



Enabling Always-Connected Ambulances

UK trial supported by the European Space Agency (ESA) combines advanced cellular and satellite connectivity to ensure paramedics have continuous access to the information they need.

Highlights

- NHS Arden & GEM CSU is working with East of England NHS Ambulance Trust to trial a new connectivity solution designed by Excelerate Technology to enable ambulances to provide a greater level of care in the field.
- The key focus of this trial is to test how connectivity can support emergency services to ensure patients receive efficient and effective emergency care in the right place first time.
- The solution bonds connectivity from 4G, 5G and low earth orbit (LEO) satellites to ensure paramedics can be online and are always connected even when in rural areas of low or no cellular coverage. Always connected will enable Ambulance crews to access vital clinical information which will support their clinical decision making.
- Excelerate says the solution, which supports near symmetrical speeds for both uploading and downloading data, could also be used to enable live tele-medicine.
- The solution could be used by healthcare providers to redesign patient pathways, improving efficiency and reducing the pressure on hospitals.
- The trial by the East of England Ambulance Service has been extended to February 2024
- Excelerate believes cellular and satellite connectivity could be bonded to support a range of first responder and private sector use cases, such as event management.

With healthcare systems around the world under growing pressure, their staff need to provide treatment as efficiently as possible. One way to do that is for paramedics and ambulance crews to treat people in the right place first time, increasing the possibility of 'See & Treat' in the community avoiding conveyance to hospital when it is clinically safe to do so. To that end, the UK's National Health Service (NHS) is trialling a new connectivity solution designed to enable ambulance crews to do much more in patients' homes or in the Community.

Developed by Exceleerate Technology, with co-funded support from ESA's 5G/6G strategic programme line and the UK Space Agency, the solution uses a combination of 4G, 5G and satellite technology to ensure that paramedics are continuously connected, even when in remote and rural areas.

The ultimate aim of the project – called Hybrid Connex Digital Ambulance of the Future – is to enable the widespread use of technology so crews are 'Always Connected.' A significant benefit of this would be the opportunity to roll out telemedicine pathways in which ambulances, or even patients' homes, function as remote consultation rooms as crews have access to a senior clinician to support the diagnosis and delivery of patient care. Thus, improving patient care, increasing efficiency, and saving significant money, time and resources.

"Research shows patients would be much, much happier to be treated in their own homes where appropriate," notes Callum Farrell, Sales Manager of Exceleerate. "But also, the NHS itself would cope a lot better, if patients were treated in their own homes, rather than being conveyed to hospital where they may be waiting for significant periods of time to be triaged and treated."

Each of the four vehicles involved in the trial is equipped with a special long-range cellular antenna provided by Exceleerate and a flat panel Kymeta antenna that can connect to the low earth orbit (LEO) satellites operated by OneWeb. Unlike traditional geostationary (GEO) satellite communications, the solution is able to maintain a connection even while the antenna is moving: the flat antenna doesn't need to be pointing at the satellite to be connected and doesn't need to be installed by a specialist.

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Callum Farrell - Sales Manager of Exceleerate

Exceleerate's solution uses a router that "bonds" the satellite and cellular connections together so that the ambulance is always securely connected by the best means possible. It also employs a SIM card that is able to connect to all four of the UK cellular networks, again selecting the one with the strongest signal.

As well as being more responsive than traditional satellite connectivity, LEO connections offer much more bandwidth. "With the old-style GEO technology, realistically, you could get a couple of megabits per seconds up and down," says Callum Farrell. "In 2023, there's really no application that survives on that, certainly not telemedicine."

A step change in performance and reliability

Prior to the trial, the ambulance crews were equipped with tablet computers with their own SIM cards, but they sometimes found themselves without coverage. That might mean they could not access all the relevant information about the patient limiting their options and potentially resulting in an unnecessary A&E admission.





In the trials by the East of England ambulance service, Excelebrate says the ability to seamlessly switch between satellite and cellular networks is delivering “consistent and high-quality connectivity during ambulance movements, while maintaining performance levels despite geographical changes that usually impact network quality.” Supporting near symmetrical speeds for both uploading and downloading data, the solution is capable of handling tasks, such as video streaming, without compromising performance, according to Excelebrate.

While the current trial is a R&D project, Excelebrate is hopeful that its solution will be employed permanently both by ambulance services and by other organisations that need reliable connectivity in the field.

“This has addressed all the requirements of the project,” says Callum Farrell, citing a diary in which one of the ambulance personnel who utilised the connection and saw the benefits of the improved connectivity. “They were able to talk about what they could do in areas where they’ve been in the past and have struggled.

The cellular antenna used in the trial is about 30 cm long, which makes it too big to attach to an individual tablet computer. However, it can be fixed to a tripod, as well as being mounted on a vehicle.

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The ambulance crews access the connectivity via Wi-Fi to support existing processes, such as processing electronic patient records via a secure-cloud-based system and checking on whether a patient has an existing medical condition. The connectivity can also be used to consult remote clinicians. “In fact, the paramedics on board the vehicles don’t even need to know the trials are taking place, they just know that the Wi-Fi in the ambulance is always on and it’s always good,” adds Callum Farrell.

While the trial was intended to run for three months, it has been extended at the request of the ambulance service and is now set to conclude at the end of February 2024. “The whole point is to get as much evidence as we possibly can, as much feedback as you possibly can, about different locations and different form factors,” notes Jordan Lawrence, Marketing Coordinator at Excelebrate. “So, they can get that literal and anecdotal evidence from the crews to make sure that the solution is doing what it says on the tin.”

The Hybrid Connex technology has the potential to guarantee reliable connectivity where paramedics could consult specialist clinicians in hospitals, potentially even live streaming video of the patient. Excelebrate says the trial has shown that the uplink connectivity is fast enough to support this kind of use case, even if the video needs to be in 4K resolution. Some existing apps, such as GoodSam, are designed to enable citizens to stream live video to the emergency services when calling for help, but they depend on good cellular coverage.

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Of course, there are scenarios where the right clinical outcome is for the patient to be conveyed into hospital. In this case, reliable connectivity can be used to provide the hospital staff with the information they need to treat the incoming patient as efficiently as possible by transferring the patient record.

Potential deployments and greater portability

Excelerate is exploring potential enhancements to the solution. One could be mounting the antennae into a backpack that would enable paramedics to ensure they have connectivity even when they are some distance from their vehicle: there are instances when an ambulance can't park close enough to the patient's home to ensure that the Wi-Fi hotspot provides sufficient coverage.

"ESA is co-funding innovative projects like this, alongside the UK Space Agency, to bring the benefits of 5G/6G technologies to society", said Antonio Franchi, Head of ESA's 5G/6G Non-Terrestrial Networks Programme Office. "Through working with Excelerate, we're equipping healthcare professionals with the necessary tools to provide care to those in need, anywhere, at any time."

As it refines the technology and reduces the size of the components, Excelerate believes its hybrid connectivity solution could be employed by a wide range of emergency services. Being able to fall back on LEO satellite coverage could be particularly useful for search and rescue operations in the wake of a natural disaster, such as an avalanche or flood. Excelerate says its system could be used to live stream 4K video footage from surveillance drones, for example, enabling rescuers to pinpoint where they should be focusing their resources.

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Regardless of where they are, first responders need reliable connectivity to coordinate their movements and actions. As well as remote isolated locations with no conventional cellular coverage, major incidents can occur in crowded urban locations, such as sports arenas or concert venues, where the cellular networks are heavily congested. "The beauty of the system that we've got is that it actually can adapt to both scenarios easily," says Callum Farrell.

In fact, in an increasingly digital economy, a wide range of public sector organisations and private sector companies depend on continuous connectivity. Excelerate hopes to meet this demand. "This system would similarly keep you online whether you're in law enforcement, whether you're a paramedic, whether you're a private security firm, whether you are a major venue that's looking to keep your point to sales systems online," notes Callum Farrell.



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.

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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.

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About the European Space Agency

The European Space Agency (ESA) provides Europe's gateway to space.

ESA is an intergovernmental organisation, created in 1975, with the mission to shape the development of Europe's space capability and ensure that investment in space delivers benefits to the citizens of Europe and the world.

ESA has 22 Member States: Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland and the United Kingdom. Latvia, Lithuania, Slovakia and Slovenia are Associate Members.

ESA has established formal cooperation with four Member States of the EU. Canada takes part in some ESA programmes under a Cooperation Agreement.

By coordinating the financial and intellectual resources of its members, ESA can undertake programmes and activities far beyond the scope of any single European country. It is working in particular with the EU on implementing the Galileo and Copernicus programmes as well as with Eumetsat for the development of meteorological missions.

Learn more about ESA at www.esa.int

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