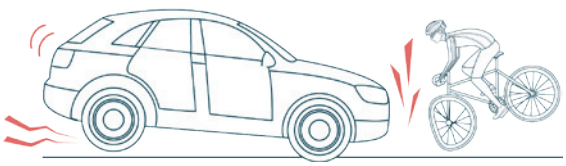
GSMA Internet of Things Case Study
Telefónica Proof of Concept: Drones for road hazard warning system using C-V2X

INTRODUCTION

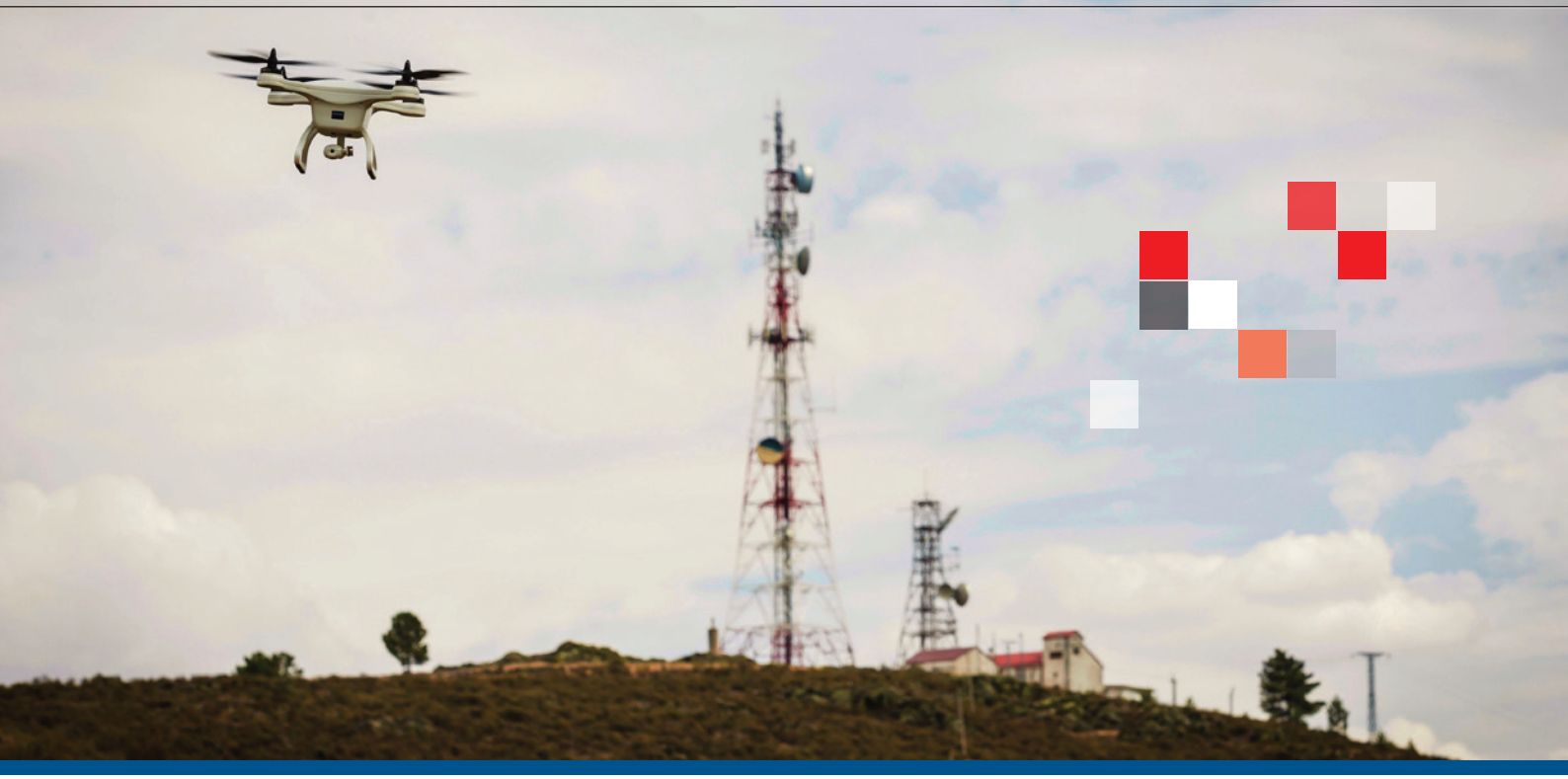
Over 50% of all road traffic deaths globally are among vulnerable road users such as cyclists.[1] However experienced a cyclist may be, they are always at some physical risk on the road: in Europe alone, **250,000 cyclists are injured** every year, and **2,100 lose their lives**.[2] Clearly, this must change.

Thankfully, cellular connectivity can help here: Cellular Vehicle-to-Everything (C-V2X) technology now offers drivers a kind of sixth sense via a variety of connected items like cameras and road signs, which enables better driving decisions and safer roads for all. This case study examines how Telefónica has created an IoT, Big Data and Artificial Intelligence solution between drones, mobile network and cars to warn drivers of what faces them in the road ahead, demonstrating how a single source of connectivity can be used from multiple devices to improve road safety. This solution, which is not commercial yet, has been trialled as part of a joint effort between Telefónica, the Spanish Government's Directorate General for Traffic (DGT) and SEAT, with the view of using IoT technology to increase cyclists' safety on the road.



[1] World Health Organisation: https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries

[2] European Commission: https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/statistics/dacota/bfs20xx_cyclists.pdf
World Health Organisation: https://www.who.int/violence_injury_prevention/road_safety_status/2018/en/



DRONE

MOBILE CONNECTIVITY

MEC (Multi-Access Edge Computing)

COMPUTER VISION + MACHINE LEARNING

CONNECTED CAR: C-V2X (Cellular Vehicle-to-Everything)

The solution

Telefónica has developed an IoT system to provide road hazard warnings, using drones equipped with cameras and connected to the cellular network. The drones are programmed to gather images of risky locations, and this data is transferred to a server based at the edge of the network. The ubiquity of cellular connectivity – and the server's location at the edge of the network, to reduce latency – allows for the images captured to be sent to the system and processed in real time.

The Multi-access Edge Computing (MEC) system allows applications to be deployed at the edge of the network, closer to where they are needed, reducing latency and optimising the data transmitted for traffic management control. MEC is not simply an intermediary to reduce latency – by adding intelligence to the edge of the network, it becomes a major source of processing power.

The deployed application assesses the images and spots risky situations, such as a broken-down vehicle, cyclist on the road, or other unexpected obstacles: computer vision technology enables detection of new objects and scenarios (for instance falling rocks, crossing animals, or uneven roads and potholes) and machine learning allows it to

recognise them as potential sources of danger. Responses can then be generated immediately, close to where they are needed, and transmitted instantly to relevant devices in the vicinity such as connected cars, by a Telematic Control Unit (TCU) using C-V2X.

The result is that incoming connected vehicles can be prepared for potential sources of danger to themselves or others well before these are in line of sight, giving them more time to anticipate the best course of action and react accordingly. In the context of road hazards, this can easily mean the difference between life and death.

ANIMAL CROSSING

FALLEN ROCKS

UNEVEN ROAD

PEDESTRIAN CROSSING

Deployment

36 cyclists lost their lives on Spanish roads in 2018 – a number the country's authorities deemed unacceptable.[3] So in September 2019, Telefónica joined forces with the Spanish Government's Directorate General for Traffic (DGT) and leading developer of connected cars SEAT, to carry out a proof of concept (PoC) of the solution, and demonstrate its real-life applicability to making roads safer for vulnerable road users, by indicating the presence of cyclists or stationary automobiles. The PoC also served as a useful illustration of how connected cameras can use C-V2X to maximise the efficiency of traffic circulation, improving the economic performance and environmental impact of road systems.

Telefónica provided the project with end-to-end connectivity, and opened its network so that third parties could deploy applications on the edge of the network for traffic management and other critical communications purposes. Technology partners on the project included Ficosa, which developed the TCU unit and software to allow transmission of information from vehicles to external entities and vice versa, and Aeorum, which designed the camera-equipped drones and developed their intelligent capabilities to enable identification of unfamiliar obstacles.

[3]*** Directorate General for Traffic: http://revista.dgt.es/es/noticias/nacional/2019/01ENERO/0103-Presentacion-balance-accidentes-2018.shtml#.Xmd1vKj7RPa

Telefónica's IoT strategy specifically aims to support the development of drones as a means of enabling digital transformation. Among the advantages of the solution, however, is its versatility – while drones are the focus for now, given their ability to patrol given areas or attend sites of particular interest, this system of connected cameras can also be affixed to infrastructure such as traffic lights. At MWC19, Telefónica and SEAT demonstrated several use cases for connected cars and assisted driving via 5G, whereby sensors installed in various forms of urban infrastructure warned the connected cars of the presence of pedestrians, cyclists and stationary vehicles on the roads. This form of deployment allows planners to avoid any issues associated with the limitations of battery life in drones, for instance in fixed locations where uninterrupted monitoring is required.

Conclusions

The ubiquity of cellular connectivity makes mobile technology the natural architecture on which to build solutions of this kind, as do the characteristics of that connectivity: with 4G, latency is about 40 milliseconds, and with 5G, latency of as low as 5 milliseconds can be achieved. The reliability of mobile networks in all weather conditions, too, is a key strength in supporting critical communications of this type. A secure communications channel is also essential in the delivery of solutions critical to life, and the inherent encryption and security mechanisms of mobile networks provide the assurance required.

Find out more: https://www.telefonica.com/en/web/press-office/-/telefonica-dgt-and-seat-join-forces-to-use-iot-technology-to-increase-cyclists-safety-on-the-road

There are opportunities here to save lives, reduce road emissions, improve the economic performance of urban areas, and stimulate the drones ecosystem, as well as to create additional demand for connected sensors and supporting hardware. With connected transport being a key vertical as the IoT grows, work of this kind is likely to bring increasing importance and relevance to the mobile industry in the near future.

About the GSMA

The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators and nearly 400 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences.

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

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About the GSMA Beyond Connectivity campaign

Delivering seamless IoT connectivity has been a crucial element in helping operators to launch new services such as low power wide area (LPWA) networks, using NB-IoT and LTE-M technologies and create added value and sustainable growth. Now leading IoT operators are building on this and their reputation as trusted industry partners by delivering value added services beyond connectivity.

These end-to-end solutions include services across big data, machine learning, analytics, edge computing and distributed ledger technologies. They are delivering substantial benefits to customers such as increased productivity, reduced costs and automated business processes as well as driving innovative new products and services, new lines of business and new business models.

Services beyond connectivity are transforming businesses and industries.

www.gsma.com/BeyondConnectivity

About Telefónica Tech

Telefónica is a company that is aware of the new challenges posed by today's society. This is why we offer the means to facilitate communication between people, providing them with the most secure and state of the art technology in order for them to live better, and for them to achieve whatever they resolve. An innovative and attentive spirit with an immense technological potential that multiplies the ability to choose of its more than 356 million clients. Telefónica operate in 14 countries and has a presence in 24, with and an average of 120,138 professionals.

IoT-Big Data is one of the recently integrated digital services offered by Telefónica, together with the cloud and cyber security services, in Telefónica Tech, a new unit that brings together these three businesses with a high growth potential and with which it seeks to accompany its customers in their digital transformation. At the close of 2019, Telefónica was managing 23.8 million IoT connections worldwide. Recently, for the sixth consecutive year it has been recognised as a global Leader in Gartner's Magic Quadrant Managed IoT Connectivity Services. In addition, Telefónica has also been recognised as Leader among Specialized Insights Service Providers for Big Data.

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