Remote area Access Network for 5th GEneration

HORIZON 2020

Results in Brief

Affordable and reliable internet access available to remote areas

While connectivity is improving in more parts of the world, about 1.4 billion people are still without reliable mobile broadband coverage and aren't enjoying the benefits of high-quality internet access. This is where 5G comes in.

DIGITAL ECONOMY

© Luciano Mendes

Until now, mobile networks have been designed to address the demands of modern urban areas, where small cells increase the overall capacity and allow for better frequency reuse. This isn't economically feasible in remote areas as low population density would result in few subscribers per cell along with a prohibitive per capita operation cost.

In line with the spectrum allocation procedure, operators must acquire the licence to exploit the spectrum from an auction. But the high cost of spectrum licences makes the return on investment in remote areas unattractive to mobile operators. Quality of service is another challenge as mobile networks are designed to operate in cells within less than 10 km of reach, making performance over larger distances very poor.

Latest technology offers solutions to local internet providers

The EU-funded 5GRANGE project conceived a 5G operation mode to provide reliable coverage for applications in remote areas with a cell radius above 50 km and at least 100 Mbps using high-power customer-provided equipment such as rooftop antennas. The 5GRANGE solution [↗] has a redesigned network architecture to provide reliable and cost-effective internet access by applying advanced channel coding and multiple antenna techniques.

"The quality of service has greatly improved when compared with other wireless technologies, since 5GRANGE is able to provide up to 100 Mbps at the cell border," notes Luciano Mendes, 5GRANGE technical manager. To tackle the spectrum access issue, cognitive radio technology is used to exploit the vacant UHF channels commonly available in remote areas. The mobile units and the base station access the geolocation database provided by regulators to verify which TV channels are vacant in a given area. These devices carry out the spectrum sensing to assure that the channels are free of unauthorised TV transmissions. This means the vacant spectrum can be exploited without going through the cumbersome and expensive auction process, allowing small and local internet providers to become new players in this market.

Backup, remote maintenance and spillover benefits

5GRANGE uses software radio technology, which means that all communications algorithms for the physical, media access control and network layers run on general-purpose processors. The overall cost of the equipment is reduced and allows for higher reliability. Backup base stations can even run on different virtual machines. Updates and troubleshooting can also be performed remotely, and the multiple transmit and receive antennas that provide diversity also work as redundancy [↗] in case of a hardware failure in one of the radio frequency communication chains.

Remote and rural area mobile networks can modernise agribusiness by introducing technology to farms. This concept, known as smart farms, can improve farm productivity without increasing the exploited area. It also minimises pesticide and fertiliser use, lowers production costs and reduces contamination. This means fewer environmental impacts and improved quality of life. New digital services also become available to rural areas such as remote health services. 5GRANGE has produced an informative animated video [↗] offering an overview of all the above workings and benefits.

Connecting remote and rural areas to mobile networks is feasible and 5G can overcome all barriers to providing true universal internet access. "This solution has the potential of including a large number of people in the information era, allowing those living away from urban areas to enjoy the benefits of being connected," concludes Marcelo Bagnulo, project coordinator.

Keywords

5GRANGE, mobile network, remote areas, internet access, 5G, connectivity, wireless technologies, smart farms

Discover other articles in the same domain of application

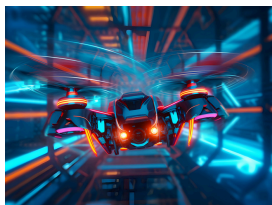Cost-effective, optical system-on-chip technology to satisfy ever-growing bandwidth demand

New robots set to transform farming

Getting royalties to film content creators

AI flies drone like a champ

Project Information

5GRANGE

Grant agreement ID: 777137

Project website

DOI
10.3030/777137

Project closed

EC signature date
21 September 2017

Start date
1 November 2017

End date
31 October 2020

Funded under
INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT)

Total cost
€ 999 906,25

EU contribution
€ 999 906,25

Coordinated by
UNIVERSIDAD CARLOS III DE MADRID
Spain

This project is featured in...

RESEARCH*EU MAGAZINE

Another small step: A new age of solar system exploration

NO. 104, JULY 2021

Related articles

SCIENTIFIC ADVANCES

Towards an Internet of humans

8 November 2023

SCIENTIFIC ADVANCES

Join the drive for a new open European infrastructure for web search

13 March 2024

Last update: 9 April 2021

Permalink: https://cordis.europa.eu/article/id/429572-affordable-and-reliable-internet-access-available-to-remote-areas

European Union, 2025