

Software Decongests Wireless Communication

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Researchers are testing ways of better utilising the radio spectrum used in all types of telecommunications. A group of investigators in Ireland is to test software capable of automatically modifying the radio frequency used by any telecommunications device. The system allows mobiles, computers with wireless InterNet connection, radios and other devices to detect and jump to a frequency that is free, instead of being limited to using the specific frequencies allocated to each type of service. The radio spectrum "is a scarce resource", says project coordinator Linda Doyle. There are, however, large bands of spectrum that if found to be temporarily free can be used by these "software-defined radio" systems. The result is better exploitation of the spectrum and decongestion of frequencies.

Portuguese participation

The current problem in the use of the radio spectrum, observes Paulo Marques, Portuguese researcher in Trinity College Dublin and one of the scientists working on the project, is the attribution of a band of frequency to different services (military communications, television, mobiles, wi-fi), independently of the use that really is given to this band. "The rules governing access to the spectrum were created in 1930's and the simplest form was chosen to prevent interference between the systems." As result, not all services have the frequencies that they really need.

"Why do we still not have a mobile broadband connection to the Internet of the same quality that we have with a fixed line?" he asks. "Essentially, because the third generation mobiles still do not have sufficient attributed spectrum." These limitations in the attribution of the spectrum are "a restriction on the development of new services." However, this tool, he says, will allow use of new frequencies for innovative applications: "A possible service, for instance, could be the remote control of some home electronic devices from office through the new available frequencies."

Multiple uses

While the "futuristic" applications of this cognitive radio software still may not be exploited immediately, in the short-term the system will be of interest to companies providing wireless InterNet access or telecommunications providers who want to reduce the congestion on their networks. The technology will also allow some particular types of use, believes Linda Doyle: "a simple example is a big concert or soccer match." In heavy use periods such as these, where the signal emitted for radio and television has a bigger search, broadcasters could rent bandwidth just for those events. "The devices would be reconfigured to use the new frequencies only during this specified period." Another possible use could be outside large cities, where the free spectrum would have other applications. In an ideal scenario the technology would lead to "to a world completely free, where each user could use the spectrum that best corresponds to their needs", allowing "a flexible market, capable of encouraging great innovations".

Tests in real conditions

The Irish project will advance to a phase of tests in real conditions, during the next year. "The Irish communications regulator realized the strategic importance of this technology and attributed a frequency band for tests to Trinity College", explains Paulo Marques. "There are still many questions to be addressed before the technology can be made available to customers". On the one hand, the technology standards are only now starting to be defined. On the other hand, the devices are still not available. In the mobile phone industry, "not even 3G has

this capacity. Therefore, the new mobiles phones capable of using this software are called fourth generation ", says **Paulo Marques**. Another question to be resolved is how it will operate in real time. A cognitive radio system has to be in constant activity "to reconfigure itself in reaction to the spectrum changes that exists in any specific geographic zone and guarantee not to interfere with primary services", for example the emissions of licensed television or radio broadcasters. The "main issue", relates the researcher, appears when, during a transmission by the opportunist system, a licensed terminal wants to use that frequency. In this case, the opportunist terminal must leave the band immediately and move to another one.

Scarcity of spectrum of radio in Portugal is only apparent

In Portugal there is not a scarcity of radio spectrum but only a problem of access – says Atílio Gameiro, who is preparing to co-ordinate from June an Institute of Telecommunications project in radio-opportunistic systems. "The spectrum scarcity is more apparent than real." The problem "lies in the rigid attribution of licenses" and it is the current regulations that make the spectrum "an expensive and scarce resource". Paulo Marques, part of the Irish project, agrees that Portugal does not have a problem of scarcity but of distribution: "There are only four terrestrial television channels operating, but there are a lot of radio channels attributed in UHF/VHF bands, most of them unused." However, "the bands used by mobiles are congested". Atílio Gameiro classifies as "depleted" the current model of distribution and considers necessary "to persuade the regulators that there are technologies that make new, much more flexible spectrum management policies possible".