

Cognitive radio helps guarantee reachability of emergency services

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(PhysOrg.com) -- A new approach to wireless communication will guarantee the reachability of emergency services in a better way. 'Cognitive radio', for which Qiwei Zhang (CTIT) developed new techniques, borrows free space in other frequency bands or even organizes an ad hoc network 'on the spot'.

In the event of a disaster, the emergency services have to be able to trust communication networks implicitly. But what happens if the network is overloaded or even off the air as a result of the disaster? Soon it will be possible to borrow free space in other frequency bands or to organize an ad hoc communication network on the spot thanks to 'cognitive radio'. This means that the scarce space available will be put to better use. Qiwei Zhang, PhD student at the University of Twente, the Netherlands, has developed new technical solutions to this end. He was awarded his PhD on 26 February.

If a major catastrophe takes place, the public network is often overloaded by concerned citizens and calls for help within a very short time. It is true that special emergency channels are allocated to prevent the emergency services from being too dependent on this public network, but they, too, often have a limited bandwidth. If, for example, emergency services also want to communicate via video in the future, or want to send data on a patient to the hospital, more bandwidth will be needed. Cognitive radio can identify all transmitting and receiving possibilities in the vicinity and utilize them to the full. It is even possible to construct an ad hoc network without the basic infrastructure being

present. Mobile users in the area, for example other emergency services, will then jointly form the nodes of a temporary network. The information flow will jump from node to node.

This does require a totally new approach to the radio spectrum: instead of the current highly channelled approach, cognitive radio tries to borrow bandwidth in other bands, without disturbing the users of these bands. Qiwei Zhang's significant steps in this field include developing techniques for finding available spectrum.

Chameleon

Because cognitive radio must be highly flexible and capitalizes on local circumstances, it requires a lot of calculating power. According to Mr Zhang, the reconfigurable processor 'Montium' (the name refers to a chameleon which adapts its colouration to the environment) that was developed at the UT, is a good candidate for this purpose because, amongst other things, this chip has a limited energy consumption. He has also developed special algorithms to adapt the transmitting signal to the local conditions and to prevent undesirable interference with other users. The trick here is to restrict the calculating power required: this can be realized by, for example, using prior knowledge of the type of signals that other users transmit. More rapid recognition of other users, and thus faster intervention, is the result.

Cognitive radio is not restricted to applications in emergency situations. In future this approach will work at any spot where wireless network jams occur. The challenges are not only of a technical nature, however. Due to the totally different approach, a lot will also have to change in the legislation.

Provided by University of Twente, Netherlands

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