GSMA
Foundry

JUNE 2024
CASE STUDY

The Role of 5G Networks & UAVs **In Ports Efficiency and Safety Screening?**

Introduction

This case study explores the potential to transform smart port operations with the use of 5G-augmented autonomous drone technology supported by the GSMA's Open Gateway APIs. It addresses how ports can leverage private 5G networks and autonomous UAVs (uncrewed aerial vehicles) to enhance their operational capabilities, enabling real-time monitoring and improved decision-making in the increasingly complex port environment. Drawing on Unmanned Life's deployments in European ports, including the Port of Tyne, the Port of Bristol, the Port of Antwerp and the Port of Barcelona, this paper evaluates the impact of these technologies on efficiency, safety and the economics of port operations.

Unmanned Life's software platform deploys, controls and orchestrates different types of drones and robots to work as autonomous, unified fleets. By leveraging 5G and network APIs, edge compute and artificial intelligence, the platform provides an intuitive interface to the user, who can then launch autonomous drones to perform a variety of tasks.

U-Security - an application extended by the Unmanned Life platform - is designed to connect and deploy autonomous drone fleets for security surveillance and inspection of facilities. With cutting-edge features, such as 5G connectivity, autonomous charging, thermal imaging, AI decision-making and more, U-Security can deliver real-time, remote surveillance capabilities to ports and other industrial facilities.

COPYRIGHT ©2024 GSMA

The Role of 5G Networks and UAVs in Improving Efficiency and Safety

Modernising ports depends on adopting cutting-edge technologies, such as IoT devices, sensors, robotics and automated heavy machinery. Each of these technologies increasingly relies on mobile connectivity, and 5G provides the backbone for these devices to function.

In the dynamic landscape of modern ports, where efficiency is paramount, private 5G networks offer the high bandwidth and low latency necessary to sustain critical operations. They ensure seamless connectivity and data exchange, supporting various processes from asset management to security and infrastructure inspection. Additionally, in an environment where real-time data is crucial, private 5G networks excel at reducing handover times and ensuring uninterrupted data flow, enhancing overall operational efficiency.

Traditional manual operational methods often falter in coordinating key activities, such as asset inspection, traffic management and security, leading to inefficiencies and hazards stemming from operational complexity, safety risks, limited visibility and high costs. The scarcity of real-time data exacerbates delays, while labour-intensive processes inflate costs and impede resource allocation.

5G-enabled, autonomous uncrewed aerial vehicles (UAVs), offer a solution to the aforementioned challenges affecting port management. Equipped with advanced sensors and cameras, UAVs can transform surveillance, infrastructure inspection and security patrols, surpassing manual methods in speed and accuracy. Navigating hazardous or hard-to-reach areas, they mitigate risks to human workers and identify safety hazards in real-time.

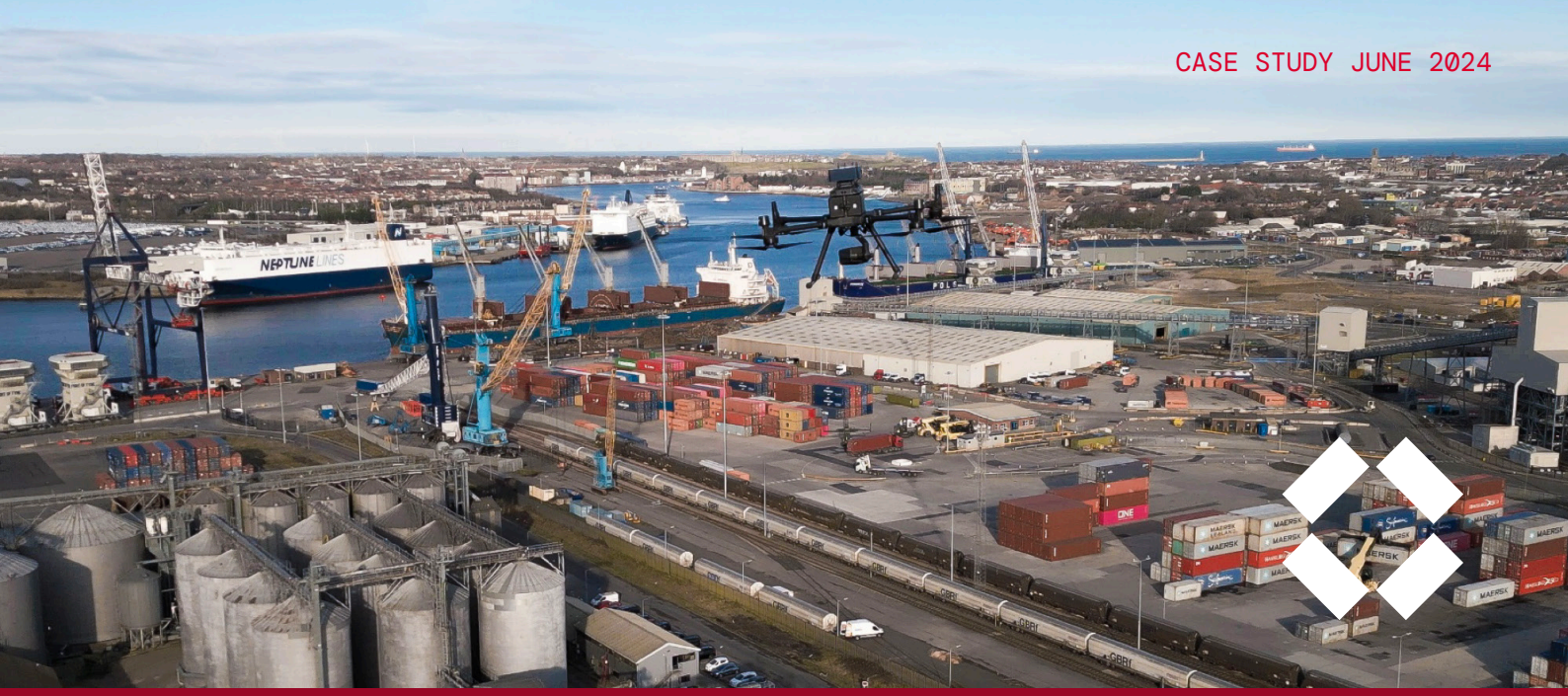
The only issue? High-quality video transmissions from a fleet of drones takes bandwidth, and autonomous command and control systems need low-latency connectivity for safety and flexibility. Here, private 5G networks emerge as pivotal enablers of UAV technology in ports, providing these critical capabilities. Their reliable, dedicated coverage ensures continuous UAV communication across large and bustling port environments.

Enhanced security features safeguard sensitive operational data, crucial for maintaining security and data integrity. The GSMA's Open Gateway APIs add two further key features. Firstly, the APIs can provide device location through networks, which is vital for the platform to maintain safety measures, as a redundancy for GPS. The second is quality on demand, where network quality can be improved at the press of a button if critical missions are being flown. This could be useful when sending out large fleets of drones as an example.

Leveraging real-time data from UAVs, facilitated by private 5G networks, port managers can optimise resource allocation, improve traffic management and enhance overall operational efficiency.

> Our U-Security system, powered by private 5G and AI, sets a new standard for efficiency and safety. With autonomous drones, we enhance operations and ensure real-time monitoring and swift responses in high-risk areas. Ports are vital to economic growth, and we are proud to support their security and efficiency.

Jorge Muñoz - Chief Commercial Officer of Unmanned Life



Unmanned Life's U-Security Trial at the Port of Tyne

Collaborating with the Connected Places Catapult, BT and Ericsson, Unmanned Life tested the capabilities of U-Security in a real-world port environment. This trial, part of the Connected Places Catapult's Maritime Accelerator programme, aimed to showcase the efficiency gains achievable by integrating autonomous drone technology into port security operations. The objective was to address security challenges, such as blind spots, limited range and manual errors associated with traditional surveillance tools.

The trial featured drones managed by the Unmanned Life platform and specifically designed for industrial environments. They were equipped with advanced capabilities including onboard 5G connectivity, thermal imaging, AI decision-making and a fleet orchestration option. Leveraging BT and Ericsson's private 5G network infrastructure, the drones enabled real-time, remote monitoring capabilities for security patrols and inspection tasks across the port.

Key Outcomes

Rapid response times: With response times of less than 60 seconds to incidents anywhere at the port, the autonomous drones demonstrated their agility and effectiveness in addressing security threats promptly.

Worker safety: Real-time monitoring capabilities ensured timely intervention in emergencies or hazardous situations, enhancing overall worker safety within the port environment.

Enhanced security coverage: By automating patrols and inspections, the drones enabled robust coverage and rapid incident response, minimising security risks and vulnerabilities.

Risk mitigation: Deploying drones for high-risk tasks reduced direct exposure to potential dangers for security personnel, enhancing safety protocols within the port.

Efficiency gains: The trial showcased the swift setup and deployment of an effective autonomous drone system within hours - a fraction of the time it would take to deploy fixed infrastructure, leading to cost savings and operational efficiencies.

The successful integration of autonomous drones supported by private 5G networks promises a new era of efficiency, safety and adaptability in industrial settings, such as the Port of Tyne. The collaboration between Unmanned Life, BT, and Ericsson, supported by the Connected Places Catapult's Maritime Accelerator Programme, underscores the potential for reshaping port operations and driving innovation across various industries and emergency response scenarios.

Driving Efficiency in the Port of Bristol Over Private 5G

Unmanned Life joined a consortium led by the West of England Combined Authority to test and enhance smart port operations in the UK. The project aimed to demonstrate how 5G private network capabilities could boost efficiency and productivity in the logistics sector, while showcasing precise tracking of containers and items in a freeport-freezone setting.

As part of this initiative, Unmanned Life showcased its autonomous UAV-based surveillance application at the Port of Bristol. Three mission types were demonstrated: pre-defined autonomous UAV surveillance missions, on-demand surveillance missions and triggered autonomous incident response integrated with port sensor systems.

Additionally, Unmanned Life conducted a deployment test at the Port of Bristol, focusing on two key areas:

- → Deploying 5G-enabled autonomous UAVs for enhanced security and inspection.
- → Demonstrating geo-fenced monitoring and tracking capabilities.

In the triggered incident use case, autonomous UAVs equipped with 5G connectivity significantly reduced response times, reaching the affected areas within eight minutes compared to 19 minutes for manual assessment. Working with the University of Bristol, Unmanned Life also showcased real-time surveillance using geo-fencing technology, completing inspections in just nine minutes compared to over 17 minutes for manual methods.

Advancing Port Security with 5G-Connected Drones: Drone Security at the Port of Antwerp

Liberty Global, Unmanned Life and Amazon Web Services (AWS) collaborated on a pioneering trial at the Port of Antwerp, demonstrating the potential of 5G-connected drones for enhanced surveillance and security. Harnessing 5G connectivity, edge computing and AI, the trial showcased a cutting-edge solution aimed at improving efficiency, flexibility and cost-effectiveness in port security operations.

The trial demonstrated the following capabilities:

- → Live high-quality video streaming enabled real-time monitoring via the Unmanned Life web interface.
- → AI-enabled person recognition automatically detected unauthorised entries, triggering immediate alerts.
- → Compact cellular modems mounted on drones facilitated real-time communication over long distances.
- → The 5G connectivity, unaffected by obstacles, provided greater bandwidth for data transmission.
- → AWS' Snowball Edge service handled data analysis, optimising drone battery life and ensuring real-time analytics presentation.

The standalone 5G network provided by Telenet (part of Liberty Global) ensured uninterrupted connectivity throughout the test flight, showcasing the potential of standalone 5G, cloud, edge computing and AI-driven applications to enhance industrial shipping practices worldwide.

The successful trial highlighted that drone security can deliver significant benefits:

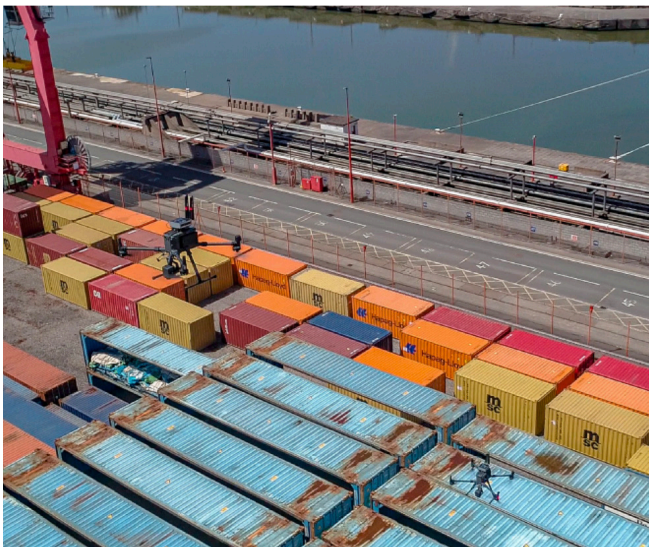
- → Reduced response times, with drones reaching triggered areas within minutes compared to manual assessment.
- → Enhanced security coverage and rapid incident response, minimising security risks and vulnerabilities.
- → Substantial efficiency gains, with swift setup and deployment of effective autonomous drone systems.
- → Low latency of 20-50ms at the application level between the edge and drone, enabling real-time command and control.

The Strategic Advantages and Future Potential of Private 5G, APIs and Autonomous UAVs in Port Operations

The integration of private 5G networks, the GSMA's Open Gateway APIs and autonomous UAV technology presents a range of benefits for smart port operations. This case study explores how these technologies can revolutionise traditional port management methods, offering enhanced efficiency, safety and economic advantages.

Private 5G networks emerge as pivotal enablers of innovation in port operations. With their fast data transmission speeds, low latency and reliable coverage, private 5G networks facilitate seamless connectivity and data exchange, which are crucial for sustaining critical operations in dynamic port environments. Moreover, their dedicated coverage ensures continuous communication, enhancing the availability of the technologies.

The Open Gateway APIs also play a vital role in empowering autonomous UAVs with enhanced capabilities. By leveraging a quality-on-demand API, UAVs can access the high-quality, real-time data necessary for efficient surveillance, infrastructure inspection and security patrols, whilst the device location and identifier APIs support safe operations. These integrations ensure optimal performance and reliability, enabling port operators to streamline operations and mitigate risks effectively.



About the GSMA

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry, and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

GSMA is a membership-led organisation where members collaborate with industry peers and stakeholders, engage in influential discussions, and drive industry-wide initiatives that address the most pressing industry challenges and opportunities. As a GSMA Member, you'll have a seat at the table where decisions are made, specifications are developed, and the future of mobile telecommunications is shaped. Join a global community of like-minded professionals and organizations who share a common goal of advancing the mobile ecosystem for the benefit of billions of people worldwide.

Find out more: gsma.com/membership

For more information, please visit the GSMA corporate website at gsma.com

Follow the GSMA on Twitter: @GSMA.

About the GSMA Foundry

The GSMA Foundry is the go-to place for cross-industry collaboration and making positive change happen, supported by leading technology organisations and companies. By bringing together members and key industry players, engaging, and unifying the end-to-end connectivity ecosystem, the GSMA is solving real-world industry challenges.

Our vision is to unlock the full power of connectivity so that people, industry, and society thrive. This enables the mobile industry's mission: to connect everyone and everything to a better future.

Find out more, or submit a new project idea, at gsma.com/Foundry

About Unmanned Life

Unmanned Life offers a software platform to deploy, control, and orchestrate different types of robotic devices (drones, legged robots, autonomous mobile robots, and more) as intelligent, autonomous fleets.

U-Security is an application extended by the platform, designed to connect and deploy autonomous drones for security surveillance and inspection of facilities. With cutting-edge features such as 5G connectivity, autonomous charging, thermal imaging, AI decision-making, and more, U-Security can deliver real-time, remote surveillance capabilities, deployed through a simple user interface.

About this case study

This case study is for information only and is provided as is. The GSM Association makes no representations and gives no warranties or undertakings (express or implied) with respect to the study and does not accept any responsibility for , and hereby disclaims any liability for the accuracy or completeness or timeliness of the information contained in this document. Any use of the study is at the users own risk and the user assumes liability for any third party claims associated with such use.