

Cognitive radio technology optimises use of scarce spectrum

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As the number and variety of smartphones and other connected devices keeps growing, the need for radio spectrum grows with it. Cognitive radio technology developed under the EU-funded QOSMOS project could help meet these needs while controlling telecom costs, improving service and driving the development of new markets.

In the near future, the telecom industry will be faced with three challenges: a need for more [radio spectrum](#), an ever-increasing demand for data, and consumers' increasing unwillingness to pay for it. Spectrum, however, is a finite resource.

The QOSMOS project addressed the twin problems of scarcity and cost by developing cognitive [radio technology](#) that dynamically optimises the

use of radio spectrum, by accessing under-utilised portions of the spectrum and sharing spectrum across devices.

'The idea is to break down silos,' says Michael Fitch of British Telecom, who coordinated the QOSMOS project. 'Every new service and technology needs a new spectrum, and silos are formed when there are umpteen different devices that use umpteen different parts of the spectrum.'

This diversity does not make for efficient [spectrum management](#). The project partners therefore developed three technologies: a central manager that controls the spectrum 'portfolio' in real-time for a region or country; a resource manager that allocates the spectrum to individual systems and senses the environment; and a cognitive radio terminal.

The project also developed a prototype transceiver to generate FBMC (Filter Bank Multicarrier transmission) waveforms. FBMC is expected to replace the OFDM (Orthogonal Frequency Division Multiplexing) technology that is more commonly in use today. With FBMC transmission, spectrum is carved out in rectangular blocks so that it is tightly packed for more efficient spectrum use.

Avoiding interference

Since the idea behind QOSMOS is to use under-utilised portions of the already-allocated spectrum, a key issue is avoiding interference. An early pilot led by UK telecommunications regulator Ofcom, for example, would use some of the technology developed in QOSMOS to access TV white spaces, which are unused spaces in the UHF band allocated to TV broadcasters. Without intelligent spectrum management, interference by 'secondary spectrum users' could degrade broadcast quality for viewers.

'Avoiding interference calls for more spectrum management,' says Fitch.

'And it's not just a case of choosing the optimum spectrum, but also the appropriate waveform.' He also notes that the number and variety of devices that attach to the network and one cell is enormous, and that each device has a different need. A home automation sensor, for example, may periodically transmit state information with a low data requirement, while a television set top box may require much higher bandwidth and more complex spectrum management.

More than technology

Members of the QOSMOS consortium did not only develop the technology, they also gave serious thought to how it could be deployed. They conducted a value chain analysis and developed business 'use cases' that compared the costs of accessing under-utilised spectrum against that of buying new spectrum, and identified the areas where [cognitive radio](#) technology could be commercialised.

Existing owners of spectrum, for example, could rent out their spectrum assets for short periods of time, while network managers could offer premium spectrum management services. An entirely new market in micro-trading spectrum could develop over time.

The project culminated in events hosted by BT in the United Kingdom and Microsoft in Washington, DC. The Commissariat à l'Energie Atomique in France is continuing development work on the FBMC transceiver and several consortium members are likely to commercialise the [spectrum](#) manager technology. Meanwhile, according to Fitch, UK regulator Ofcom is in position to commercialise TV white spaces from 2015.

More information: For more information, see www.ict-qosmos.eu/

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