

# Technology behind the Personal Network

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First Ultra Wide Band chipset for High Band operation? Source: MAGNET Beyond

(PhysOrg.com) -- Experts believe Personal Networks will run to a thousand devices by 2017, which presents an enormous networking challenge. European researchers are developing some very clever technology to create a Smart Personal Network that can cope with all those devices.

When sensors, personal and home devices and in-car technology are all counted, expert group, the Wireless World Research Forum, believes people will own and use up to a thousand devices by 2017.

It may not be that many in the end, but it will be an awful lot and it will be impossible for an individual to manage all the data, networking, functionality and services for so many tools. Smart Personal Networks

will be essential.

A Personal Network (PN) links together a group of Personal Area Networks (PANs) and all devices and technology belonging to a private entity, whether it is a person, or eventually a car or an airplane. Developing a robust, effective and trustworthy network represents an enormous challenge.

Enter the MAGNET Beyond project, a huge European effort to develop a PN to respond to the challenge posed by 2017. The vision requires a lot of new software and hardware technology and key to the technical effort was the development of the architecture, optimised air interfaces and tailored security.

The architecture in MAGNET Beyond is based on four conceptual layers: connectivity, network, service enabler (middleware), and service layers.

The connectivity layer is able to handle connections to any mix of radio frequency (RF) networks, from Bluetooth to 3G and everything in between. It is also designed to cope with any emerging RF technologies, like Beyond 3G (B3G).

## **Promiscuous PNs**

The connectivity layer masks the underlying RF system from the rest of the MAGNET platform, which provides seamless and hassle-free connections for the user.

The network layer handles the management or creation of Personal Networks and communications within and between PNs. It is also responsible for the creation of permanent or temporary PN federations. A federation exists when two separate PNs link together – to those

belonging to friends, family, clients or colleagues, for example.

The federation can exist on a temporary or permanent basis. Similarly, when the user is travelling, the PN can federate with anyone he or she meets. It is known as a promiscuous PN.

The middleware layer provides overlays for service and context management and acts as a service enabler.

## **Software and beyond**

MAGNET Beyond went beyond software and developed innovative new hardware prototypes for the support of the MAGNET system. The project designed two new optimised air interfaces for Low Data Rate (LDR AI) and for High Data Rate (HDR AI) communications.

The LDR AI is based on ultra-wideband (UWB) transmission with frequency modulation (FM) aiming at short-range applications with low data rates. Transmission is under 10 metres and lower than 100kbps. The interface is power efficient, cost efficient and simple to manufacture and integrate into common devices.

“The project has produced one of the first, if not the first, Ultra Wide Band (UWB) chipset for High Band operation,” explains Liljana Gavrilovska, Technical Manager of the MAGNET Beyond project (see photo 1, above).

UWB is a radio technology that can work with very low energy levels for short-range high-bandwidth communications by using a large portion of the radio spectrum collectively.

The HDR AI, on the other hand, relies on multicarrier transmission with frequency spectrum spreading (MC-SS) to maximise achievable data

rates, which are impressive: the maximum data rate is approximately 130 Mbps. The two radio interfaces can coexist on the same device providing multimode operations (see photo 2)

The HDR achieves its data rate without using multiple-input multiple-output techniques (MIMO), which could push the rate higher. It means the technology has an upgrade path that can cope with higher data rate applications of the future.

The air interfaces are an impressive success, offering a new standard in optimised, low-cost communications.

Even better, other EU-funded projects are keen to take advantage of the new devices. Both ORACLE and WHERE projects are exploring the potential of the HDR AI and OMEGA has also shown an interest. Right now, the MAGNET Beyond HDR is in the patent process.

And that was just one element of the overall MAGNET programme.

## **Personal security**

Security, too, was a major focus of the project and led to a suite of solutions. There were four core activities, with security working across all layers.

The first activity, Personal Network security architecture, looked at network security and group communication. Another activity, Lightweight crypto, examined improvements for pairing devices within a PN, establishing a link between two devices.

A third, Context aware security management, dealt with privacy, profiles, roles and associated security requirements relevant to the user's context, whether at work or home, for example. Finally, the project

undertook validation, implementation, performance and analysis of potential threats and attacks.

The methods developed by the group included a PN federation protocol suite, secured through separate lightweight public key infrastructure for authentication. It also uses a high performance group key management for access control.

The EU-funded MAGNET Beyond project also developed a new physical layer encryption concept that works with very low-power devices. Anonymity, too, was a focus of the security efforts, with the project developing an avatar concept to provide a virtual identity and ensure complete, anonymous access.

In all, the hard and soft technology developed by MAGNET Beyond responded to real, current needs, but designed solutions so that they are flexible and upgradable, and can adapt to new standards and technology in the future.

It is an impressive list of achievements and finally delivers a platform that can create simple, transparent, effective and secure Smart Personal Networks capable of coping with the bewildering growth in personal technologies.

But the real proof of MAGNET Beyond's technology lies in the real-world performance tests undertaken with the prototype in validations and pilot demonstrations.

The MAGNET Beyond project received funding from the ICT strand of the Sixth Framework Programme for research.

*This is part two of a three-part series on MAGNET Beyond.*

**Part 1.** [www.physorg.com/news146150493.html](http://www.physorg.com/news146150493.html)

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