



ISSN: 2230-9926

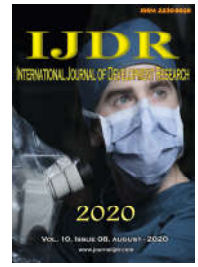
Available online at <http://www.journalijdr.com>

# IJDR

*International Journal of Development Research*

Vol. 10, Issue, 08, pp. 39523-39526, August, 2020

<https://doi.org/10.37118/ijdr.19634.08.2020>



RESEARCH ARTICLE

OPEN ACCESS

## POWER LINE COMMUNICATION: ELECTRIC TRANSMISSION NETWORK AS A SPREADER CHANNEL SOLUTION FOR INTERIOR IN AMAZONIA THAT DOES NOT HAVE AN INTERNET PROVIDER STRUCTURE

Ricardo Sabino de Araújo Filho, Fábio Peso da Cruz, Jean Mark Lobo de Oliveira  
and \*David Barbosa de Alencar

Av. Palmeira Imperial, Brasil

### ARTICLE INFO

#### Article History:

Received 03<sup>rd</sup> May 2020

Received in revised form

14<sup>th</sup> June 2020

Accepted 11<sup>th</sup> July 2020

Published online 30<sup>th</sup> August 2020

#### Key Words:

Electric network. Data communication. Power line communications (PLC). Media.

#### \*Corresponding author:

David Barbosa de Alencar

### ABSTRACT

In the Amazon region, the internet did not reach all municipalities, which affects public services. When there is no connection, speed is slow and service expensive. PLC, the objective is to offer a decent internet, which makes a series of data network services with the same quality found in other regions of the country viable: broadband internet, telemedicine, distance education, education and research institutions, and call between health, public safety, traffic and tourism. In addition, the connection will also favor an improvement in military communications at the border, offering gains for national defense.

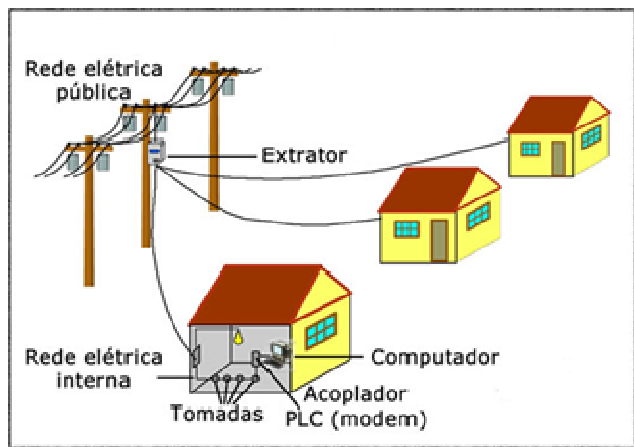
Copyright © 2020, Ricardo Sabino de Araújo Filho et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Ricardo Sabino de Araújo Filho, Fábio Peso da Cruz, Jean Mark Lobo de Oliveira and David Barbosa de Alencar. "Power line communication: electric transmission network as a spreader channel solution for interior in Amazonia that does not have an internet provider structure", *International Journal of Development Research*, 10, (08), 39523-39526.

### INTRODUCTION

With the coronavirus pandemic and social isolation, it forced many professionals to adapt through social networks and video conferencing programs in order to be able to continue their work. An example of this is the teachers who were destined to modify the teaching methodology for teach classes at home. However, the lack of Internet and the instability of the network complex the work. This being the case, our capital does not have a connection in all neighborhoods, and the biggest inconvenience is that many students live in the interior of Manaus, where the internet is something far from their current reality. The internet via electric energy demonstrates the development and monitoring of society, that is, the evolution and growth are encompassed, being essential new ideas that need to follow the real needs of internet users who need to get the most information in record time, so the internet via electric power can be used as a technological and innovative process, thus the Power Line Communication (PLC) cause countless

advantages for society in the view of Pinto & Albuquerque (2014), for Gustavo, Martins & Gimenez (2016) the internet via electric power, follows the evolution of society, so without a doubt, a strong ally in the development process of current scenario, as it is possible to adopt methods of use that work by means of radio frequency, where it is essential to have efficiency of the electric distribution network, since this will act as a means of transport for considering the supply of signals that direct communication. Murata & Ferreira (2009) emphasizes that the internet via electric power strengthens the relationship and communication between the citizen who enjoys the internet and technological evolution, and finally, Cardoso (2008), establishes in his thesis that the internet via electric power has evolved today, and this was due to the need for new technologies that already enjoyed the systems already installed, as is the case of the PLC that makes the structure of posts and wires that are used by the energy utilities applicable. The general objective is to find out how internet technology can be implemented through an electrical network, as well as to determine the advantages and disadvantages of this technology called Power Line Communication (PLC).



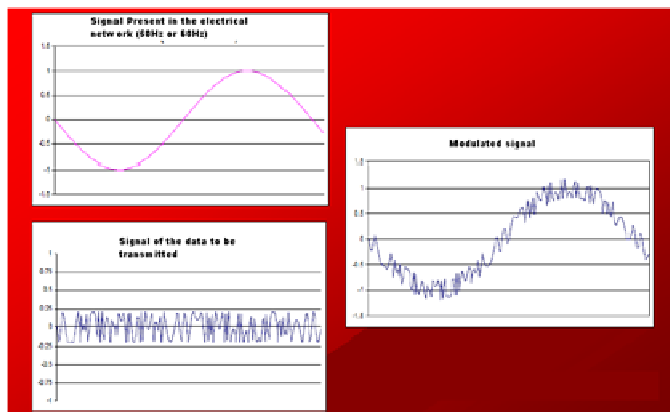
Source: <https://www.bpiropo.com.br/fpc20100823.htm>

Figure 1. PLC network

The lack of internet in most of the municipalities of Amazonas is directly linked to the lack of infrastructure of Internet Providers, making this connection impossible. The PLC, is a result that comes to solve this connection problem because as the electrical network reaches some regions where providers have not yet arrived, either due to time or lack of structure, since once the main structure exists, residential connections are possible.

### Theoretical Reference

**PLC (Power Line Communication):** Also known as Power Line Telecommunications (PLT), it is the communication technology that makes use of the existing public and private wiring for the transmission of [signals. Using PLC communication signals, high-speed data, voice and video are transmitted over low voltage power lines.



Source: Texas Instruments

Figure 2. Modulation of the information to be transmitted

### What is power line communication?

The technique of transferring energy and data for communication through the same existing wire network from one end to the other is called Power Line Communication. It offers broadband data communications on conductors that are already in use for the transmission of electrical energy using a modular signal. This can now be done through domestic or local wiring and also through the existing electricity distribution system. BPL (broadband over the power line) is also known as the power line Internet, which supports PLC

technology to authorize access to the Internet through transmission lines. BPL technology with PLC is often used in remote locations where limited Internet access is available via cable or PDSL connections.

### Types of Transmission

- ✓ Internal network: High-speed data transmission can be supplied to home networks using electrical wiring from the internal network.
- ✓ Broadband through the power line: Broadband Internet access can be supplied through the electrical wiring of the external network.
- ✓ Internal narrowband applications: Low bit rate data services, such as home automation and intercoms, can be monitored and used for communication via the internal power grid.
- ✓ External narrowband jobs: external narrowband applications can be used for automatic meter reading and surveillance or remote control.

### How does the PLC work?

Like any other communication technology, the PLC also consists of a sender that modulates the data to be sent by a means of communication and then the receiver demodulates the data for later use. In addition to sending signals for communication, the PLC also allows the user to control and monitor all devices connected to the power line, because it is implemented in the same wiring system.



Source: DEVMEDIA

Figure 3. PLC network devices

**Internet for the Interior of Amazonas:** The internet is certainly one of the most significant advances in recent decades. Its popularization started in 1994, and, 25 years later, there is still much to grow, especially in the Amazon, where only 63% of households have access to the internet (IBGE). In Amazonas it is even more reduced, and the interior is the one that suffers the most with the connection incompatibility.

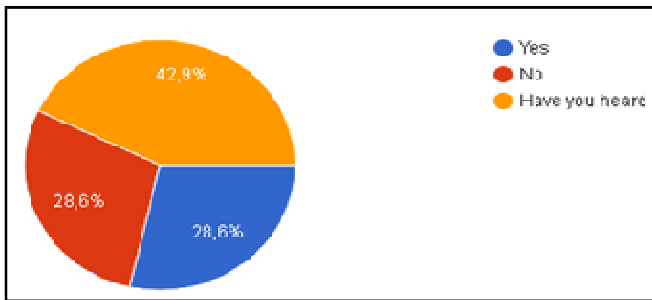
## MATERIALS AND METHODS

A survey of data on the knowledge of the population regarding the internet via electric power was carried out to understand their level of understanding and thereby raise factors and positives and negatives for its implementation in homes and businesses. PLC technology is undergoing great transformation, and most people end up experiencing an

interest in getting to know better. Thus through studies and some revisions of articles and other literature that had been applied previously, in some regions of Brazil.

**Data collection instruments**

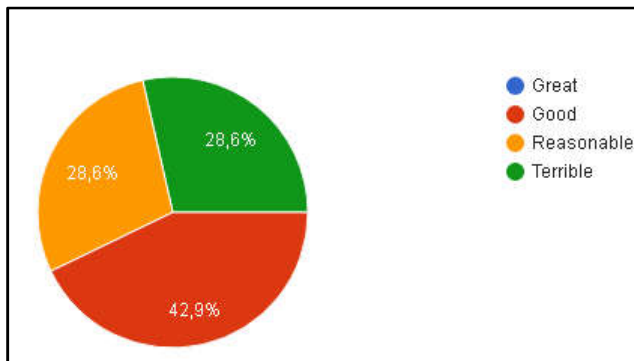
A questionnaire was conducted with 4 closed questions for one hundred (100) people who use the Internet, aged between 30 and 45 years old, to find out the level of understanding of accessibility regarding the Internet via electricity. Daily, many users complain about existing technologies for not offering a fast service, which will meet the demand in a broad and clear, safe and practical way.



Source: Author (2020)

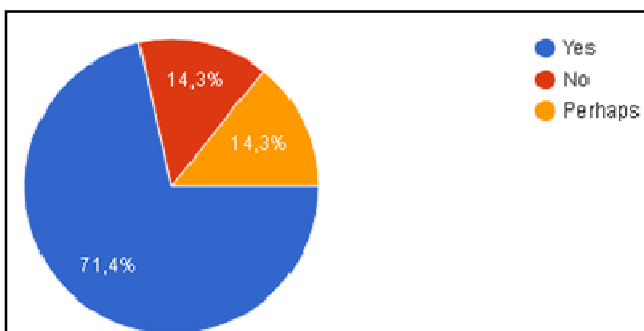
**Graphic 1. Knowledge about the internet via electricity**

According to Graph 1, 28.6% of respondents answered that they know the internet via electricity, another 28.6% do not, and with the majority of 42.9% they have heard of this type of access.



Source: Author (2020)

**Graphic 2. Satisfaction level of existing internet technologies**

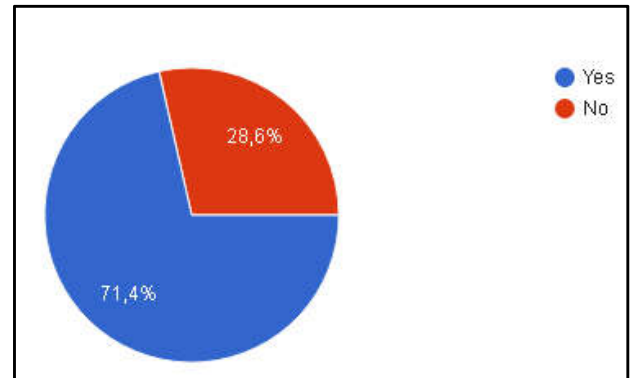


Source: Author (2020)

**Graphic 3. Regarding the use of PLC technology and its benefits**

Regarding the level of satisfaction of the existing technologies, 0% consider the Internet via Broadband and 3G Technology to be excellent, another 42.9% as good, 28.6% already

reasonable, and 28.6% said they were dissatisfied with the technologies used via phone. In Graph 3, 71.4% of the interviewees consider PLC technology and its benefits to be an overcoming of existing technologies, another 14.3% do not believe that the internet via electricity can be real and that they can neither use it, since 14.3% of respondents believe that this reality may soon be in the home of any citizen.



Source: Author (2020)

**Graphic 3. The preference for Internet via electricity inside the home**

Graph 4 clearly shows the preference of people, with 71.4% of support and insertion of the internet via electricity, and another 28.6% for not knowing the services do not believe in this type of access. PLC technology is still little discussed among communication companies, it is noted that the preference for new options grows every day, further strengthening the standardization of these resources.

**RESULTS**

The questions were listed according to the categories created during the study by preference of the internet users' opinion. Issues related to knowledge, use, feasibility, access and cost reduction. These resources now show that people need to be aware of the benefits of this technology in order to better produce equipment that reduces uncertainty and the burning of molds. The effects pointed out that this new communication structure could be assiduous, both in commercial areas and in residential areas, so throughout the experience, users can question their connections, observing the quality of the service. Thus, it is worth remembering that its standardized interfaces must be reconcilable to the PLC, capable of reporting on the resistance of the services provided. Therefore, the eventual problems can be revised in order to improve the quality of the connection, security and the like.

**Conclusion**

Being a little old technology, but not propagated and little explored, the PLC technology still needs studies in the area of developing solutions in areas such as those of modulation techniques, so that more and more, the signals are resistant to noise, as well such as equipment that reduces the incidence of these noises. With the development of such solutions, PLC technology can be an ally against the digital exclusion that exists in our interiors, a possibility for current Internet distributors to have greater coverage for their services and to reach where no other has reached, can help improve the quality of distributed energy and the support given to its customers. This technology can also further stimulate the development of solutions aimed at home automation. I believe that in the near

future we will be able to hire PLC Internet services in our interiors, seeing that in Europe this is already possible.

### Acknowledgments

I dedicate this work in the first place to God, who gave me health and strength to overcome all the difficult moments that I faced during my graduation, to my father Ricardo Sabino de Araújo, and my mother Maria Angela da Silva, for being essential in my life and to all my family and friends for encouraging me to be a better person and not giving up on my dreams.

### REFERENCES

- ALVES, J. C.; RAMOS, G. S. Transmissão de dados via rede elétrica: um estudo bibliográfico sobre a tecnologia PLC. In: ENCONTRO INTERNACIONAL DE GESTÃO, DESENVOLVIMENTO E INOVAÇÃO, 1., Naviraí, MS, 2017. Anais... Naviraí, MS: UFMS, 2017.
- ANDRADE, R. T. BPL (Broadband Over Powerlines) II: características e aplicações. FITEC: inovações tecnológicas. 27 nov. 2010 Disponível em: < <http://www.teleco.com.br/pdfs/tutorialbpl2.pdf> >. Acesso em: 20 fev. 2020.
- ARAÚJO DO NASCIMENTO, J. M.; LUCENA, P. B. Protocolo Modbus: Redes para Automação Industrial – DCA2401. Rio Grande do Norte: UFRN, 2003. Disponível em: < [https://www.dca.ufrn.br/~affonso/FTP/DCA447/trabalho3/trabalho3\\_13.pdf](https://www.dca.ufrn.br/~affonso/FTP/DCA447/trabalho3/trabalho3_13.pdf) >. Acesso em: 3 ago. 2020.
- CARDOSO, J. R. Transitórios em linhas de transmissão. Apostila para a disciplina de graduação do departamento de engenharia elétrica de energia e automação elétrica – Teoria eletromagnética. São Paulo. 2008.
- COSTA, J. S. S. Internet Via Rede Elétrica. Manual das Faculdades Unificadas Doctum Cataguases. Rio de Janeiro. 2009.
- DIAS, A., Power Line Communication - PLC: Comunicação de dados através da rede elétrica. Disponível em: <http://site.megaomni.com/img/489/PLC%20Power%20Line%20Communication.pdf> Acesso em: 26 de Janeiro de 2020.
- FRANÇA, A. M; LIMA, A. F; NAVAS, L. M. A tecnologia PLC: oportunidades para os setores de telecomunicações e energia elétrica. Disponível em: <http://www.teleco.com.br/tutoriais/tutorialkbns/default.asp> Acesso em: 20 de Fevereiro de 2020.
- GUSTAVO, V. S; MARTINS, E. J. C; GIMENEZ, L. B. G. *Power Line Communication*: arquitetura, funcionamento e aplicações. Seminário de Redes e Sistemas de Telecomunicações – Instituto Nacional de Telecomunicações (INATEL). São Paulo. 2016.

\*\*\*\*\*