POWERNET

Broadband over powerlines that works and meets the users expectations

IST project: FP6-027953

The market of broadband communications is growing and broadband over power lines (BPL) has a big market potential with the realization of “Broadband for All” objective. The main advantage of BPL is its ubiquitous infrastructure across the world both ‘rich and the poor’.

The main project objective of POWERNET is to develop and validate a ‘plug and play’ Cognitive Broadband over Power Lines (CBPL) communications equipment that meets the regulatory requirements concerning electro-magnetic radiations and can deliver high data rates with low transmit power spectral density and working at low signal to noise ratio.

Technical approach

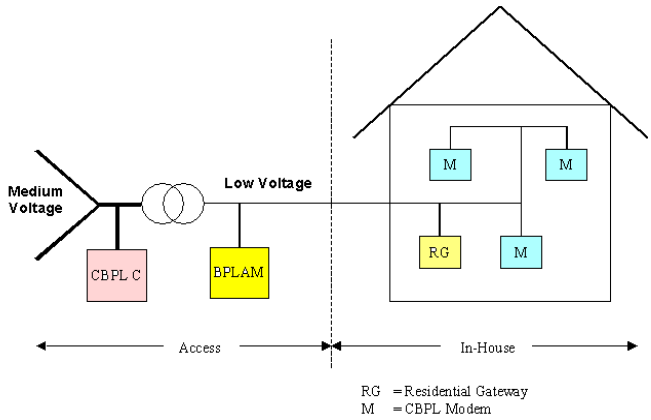
The CBPL technology used in POWERNET employs asynchronous, peer to peer communications between the users to keep the required transmit power spectral density as low as possible to comply with the regulatory requirements. The research is based on several patent applications for the proposed technology based on multi-carrier modulation employing digital filter banks (DFB) to achieve high stop-band attenuation to minimize the interferences in the frequency bands allocated to other users.

POWERNET project proposes to design and implement HW and SW modules for validation of the CBPL technology in the field. These CBPL demonstrators will use FPGA devices to implement the CBPL technology and expensive analog off-the-shelf components. Once the CBPL technology has been validated and the analog signal processing is finalized, analog ASICs will be developed to allow CBPL equipment to be tested in the final field trials at user premises.

The figure shows the CBPL network, comprising both the access and in-house networks. The following types of CBPL equipment are used in the access network: Medium Voltage Communicator, Low Voltage BPLAM, and Residential Gateway.

The In-house CBPL network consists of at least two CBPL P_2_P modems. The In-house CBPL network is connected to the Access CBPL network and the Residential Gateway.

The CBPL modem discovers its neighbourhood during joining the access or in-house power-line network, if the link it is going to use is free. If it is occupied, the CBPL modem will select another channel and it will use a transmit PSD tailored to the path loss between the two modems.



The project[1] aims to achieve the following goals:

- Use low transmit power since they are necessary for low radiation
- Ensure communications even if high path loss is present (at very low SNR)
- Advanced frequency management to sculpture the frequency band for coexistence with the other users of the radio spectrum
- Achieve high data rates

The main features of the system proposed are:

- Use peer-to-peer communications to achieve as low transmit power as possible and have no single point of failure.
- Use collision avoidance and robust synchronization together with a simple protocol for link set up and means for neighbourhood discovery.
- Use of DFB (Digital Filter Banks) instead of OFDM to achieve high stop-band attenuation of each sub-carrier used.
- Use bit allocation to achieve high data rates on sub-carriers having good SNR.
- The compliance to the regulatory requirements concerning radiations operations.
- Performance at very low SNR
- Achievable aggregate data rate at given SNR
- Egress interference in frequency bands allocated to other users like radio amateurs

Expected Achievements[2]

The primary goal of the project is the validation and exploitation of concepts and technologies that have been tested by simulation already. The project will specify, define and develop the HW and SW required for CBPL product development. So, the project partners are expected to commercialise the results of the project in the form of products and services, in the near future after the completion of the project.

During the first year the HW and SW of the system including the Analog Front End (AFE) with off the shelf components has been completed and the first set of trials has been completed. The results are very promising. The figure below shows the CBPL demonstrator unit that was installed and tested during the field trials.

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Coordinator: Dr Sathya Rao, TELSCOM AG

email: *Rao@telscom.ch*

Public deliverables and publications are available here:

Web site: www.ist-powernet.org

[2] **Participants**

Telscom AG	Switzerland
ACN SA	Switzerland
CETECOM	Germany
IMEC	Belgium
Ville de Neuchâtel	Switzerland