

Digital Eyes in the Sky



Telefónica and Unmanned Life are demonstrating how swarms of 5G-connected drones can transform surveillance

For any organisation with property and land, drones could soon become essential tools.

Equipped with video cameras, drones can quickly and efficiently perform a wide range of tasks, such as inspecting damage and checking for security breaches. Using 5G networks, the footage from these cameras can be streamed to edge computing facilities, where the images can be analysed by software that can immediately identify anomalies.

As a result, connected drones can be much more effective than existing surveillance methods, such as CCTV, which are constrained by fixed angles and limited range. These limitations can mean false call outs, which are labour intensive and can be error prone. In cases where helicopters are used for surveillance, there is the risk of an accident and injury to the crew, as well as the expense involved in flying such a large aircraft. It can cost more than €1,000 an hour to keep a helicopter in the air.

Given the high cost of manual surveillance, drones could cut costs dramatically by providing a flexible and efficient means of surveying large areas and detecting problems. Telefónica estimates drones could be up to 15 times more efficient than a fixed camera, while also speeding up response times 80-fold in unattended environments.

Telefónica and Unmanned Life - a Wayra-invested start up - are testing and demonstrating 5G-connected drones for surveillance purposes at the telco's headquarters in Las Tablas, in the north of Madrid. Telefónica says its connected drones are attracting interest from analytical companies, sports clubs, the military and police.

"When we make the business case, our focus is for the security, but we know that the drones can be used for more than this aspect," says Miguel Álvaro Fernández, a drone specialist from Telefónica Ingeniería de Seguridad. "Every day, we note new functionalities that the drone service can do, as customers suggest more functionalities that we don't have in our road map."



Trialling drones in testing conditions

The Madrid headquarters, which holds 14,000 people, is a challenging testing ground for drone technology. Located in a busy air space area, the headquarters is close to Madrid Airport,





Madrid's metropolitan area, and two heliports. The trial requires intensive coordination and communication with AESA (the Spanish Aviation Safety Agency).

Telefónica is exploring two different kinds of surveillance missions, each involving at least two drones working together. The first is routine surveillance, in which an operator sets a required interval, as well as the number of drones, to survey preconfigured areas. The second is on-demand drone flights: In this case, the operator will select the drones and indicate the required area for each flight.

In both cases, the drones autonomously calculate the route in real-time using a 5G connection to an edge compute facility. Once the mission is underway, high-quality video streams are streamed in real-time to Telefónica's security centre over 5G. A person detection system, developed with artificial intelligence, automatically detects any unauthorised entry to the site. Each drone can fly for 45 minutes before autonomously visiting a nearby charging station to fully recharge in about 30 minutes. The system has been designed to comply with all aeronautical legal requirements for drone flight and privacy.

Telefónica has also found the drones to be useful for other purposes. "One month ago or something like that, we had a sand storm here in Madrid and with the drones we were able to inspect the sand covering the solar panels on our roof," recalls Miguel Álvaro.

Since the trials began in December 2021, Telefónica has been conducting two or three drone missions per week, depending on the weather conditions. The trials have helped Telefónica and Unmanned Life refine the solution. "Two or three times, we have augmented and upgraded functionalities of the platform," notes Kim Clement, CTO of Unmanned Life.

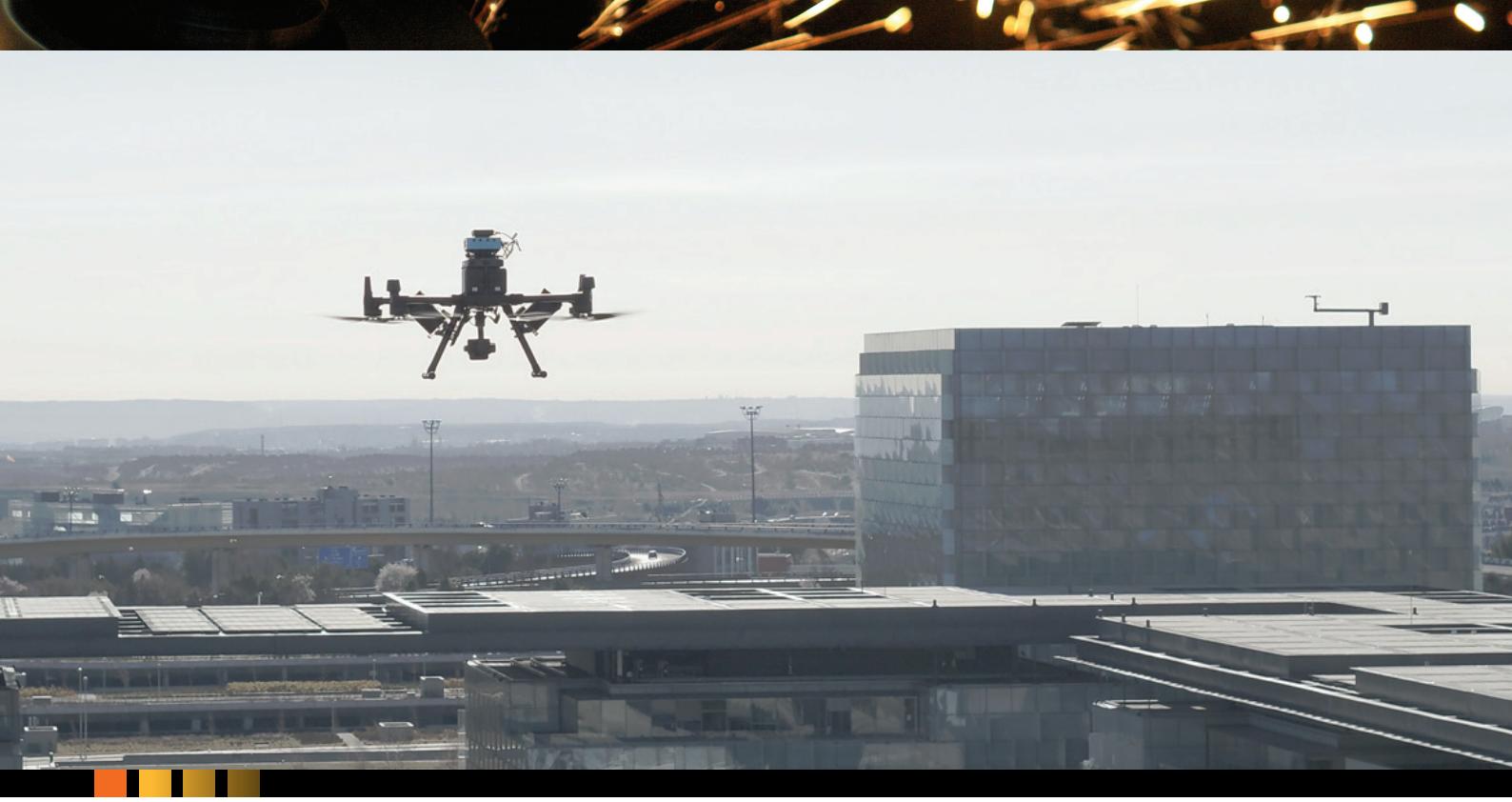
Although regulations require the flights to be overseen by a reserve pilot, the drones fly completely autonomously and the pilot hasn't yet had to intervene. Telefónica hopes to secure regulatory clearance to remove the pilot oversight by the end of the year.



5G and the edge: key enabling technologies

Telefónica's 5G network is a crucial part of the overall solution. It can transmit data at high bandwidth and capacity, whilst supporting the low latency required for drones to communicate in real-time. In the past, drones have used proprietary wireless communications systems to enable a pilot to control them remotely. The limitations of these systems mean the drones need to fly within visual line of sight and can only transmit low quality video streams.





The capacity of 5G means “we can increase the throughput for the video, if we want,” as well as using multiple drones, explains Miguel Álvaro. Although “we are able to control the drone and video with 4G technology, if we want to control a swarm of drones, 5G is important.”

As well as providing faster, more responsive connectivity, the 5G public network makes it easier to scale the solution. Where cellular coverage is already in place, connected drones can be configured quickly using dedicated access point names (APN).

By locating the computational power required for image recognition at the edge of the network, Unmanned Life is able to reduce the weight of the drone and increase flight times. The longer each surveillance mission, the greater the overall efficiency. Using computing power at the edge, rather than in the cloud, also delivers the low latency required to ensure the analytics are presented in real-time.

Unmanned Life also uses the edge compute to perform the real-time calculations required to enable a swarm of drones to fly autonomously. With a low latency connection, the drones are able to react rapidly to any change in the circumstances.

Unmanned Life’s platform is designed to be hardware-agnostic, so it can support a wide range of drones, including models with rotors and fixed-wing aircraft with a much longer flight time. When the battery of one drone is running low, the platform automatically replaces it with a fully-charged model. The trials harnessed both on-site edge devices and the public network telco edge. As the solution is deployed commercially, Telefónica plans to use the public network telco edge capabilities within its 5G network to support the drones.

That means it can offer the whole solution as a service, rather than a project or a product. “For example, if we want to deploy the system in Bilbao or another city in Spain, we don’t need to go there with our server to deploy all the system,” explains Miguel Álvaro. “We only need to deploy the service in an existing edge facility.” However, Telefónica recognises that some customers, such as the military, may prefer to use private computing facilities.

() Reconfiguring networks for airborne connectivity

Telefónica’s trials of drone technology are yielding some important insights. One of these is that existing cellular networks, which have been optimised to support land-based devices, such as smartphones, won’t necessarily perform as well when serving airborne devices, such as drones. “We need to be very careful with the protocols that we use to, for instance, to stream video to the edge in order to recognise images,” says David Moro, head of services platform in Telefónica CTIO. “In the upcoming years, we know that drones are going to be increasing in number. So, we need to start thinking about how to optimise for the needs of this specific kind of end user, the specific terminals that we are going to have.” Working with Unmanned Life, Telefónica is already optimising the way in which videos are transmitted.

Although forthcoming iterations of the 5G standard will incorporate specific features to support drones, telcos will also need to consider how to support airborne connections when planning their coverage. “We are now going to have devices or

terminals that are flying at 60 metres when this is not normally the case,” says David Moro. “It’s a way of thinking. In the past, the planners of the access network didn’t traditionally think about having to support drones. But this is something we need to take into consideration for the following years and it’s a very important insight.”

As their numbers rise, drones will need to communicate with air traffic systems. In this respect, customised 5G connectivity is set to play a key role in enabling individual drones to connect directly with UAM (urban air mobility) systems and with each other. Through this low latency, managed connectivity, the drones will be able to communicate their coordinates, their altitude, their direction of travel and speed in real-time. “Now that we are enabling swarms of drones, all of them need to be coordinated to avoid risk,” notes Kim Clement

Next steps - getting customers comfortable with the technology

Telefónica is hopeful that the first commercial deployments of its drone surveillance solution will begin during 2022. “The technology is very new, so customers are unfamiliar with it and they are a little bit reticent to implement it,” says Miguel Álvaro. “But I think the first reference customer will be a good opportunity to increase the deployment.”

The mobile operator believes the solution could ultimately be deployed across smart port environments, heavy industry sites, smart factories, agricultural monitoring, and other sectors for

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security, surveillance, event verification, or critical infrastructure maintenance tasks. Together a drone, a video camera and image recognition software are a potent combination that could be used across many different use cases. “We consider the drone as a tool,” explains Miguel Álvaro. “The most important part for us is the camera, the video, that give us a view of the perimeter that we want to analyse.”

From a cost perspective, another key step will be the green light from regulators to allow fully autonomous flights (without a pilot in reserve). The trials being conducted by Telefónica could pave the way for regulatory clearance in Spain this year. "One of the most important things for Telefónica is that we have very good vision of the regulatory parts," says Miguel Álvaro. "And we know really what it is possible to do and not to do with the drones at this moment and what will be possible to do in the following months or years. And with this vision, we can deploy products in the market, not only proof of concepts and so on."



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About Telefónica



Telefónica is one of the world's leading telecommunications service providers. The company offers fixed and mobile connectivity, as well as a wide range of digital services for individuals and businesses. It is present in Europe and Latin America, where it has more than 365 million customers. Telefónica is a fully private company whose shares are listed on the Spanish stock exchanges and on the New York and Lima stock exchanges.

www.telefonica.com

About Unmanned Life



Unmanned Life is changing the way robots are being deployed by providing seamless orchestration of autonomous robotics with its Autonomy-as-a-Service software platform. Unmanned Life integrates different technologies, such as AI, 5G, and Edge computing with multiple robots, like drones and/or autonomous mobile robots (AMRs) and a variety of capabilities to enable autonomous robotics operations across multiple industries in particular, Industry 4.0 and Smart Cities.

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