Lucerne University of
Applied Sciences and Arts

HOCHSCHULE LUZERN

Technik & Architektur
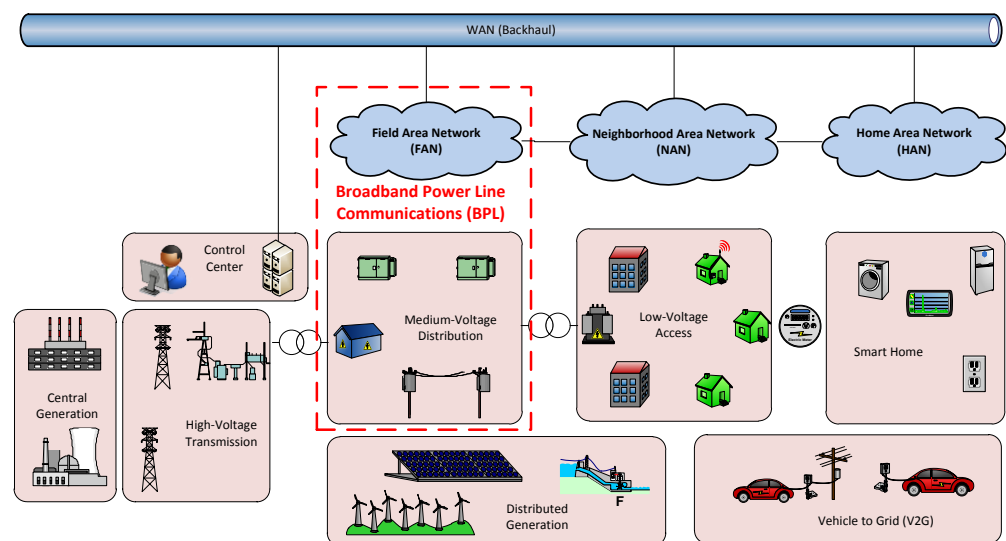
CC Innovation in Intelligent Multimedia Sensor Networks (IIMSN)

Project: Smart Broadband Power Line Topology Protocol SBPL-ToP

Project Objective

The Competence Center for Innovation in Intelligent Multimedia Sensor Networks (CC IIMSN) at the Hochschule Luzern (HSLU) is performing research in the use of Broadband Power Line Communications (BPL) systems within the general context of Smart Grid applications. One current project Smart Broadband Power Line Topology Protocol (SBPL-ToP) focuses on the use of BPL as a Field Area Network (FAN) within the Medium Voltage (MV) electric distribution network. BPL provides a high-speed communications network over the existing power distribution grid interconnecting the substations with the various Transformer Stations (TS) as shown in the figure above. The BPL-FAN is then used for the transmission of aggregated metering data from the Low Voltage (LV) network as well as sensor and control data from the MV TSs for various applications such as Automated Meter Infrastructure (AMI), remote control and management, fault identification and localization, etc.

Applications & State of the Art

Large-scale BPL networks have been successfully deployed especially in Spain covering many hundreds of MV TSs. The use of BPL in the FAN limits the number of required Wide Area Network (WAN) connection points as data may be forwarded across multiple TSs. In this aspect, BPL technology is similar to competing RF mesh solutions. However, while RF mesh protocols have been optimized over many years to provide self-configuration and self-healing capabilities (peer-to-peer routing) which

Project
Smart Broadband Power
Line Topology Protocol
(SBPL-ToP)

Start: 01.04.12
End: 31.10.13

Project Management:
Stephen Dominiak, CC
IIMSN

Contact

Hochschule Luzern
Technik & Architektur
Technikumstrasse 21
CH-6048 Horw

Prof. Dr. Ulrich Dersch
T +41 41 349 35 25
ulrich.dersch@hslu.ch

www.hslu.ch/iimsn

provide increased efficiency and reliability, current BPL technology does not support such features as it has been optimized for use in smaller LV networks. This limitation not only leads to reduced performance, but also very high planning costs for the network operator. However, even though the BPL communications signal is limited by the underlying power line, the topology of MV distribution networks especially in urban/sub-urban environments tends to be more of a meshed topology providing the potential for increased redundancy providing multiple communication paths between different nodes.

Therefore, the goal of the SBPL-ToP project is to adapt the current standardized PLC technology to support such peer-to-peer connectivity and to develop routing protocols which are optimized for the characteristics of the MV power line network. This will not only greatly reduce the planning and management effort of the network provider, but also increase the overall network reliability and performance enabling more advanced applications.

In order to achieve this goal, a computer network simulation framework will be used to assist in protocol development and optimization, but also allow the system to be tested in large-scale environments with many hundreds of BPL nodes.

References

[1] "Broadband PLC for Medium Voltage Smart Grid Applications," S. Dominiak, Lars Andersson, Mikko Maurer, Alberto Sendin, Inigo Berganza, Sixth Workshop on Power Line Communications, September 20-21, 2012, Rome, Italy