Doctorado en Ingeniería

Énfasis en Ciencia de la Información y el Conocimiento

Proposal to develop a management model for domiciliary electricity networks: Conceptual Approach

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1. ABSTRACT

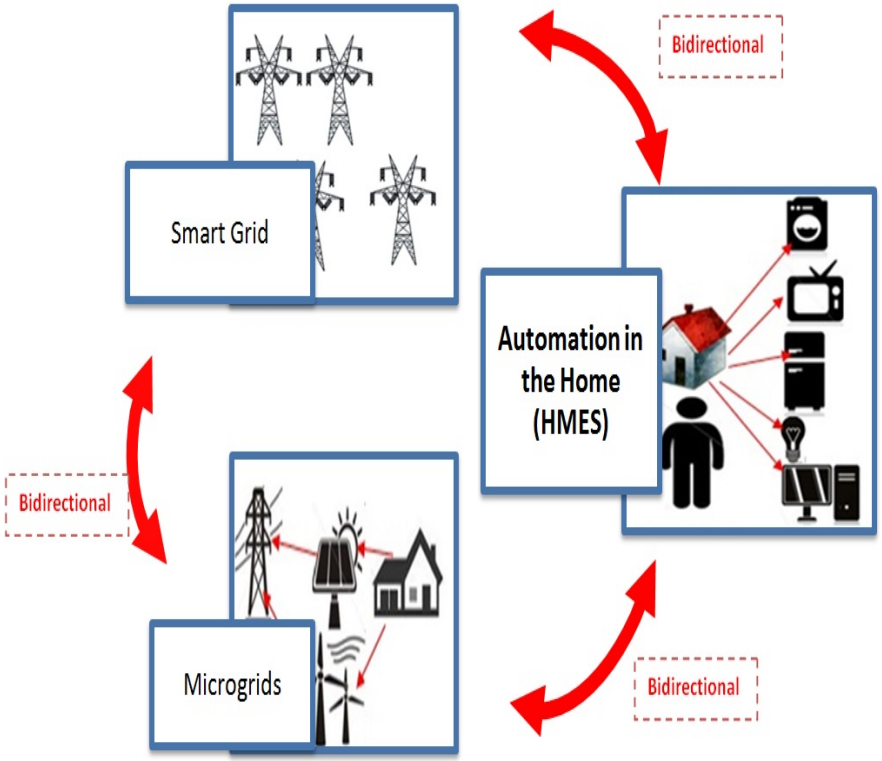
This article describes the development of the methodology which is proposed to model management in home networks conceptually that includes phases where complementarity is observed with the information and communications technology and network architecture involving level of automation devices employing techniques of monitoring, control and reliable communications.

The proposal is to raise the importance of the concept of interoperability between housing and home electrical networks that allows the final customer to go from being an inactive player in the system to an active element in the process of energy management as it relates primarily to the management of energy supply and demand, optimizing the energy consumption , contributing to the operation of the network by reducing peak demand, and therefore is highly related to assertive decision making in different consumption patterns or power generation.

Keywords: Electrical networks, home automation, interoperability, monitoring.

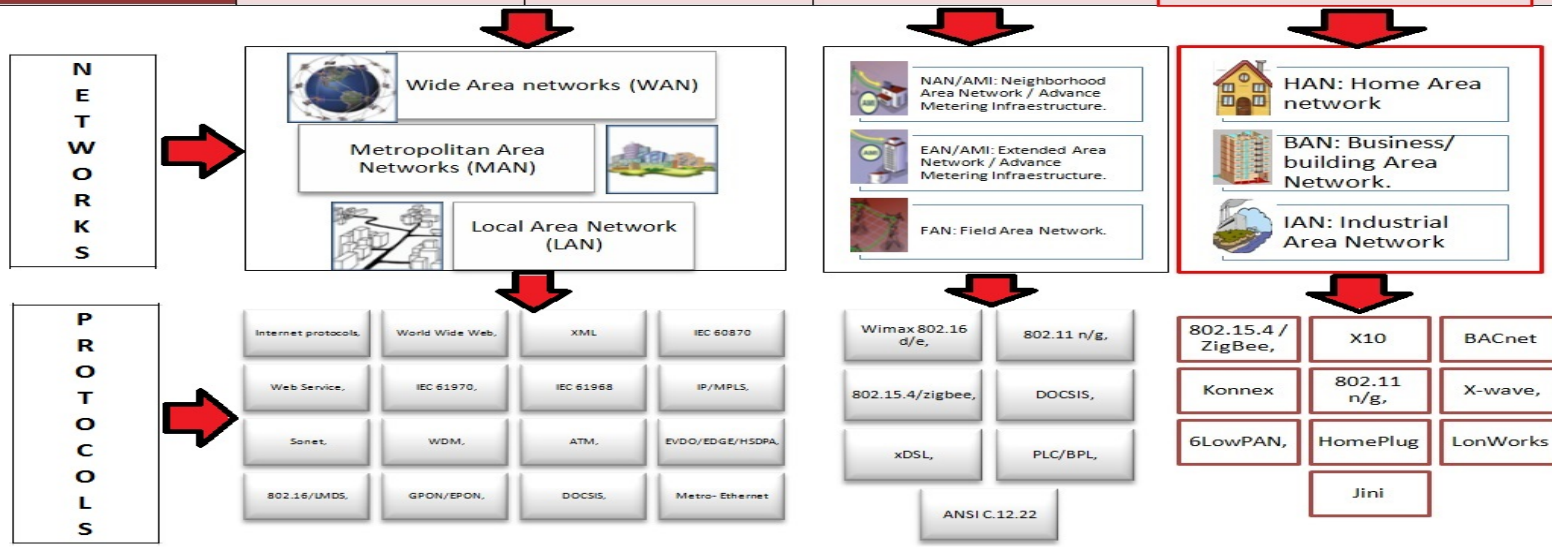
2. Introduction

This paper presents a conceptual approach to a model of energy management in home networks involving information technology and communications and network architecture level of automation in order to link the customer to the value chain.



3. Protocols used in the electrical System attached to the OSI Model

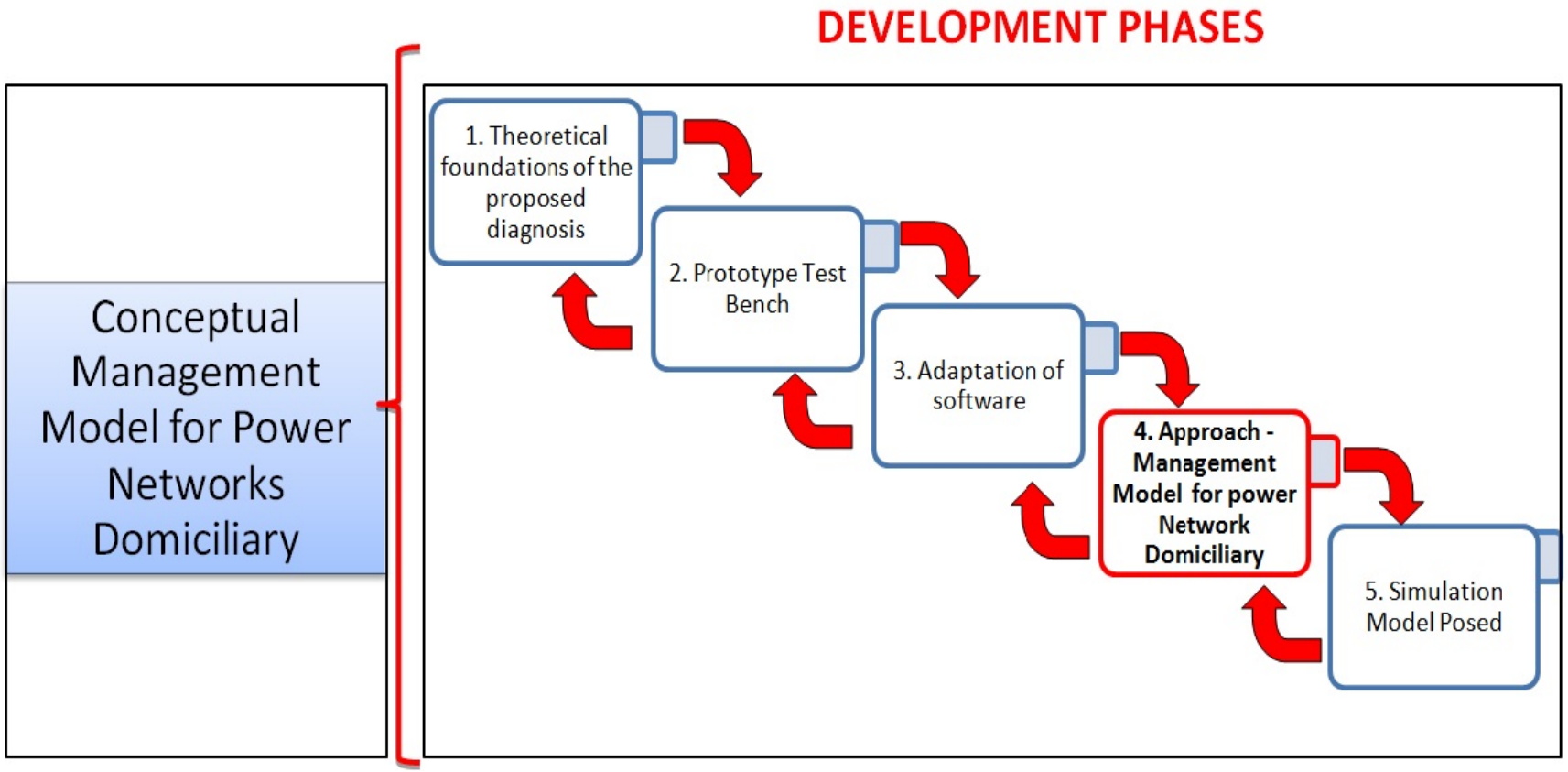
MODEL OSI (Comunicaciones - Open System Interconnection)					
INTELLIGENCE (I)					Digital Dimension
ANALISIS (A)	Distributed – Generation (Dispath, ASMGMT)	Substation Automation (APPS)	Distribution Automation (APPS)	Active Demand FUTURE	
MODEL (M)	Generation Model	SAS Model	SAS & Network Model	FUTURE	
SYSTEM (S)	Social Scada	SAS Scada	Network & SAS Scada	FUTURE	
COMMUNICATION (C)	Local & Remote	Local	Local & Remote	Local & Remote	
INTERFACE (IF)	Sensors	Sensors	Sensors	Meters	
PHISICAL (P)	Sources	FACT, HVDC	Equipment	Home Equipment	Analog Dimension
	GENERATION	TRANSMISSION	DISTRIBUTION	CUSTOMER	



4. Evolving technologies to automate home

1970	•Beginning of home automation technologies (HA). It was difficult because: - There were no economic advantages, very high costs and did not contribute to energy savings. - New network infrastructure was required for use. -Technologies lacked application for users.(Lach et al., 2007)
1988	• Ubiquitous computing, Mark Weiser has responsibility for the concept: device integration scenarios about where you are located, the human being could interconnect lighting and heating systems with an environment control, which worked continuously and imperceptibly.(Weiser, 1991)
1995	• Tele houses: housing type that spins around the use of home physical infraestrcutura for people who are away of where they live. (Echeverría, 1995)
2007	• T, Yamazaki, built a test called the "ubiquitous home", with context-sensitive binding of devices, sensors and devices via a data network. They installed several cameras and microphones in every room. Remote connectivity. Introduction of domestic robots helpers. (Yamazaji, 2007)
2010	• Apple has made a patent on the use of household electrical grid is shown for use as a data network, and your energy level management. In the patent a device that shows the status of the grid of the house with connected devices appears. (Patently Apple, 2013)
2010	•D. Han, J. Lim. Energy Management System in Intelligent Home (SHEMS) based on a IEEE802.15.4 y ZigBee ("red de sensores ZigBee") (Han et al., 2010)
2012	• Energy management system at home (HEMS) for complete automation that combines computational and physical systems in a local area, which excludes the control and management of the operator. The system is designed to be built on universal architecture Plug-and-Play, and can be accessed over the Internet. (Kim, 2012)
2014	•Proposal to develop a model home electricity management. Adriana Marcela Vega Escobar

5. CONCEPTUAL PROPOSAL FOR THE DEVELOPMENT OF A MANAGEMENT MODEL FOR ELECTRICITY NETWORKS DOMICILIARY



5.1 Theoretical foundation and diagnosis

1. Developing a approximation between the state of the art communication protocols, sensors and other electrical elements used in domiciliary networks.

2. Diagnose possible test scenarios according to the theoretical foundation.

3. Pre-select the communication protocol, sensors and other elements used in accordance with its relevant technical aspects, benefits and involvement in model development.

5.2 Prototype – test

1. Preliminary Design Model for domiciliary electrical networks.

2. Select the elements that will be tested for the home grid based on the theoretical foundation and the preliminary model.

3. Design, Construction and Implementation of a scalable test bench according to the preliminary model proposed.

5.3 SOFTWARE ADAPTATION

1. Define and analyze the functional requirements necessary for the software, taking into account the technical specifications of the physical setting which is already built or workbench (communication protocol, sensors, appliance, etc.)

2. Design the prototype software based on use cases to define the processes that take place and the system behavior.

3. Develop or adapt the prototype software that meets the proposed scenario, with algorithms that make the management of home electrical network with devices connected to it.

4. Perform function tests attached to workbench or previously constructed physical setting software.

5.4 APPROACH - MANAGEMENT MODEL DOMICILIARY ELECTRICITY NETWORKS

1. Model function tests.

2. Performance evaluation model.

5.5 SIMULATION OF THE PROPOSED MODEL

1. Preparing the simulation workbench or physical setting of the home grid and the prototype software developed for adaptation.

2. Development of the simulation by testing its operation, both control and monitoring.

3. Taking data variables.

4. Analysis and evaluation of results obtained in the simulation.

5. Conclusions and recommendations of the data.

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QUESTIONS?