

Product updates

Electrical fingerprints

Linking consumer appliances to the smart grid

Pascal Walther is the first graduate from the Master of Science in Engineering (MSE) program at the iHomeLab in Luzern, Switzerland. The iHomeLab is a research center for intelligent living and part of the University of Applied Sciences in Luzern. Landis+Gyr is a partner of the iHomeLab and provided support to the Swiss student during his thesis work. Walther specialized in an area called 'Building Intelligence' and developed an innovative device with smart metering characteristics for use in the home.

An innovative invention

The 26 year old engineer from the Swiss Canton of Valais has developed a product and system that recognizes the type of appliance and its actual consumption in real time – all at the socket. Walther's inspiration for his research and development was that every appliance leaves a unique "electrical fingerprint". In his thesis, entitled PSALM – Power Socket Appliance Load Monitoring, Walther "decoded" this fingerprint using NIALM – Non Intrusive Appliance Load Monitoring. This "fingerprint" is caused by the ripple of electricity flow that comes from an appliance in relation to the mains voltage, which runs at a constant. The ripple from a light bulb, for example, shows a regular sinus shaped pattern, when portrayed on a screen, while a computer screen curve has sharp edges.

Walther developed a system that collected and evaluated information from appliances in a tailor-made database. This information included figures relating to an appliance's active and reactive power as well as its harmonic content. These factors enable the system to recognize one, or many, appliances attached to a single socket and list and monitor them individually. An energy-intensive light bulb and its exact consumption in real time, for example, can be singled out from a coffee machine using PSALM technology.

Behavior helps create a smart grid

In order to make this technology user-friendly and suitable for the home, the Masters student also wrote software that

visualizes the information on a specific in-home display, a smart phone or even TV screen. "Simple icons such as a smiley or a sad face, depending on whether consumption is high or low, can motivate people to save energy," Walther told the Swiss press. The system even gives the end-user tips on how to save yet more energy. The ability to visualize an appliance's activity and consumption in detail provides the end-user with important information. In turn, the end-user can use this to make educated decisions regarding their individual energy consumption. This can lead to fundamental behavioral changes which, in turn, can lead to significant savings in energy usage at the grass roots level in society at large.

Andreas Umbach, President and CEO of Landis+Gyr says, "Landis+Gyr is the interface between the power grid and public and private buildings. Society's drive towards increased energy efficiency, an intelligent power grid – the smart grid – and intelligent buildings brings us closer than ever before to these areas in the public domain. We are therefore very pleased to have an institution such as the iHomelab, which is not only nearby, but also concentrated on the same research fields as ourselves." [continued on page 13 >>](#)



Landis+Gyr, partner of the iHomeLab, provided support to pictured student Pascal Walther for his Masters' thesis.