

Broadband over Power Line

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Abstract: In this paper a large number of aspects of Broadband over power line (BPL) in Communication Network are presented. The aim of this paper is to focus on the BPL access technology in term of options, working, drawbacks, preparation, future challenges, benefits and scope etc. BPL is currently a growing communication network technology that is kind of quick touching the competitive market of broad band net services in international telecommunication atmosphere. In this era of technology internet is playing a vital role in advancement of technology and development of nation, as it providing instant services like video calling, e-mail, source of information, internet banking act due to which it is widely used in Banks, Aviation systems, Hospitals, Universities and schools etc.

Keywords: Broadband over power line (BPL), orthogonal frequency division multiplexing (OFDM), power line communication (PLC).

1. INTRODUCTION

BPL is a simple way for sending data over high speed communication over electrical power lines. This could be accomplished by coupling RF energy with alternating Current onto existing power line. This could be done by using number of devices at the reception and transmission side . In it we use two types of BPL i.e. Access BPL, In-house BPL, or a combination of both technologies. In order to make use of BPL, subscribers use neither a phone, cable nor a satellite connection. Instead, a subscriber installs a modem that plugs into an ordinary wall outlet and pays a subscription fee similar to those paid for other types of Internet service. Broadband over power line (BPL) presents the unique opportunity to provide truly universal broadband access.

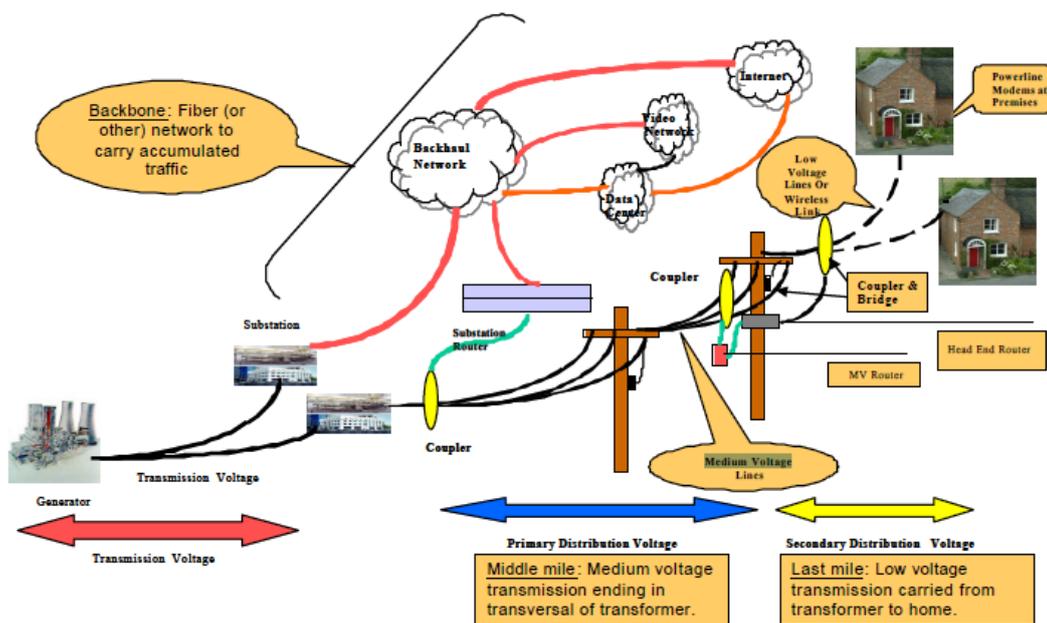


Fig 1 : Overview of BPL systems

2. TYPES OF BPL TECHNOLOGY

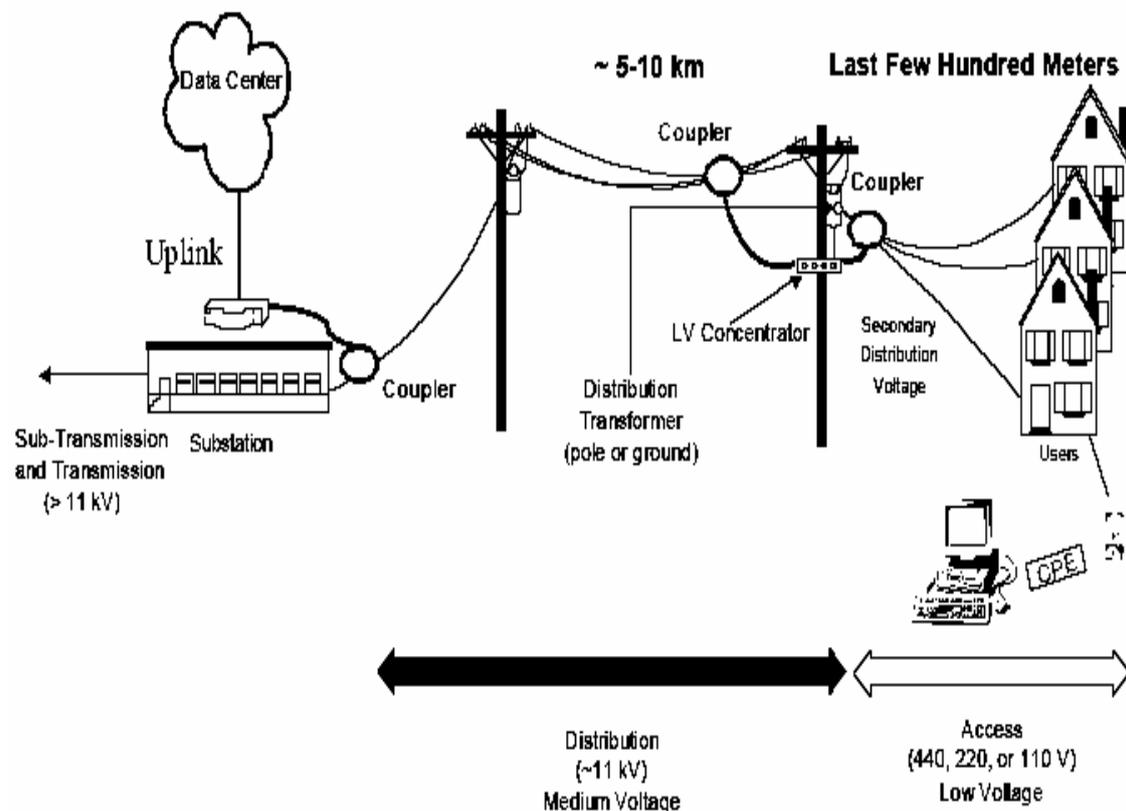
BPL is spited into two types –In-house BPL and Access BPL. These two differ on basis of there use and there radiation characteristics.

1 In House BPL: In house BPL system is most widely used application of BPL were the home networking on the voltage electricity lines within the household is done .Several years ago in house BPL was considered to be most optimum option for home broadband service as the wireless devices are quite expensive than this system but in past few years the prices of wireless systems (Wi-Fi) have dropped dramatically and have largely overtaken the in house wired alternatives .

2 Access BPL: It is a technology that provides broadband access over medium voltage power lines. Medium voltage power lines are the electric lines that you see at the top of electric utility poles beside the roadways in areas that do not have underground electric service. This system is deployed of broad band internet access on the medium voltage power lines (Access BPL), since these signals are capable of being carried throughout the utility power distribution grid . In its early stage of development this technique was termed as power line communication (PLC).PLC is being in use since , last 25 years but the advancement in modulation techniques and technology have led to significant increase in the throughput of power line carrier .

The lifecycle of electricity from generation to household use can be split into little hopes:-

- I. Generation
- II. High voltage transmission line
- III. Substation for voltage step down
- IV. Medium voltage transmission line
- V. Low voltage step down and transformer
- VI. Down drop from transformer to customer premises
- VII. House meter



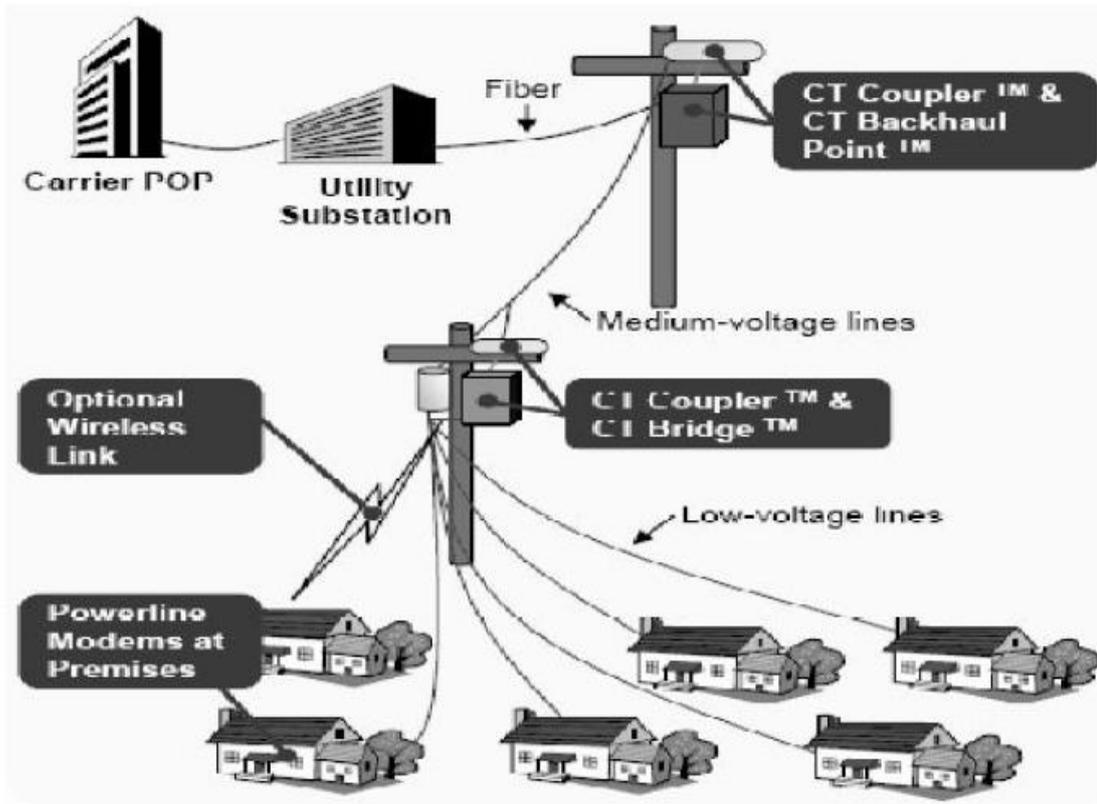


Fig 2: Power line distribution

OFDM is frequency multiplexing is a digital modulation technique in which several narrowband channels at different frequency .In this technique, a large number of closely spaced orthogonal sub carriers are used to carry data. The data is further divided into several data channels one for each sub carriers . Each sub carrier is then Modulated with conventional modulation schemes.

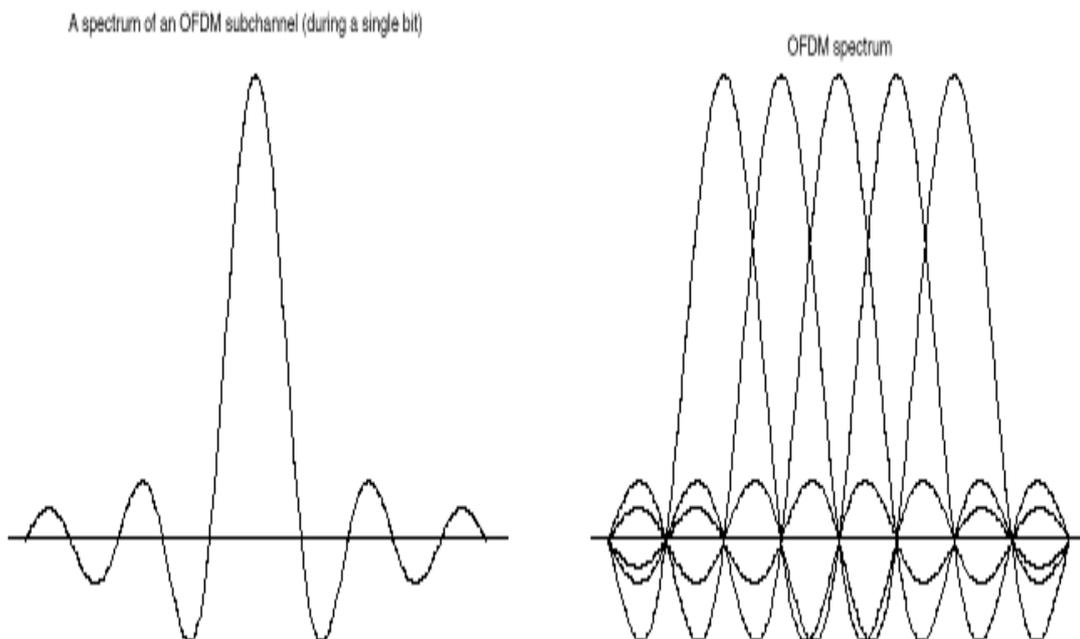


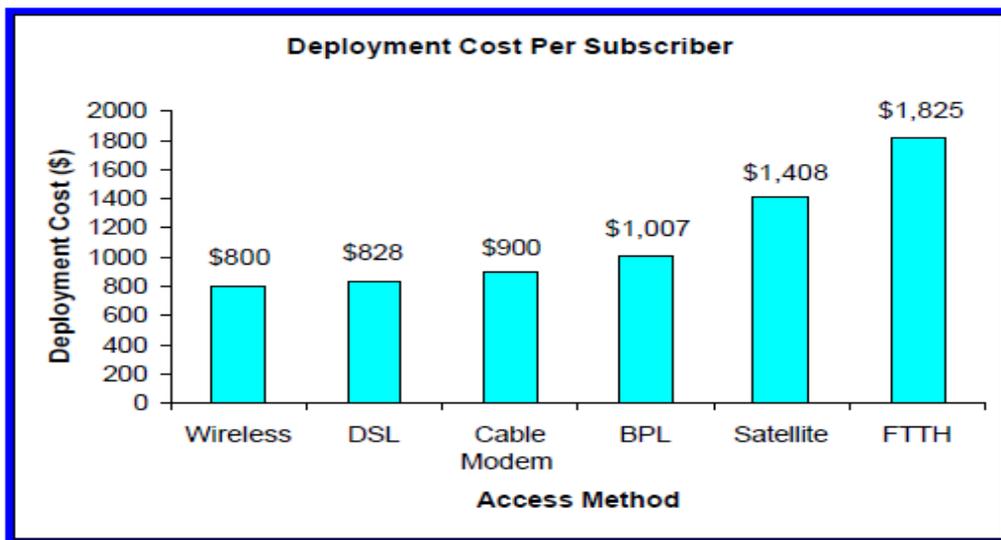
Figure 3: OFDM

3. ADVANTAGES

BPL has the ability to provide internet service by means of transmission line control protocol/ Internet protocol (TCP/IP) which can support voice, Data and video services the advantages therefore are;

I. Wide Coverage: BPL can provide wide coverage, since the power lines are already installed almost everywhere. This is advantageous especially for substations in rural areas where there is usually no communication infrastructure.

II. Cost: The communication network can be established quickly and cost-effectively because it utilizes the existing wires to carry the communication signals. Thus, PLC can offer substations new cost-saving methods for remotely monitoring power uses and outages.



4. DISADVANTAGES

1. High noise sources over power lines: The power lines are noisy environments for data communications due to several noise sources such as electrical motors, power supplies, fluorescent lights and radio signal interferences. These noise sources over the power lines can result in high bit error rates during communication which severely reduces the performance of BPL

2. Capacity: Power line is a shared medium and therefore, the average data rate per end user will be lower than the total capacity depending on coincident utilization, i.e., the number of users on the network at the same time and the applications they are using. Thus, possible technical problems should be comprehensively addressed with various field tests before the BPL technology is widely deployed

3. Open circuit problem: Communication over the power lines is lost with devices on the side of an open circuit. This fact severely restricts the usefulness of PLC for applications especially involving switches.

4. Signal attenuation and distortion: In power lines, the attenuation and distortion of signals are immense due to the reasons such as physical topology of the power network and load impedance fluctuation over the power lines. In addition, there is significant signal attenuation at specific frequency bands due to wave reflection at the terminal points. Therefore, there is loss in signal due to high signal attenuation and distortion.

5. CONCLUSION

This technology has great aspect as future point of view providedly the various issues concerned with security and other aspects could be removed. In developing countries like India where infrastructure of towns and villages are not so developed where DSL, coaxial cables could be used there this BPL could be used because as it uses existing power lines only therefore internet could be made easily available in villages and town.

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