



# Power Modulation: Ultra Low Cost Power Line Technology to make connected household appliances

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## Abstract

A smart appliance is characterized by three elements: an electronic control circuit, its capability to generate and store information, and the possibility to share such information with the home network (using a communication node).

This work starts describing some fruitful services that would be available if white goods are connected to an home network. Related advantages for the end user will be showed together with motivations why such services are still not available. Main obstacle is cost of communication node, the device that enables appliance to send and receive information on the home network.

An innovative and ultra low cost point-to-point narrow band technology is presented in this work for solving such a problem, enabling a bidirectional communication on the wiring between appliance itself and the outlet where it is supplied. This Ultra low cost power line technology is called Power Modulation because the appliance modulates an internal electric load in order to communicate with an external proxy which includes the communication node.

Adopting power modulation for White Goods means moving around 95% of communication costs out of appliance, together with all problems related to standard technology adopted in the home network (technology obsolescence, size and hookup of communication node). Liberalization and standardization work will be highlighted as Power Modulation will be promoted as open technology standard to move network communication node out of appliances.

Those processes are already started within the TEAHA IST project (The European Application Home Alliance), where specifications and tests around Power Modulation are being carried out. TEAHA project assumes that appliance self-organizes data structure to be exchanged following CHAIN specifications (CECED Home Appliance Interworking Network) and leaving network management functions to the communication node. An innovative solution is investigated in the TEAHA project where a point-to-point narrow band technology is used (Power Modulation) to physically separate the network communication node from the appliance, by including very simple dedicated connections from the device to the network communication system. This solution makes sense when the cost of the very simple connection is significantly cheaper (by one order of magnitude). This approach is widely used, including for PCs where an ultra low-cost USB connection could be used to connect to a WIFI interface device. That solution implies a Proxy approach, that is, a dedicated device acts as a proxy between the appliance and the home network.