Kinetic Mesh, we are able to provide a resilient, self-healing network that supports APM Terminals' automated operations both today and as they scale in the future.”

— Bert van Roon

Navigation Solutions Europe

“At APM Terminals Maasvlakte II, resilient and secure connectivity is essential for scaling automated operations safely and efficiently. Rajant's mesh technology supports our broader automation architecture by providing a flexible communications layer that adapts to the dynamic conditions of a container terminal.”

— Marieke Frensch
Chief Technology Officer
APM Terminals Maasvlakte II

The result is a scalable, high-performance wireless network that supports real-time decision-making, enhances operational reliability, and provides the foundation for future expansion of automated capabilities across the terminal.

