A boost to your mobile signal

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Credit: AI-generated image (disclaimer)

When using your mobile phone, it doesn't take much to lose that precious signal - just turning a corner or riding on a train can be enough. EU-funded research is developing new technologies to eradicate those annoying 'black holes' in wireless coverage, while freeing up some mobile network capacity at the same time.

We live in a 24/7, always-on, mobile and wireless world. Wherever we

go we are connected - to each other, to the web, to all our favourite apps, to whatever data we need, exactly when we need it.

Or so we like to think. The reality is quite different. There are corners of our homes where the web won't work. There are black spots in towns and huge holes in the wireless network in more remote areas. Coverage is far from complete.

To compound the problem, even when they have a good signal, smartphones often struggle to download the data they need because the mobile networks are saturated. The airwaves are at full capacity.

Europe has always been at the forefront of innovation in telecommunications and a pioneer of the next generation of mobile technologies. So watch out for 'femtocells' - small mobile telephony cells that improve both connectivity and coverage at a local level.

Better signals

The principle is quite simple. Instead of mobile operators having to invest millions in powerful long-range base stations to extend coverage over a wide area, they can move mobile connections to more localised small cells. A residential femtocell, for example, would improve coverage for just one house, or perhaps a block of flats. A commercial small cell might boost mobile connectivity for a whole office while a mobile femtocell could provide passengers on public transport with a strong and static signal (sparing their battery and eradicating sudden drops in signal).

Femtocells are far more than mobile booster stations; they can also help to divert data traffic off the mobile airwaves. This offloading creates more network capacity. Wired into the fixed line broadband network, a femtocell can reroute data and voice traffic down wires, freeing up the

precious airwaves for even more traffic.

Fast forward

Significant research is still required to turn these practical ideas into reality. There are so many dots to join up. How do you prevent femtocell signals from interfering with signals to and from main base stations? How do you decide whether to route connections through fixed lines? What protocols should you use in the layers of the 'communications stack'?

The FP7 'Broadband-evolved Femto networks' (Befemto) project unites several industry giants in mobile telecommunications equipment, mobile operators, small companies with key technologies and several technology R&D organisations to solve these issues and demonstrate prototype femtocells at work.

'Europe recognises that mobile connectivity is a powerful social and economic driver,' explains Dr Thierry Lestable, the project's coordinator. 'EU support for the development of cheap technologies to enhance and boost innovative services is really important for growth, not just growth for telecoms manufacturers and providers, but for the entire economy. Most businesses rely now on mobility and permanent connectivity.'

'By adding femtocells and small cells into the mobile network mix we make it possible for mobile operators to improve their spectrum efficiencies through heterogeneous networks (HetNets) and seamless integration of the fixed line telecoms network,' Dr Lestable continues. 'But this rerouting has to be optimised and intelligent. We have been developing and testing self-managed femtocell connections which are programmed to pick their wireless protocols and frequencies and route traffic depending on a whole host of contextual data.'

Befemto has developed advanced cooperation, self-organising, healing and switching algorithms. The built-in intelligence allows femtocells to optimise their use of radio frequencies (depending on traffic densities, for example) and fixed broadband networks. They can also communicate with macro-basestations without any interference or effect on macro signal quality or capacity.

'These new algorithms allow femtocell networks to work together to provide top quality coverage for users and support seamless, low-power and low-cost relief enhancement to the mobile service,' Dr Lestable remarks. 'We are focusing on the newly launched LTE or 4G networks because customers are paying a premium for these and will expect a true broadband experience: fast, reliable and unlimited access to everything everywhere. Femtocells, and small cells will allow operators to meet these expectations and lower their operational costs at the same time.'

Active all areas

The project partners have applied for an impressive 12 patents for the technologies developed within the project. These patents range from novel network monitoring software to mobile traffic optimisation algorithms. The project has also improved radio-frequency front-end technology to improve signal quality and reduce interference between femtocells and other wireless devices.

On the international stage Befemto has played an important role in proposing and supporting industry standards for femtocell protocols and the mechanisms for migrating data traffic between mobile, WiFi and fixed line architectures. The project partners have made a total of 27 direct contributions to 3GPP, the international standards organisation for mobile technology.

The partners have also run five international workshops worldwide and

two training schools to share the project's findings and build a common understanding of these technologies within the community. The partners have published more than 70 international papers.

The Befemto technologies and system architectures have been tested in five pilot demonstrations. Trial results show that femtocells significantly reduce load on mobile networks while boosting signal strength and quality at a local level. The work of the project will support mobile operators to reach two major technical targets: high spectral efficiency (8 bits/s/Hz per cell) - meaning more and better use of scarce airwaves - and a maximum mean transmit power of 10 mW - for lower levels of interference.

'Most importantly, our trials also prove to mobile network operators that the small cell model is a good one,' says Dr Lestable. 'We've looked at several different business models for their deployment; no matter which one you follow, femto- and small cells will save mobile operators money and help them to create value - a sure way to get them to market.'

It looks like that dream of 24/7 fast connectivity could be just around the corner - a corner that no longer gets in the way of your calls.

More information: Link to project's website:
'Broadband evolved Femto networks' website

Links to related videos / audios:
Befemto Project Youtube channel

Provided by CORDIS

https://phys.org/news/2013-01-boost-mobile.html