

Unlocking the potential of power distribution networks

Many people thought that Powerline telecommunications (PLT) was dead, the final nail in the coffin being the withdrawal of NOR.WEB from the PLT arena. That couldn't be further from the truth.

by David Hines

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THE SOUND of that nail being driven home seems to have awakened dozens of new companies, offering exciting new technologies and services. The latest enabling technologies have unlocked the potential of power distribution networks and PLT has now emerged from obscurity.

Indeed, recently, the advent of broadband PLT was significant in pushing a major European energy company's share price to a record high. Following February's announcement at the CE-Bit conference, the German energy giant, Veba, witnessed a sudden 15 per cent increase in its share price. Pretty spectacular when you consider that this is the fourth largest industrial group in Germany and not a, so-called, internet or high-tech stock. The announcement that caught the imagination of the market was Veba's venture into PLT through ONELINE AG, a new PLT service company focussing on supporting power utilities to enter the information society by providing broadband PLT access to their customers.

ONELINE AG is planning a major, 400 household, trial this year with Avacon (www.avacon.de) one of the largest regional power distribution companies in Germany, based in Helmstedt with more than 1 million customers. "We are investigating the networks - the feasibility of the networks, not to select the best networks, but to see that we have a large variety of networks so we can very broadly test the acceptance and technical features of the product", commented Dick Mensing, chief executive of Veba's new venture.

Is powerline communication alive?

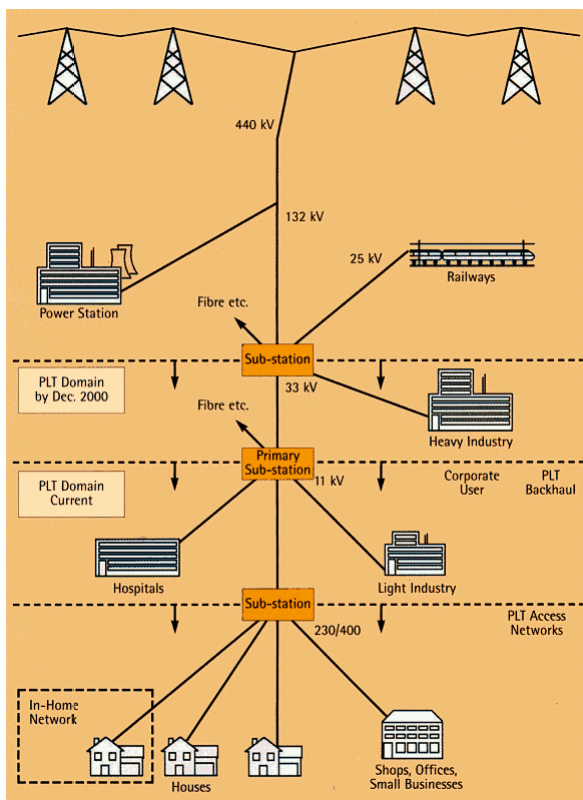
Considering PLT from the industry perspective, "recent reports of my death have been greatly exaggerated" may be an accurate sentiment. In a nutshell, powerline telecommunications is a rapidly evolving market that utilises electricity power lines for the high speed transmission of data and voice services. The especially exciting thing about the potential for PLT is that it holds the promise of solving the underlying structural problem confronting the local access market today. PLT can provide the holy-grail of a much needed, highly elusive, alternative source of ubiquitous local loops other than the incumbent telco operator, something we sadly have yet to see happen on a sufficient scale and scope. Indeed, what makes PLT so attractive from a public policy point of view are the facts that:

- the power grid is ubiquitous, it constitutes an existing network infrastructure to billions of private consumers and businesses
- the power grid offers last-mile conductivity
- the power grid supports information based services with strong growth potential, as Lawrence J. Spiwak, General Legal Counsel to the International Powerline Communications Forum, remarked in a recent pleading to US regulators.

CE-Bit this year saw a plethora of companies offering a variety of new powerline technologies, and there was no shortage of interest in what is actually only the tip of the PLT iceberg. Collectively, available PLT technologies will deliver broadband connectivity from the wall socket to the high voltage primary substation, where most power distributors have access to fibre... and the cost is plummeting. For example, a complete, palm-top-sized 2.5 million bits (Mbit) per second PLT modem board will sell for less than \$50 when it goes into production. The manufacturers have also demonstrated a 12 Mbit per second device. Yet another manufacturer in North America has announced that they have successfully tested a 25 Mbit per second device, powerline communications is very much alive. By way of comparison, typical PC modems transfer information from the internet at 0.056 Mbit per second, and just about half that from the PC out to the network.

So, the challenge now for the power distribution company is to seize this technological opportunity and take their traditional businesses into the internet age. The Veba phenomenon indicates that a traditional business can take on the characteristics of an internet stock, as new technology unlocks the communications barrier between the telecommunications and power distribution networks.

The business case is clear; deregulation poses both a challenge and an opportunity. On the one hand, secure markets are being eroded; United Utilities' NORWEB in Manchester, UK, lost a quarter of a million customers last year and has offered the company for sale. Yet its power distribution network is not limited to carrying a 50/60Hz power supply, it could be carrying broadband digital signals of 20 Mbit per second at the same time; generating new revenue streams from existing fixed assets with marginal incremental cost.



Ironically, NORWEB were the pioneers of PLT before they partnered with Nortel in the ill-fated NOR.WEB, the demise of which still remains a mystery. The cause certainly was not the technology and with the internet and e-commerce worlds hungry for bandwidth, it is difficult to believe the causes were simply commercial. Maybe it was just the wrong time. In internet and computer terms, the world is a very different place today than it was last September when NOR.WEB announced its closure. The good news is that NORWEB still has its power distribution network and the technology, services and business strategies are at hand to renew its fortunes.

Transformer barrier broken

The business case for PLT, particularly in the US, has faltered over the difficulty of bypassing transformers, enabling signals to be carried from low to medium voltage networks. In the US, a substation typically only serves a handful of customers, therefore there is a need to incorporate low-cost transformer bypass and medium voltage transmission technologies to make PLT viable. These technologies are now to hand and volume sales will inevitably drive the price down to manageable

proportions. In computer terms, PLT has not yet reached the *Pentium* processor stage of price and performance, but high volume will inevitably make that happen.

Home networking will drive PLT

PLT home networking products are already on the market, 10 Mbit per second at every socket in the home means that computers, printers and a host of other peripherals may all be networked together via existing in-home wiring in a simple, tidy and flexible way. The birth of the PLT home 'info-space' has arrived, and the natural urge to connect that space to the information society will be a major driver for the delivery of PLT access technologies worldwide.

A viable local access solution?

The nay-sayers point to other providers of bandwidth, including digital subscriber lines such as ISDN (xDSL), cable and wireless local loop. But, it is the very existence of those alternatives which indicates the insatiable demand for bandwidth now being generated by the information society, and it's just the beginning.

The European Commission has acknowledged this by recently commissioning a project under its 'Information Society's Technology 1st Programme' to develop and test a complete service and commercialisation package for potential players in the PLT market. The package comprises: technical simulation and consulting tools, initial business and ready to implement service models, as well as concrete roll-out strategies. The project, dubbed 'PALAS', will provide a complex and coherent approach to reduce time-to-market and increase certainty on market, technological, organisational and economic issues. The project aims to accompany and support a quick and sustainable development of a market segment (PLT) that will become major infrastructure in the development of the information society in Europe.

From wall socket to substation

The PLT industry at the technology level splits into three main categories:

- high-speed in-home local area networks
- viable meter to substation point to multi-point connectivity
- high-speed medium voltage substation to primary substation

In-home technology is being vigorously pursued by at least a dozen companies worldwide. Some products are already available on the market, with many more scheduled to be released, later this year. Speeds are generally around the 10 Mbit per second (10 base T equivalent) operating at relatively low power, but adequate to service a home of around 600 square meters. There is seen to be a high demand for these products, particularly in the US. The in-home network will handle standard transmission control and internet protocols (TCP/IP), making the powerline home network invisible to the computer system. The attraction for manufacturers addressing this market is, of course, the fact that they do not have to convince a power utility to attach their equipment to the network. There also appear to be fewer regulatory obstacles, although there will doubtless be many intellectual property rights (IPR) battles in the future, as is common with developing technology of this type.

The basic communication devices remain unchanged between the in-home and access solutions, but problems of connectivity related to safety and standards issues need to be addressed.

Understanding these characteristics and identifying and applying available technology to efficiently, and reliably, perform over those networks requires care, experience and attention to detail.

This link in the PLT chain also has uncertainties relating to regulatory issues. These issues surround the use of the radio spectrum and the relationship between the modulation technique adopted, the power required to transmit over the required distance, and the levels of electromagnetic emissions generated. Current research is being undertaken to model the deployment of this technology in terms of any cumulative effect of these emissions. Current theories indicate that if ubiquitously deployed, signals would tend to have a cancelling effect, thereby eliminating any significant interference, although these matters are still the subject of research and speculation.

The business case is also affected by the architecture of the power distribution network. Network architectures that support large numbers of customers from a single substation indicate a stronger business case than those networks with smaller numbers served from the substation - the reason being that a greater number of customers sharing the capital expenditure of installation gives an earlier break-even point.

The medium voltage network between the primary and secondary substations is the final link in the PLT chain. With the transformer barrier now broken, the business case for PLT is much more secure. Interestingly, because of the characteristics of medium voltage powerlines, the radiation caused by any communication signals placed on those lines is at a lower level of power or intensity and is less likely to cause problems, which means that this link is free from many of the regulatory problems associated with the low voltage networks. As an added bonus, very large numbers of business customers, public buildings, hospitals and the like, take electricity at the medium voltage. And, of course, these are the people in most urgent need of bandwidth as they accelerate towards a world of e-commerce. Little wonder that incumbent telecommunications operators fear the emergence of PLT as it begins to stalk this lucrative market sector.



Fears of the effect of sharing available bandwidth on PLT networks are also rapidly receding as efficient, transparent protocols dynamically allocate bandwidth as required. Each user apparently gains access to the full bandwidth of the system network.

The partnership strategy

PLT is essentially a hybrid technology and hybrid technologies demand hybrid business strategies. The merging of telecommunications and power distribution skills, both technical and commercial, require partnership between these two disciplines, blended using a rare catalyst embodied in the experience, skills and technology of a small number of PLT professionals.

Electricom (www.electricom.co.uk) is one company, based in the UK, with technical PLT expertise and is headed by Dr John Dickinson, co-inventor of much of the current base-technology from which the new PLT industry is being built. Electricom forms technology partnerships with entities wishing to exploit the PLT opportunity and, over the coming months, we will see more strategic partnerships emerging between power distributors, telecoms service providers and PLT specialists. Initially partnerships across the various sectors will focus on establishing commercial trials, as in the

case of the alliances seen between ONELINE / Avacon and EnBW / Siemens / Tesion. This strategy follows a model pioneered by the dear departed, but not forgotten, NOR.WEB.

These trials will generate valuable experience and will be vital proving grounds for both the technology and the commercial strategy, leading to the delivery of exciting and competitive customer services.

Regulatory capture

The regulatory issues must not be underestimated. The current situation in the UK at least, appears to be that the regulators are waiting for the power distribution companies, and the power distribution companies are waiting for the regulators. The danger for the power distribution companies is that existing telcos and others are active in lobbying for standards and regulations, which might not be in the best interests of the power distribution companies. This 'regulatory capture', as it has become known, threatens to curtail the options of the power distributor before they even consider entering the PLT arena. The International Powerline Communications Forum (IPCF) is about to merge with a similar organisation, the PTF based in Germany, thus forming a new single powerline communications forum. This provides power distributors with a truly international forum from which to formulate policy and influence standards and regulatory bodies affecting the PLT industry. The central message is, 'protect your options'. The incumbent telecoms operator would be delighted to see PLT outlawed to protect an extremely lucrative monopoly on communications channels.

Cellular approach for future proof, low risk roll out strategy

Probably one of the greatest attractions for the power distribution company, when considering venturing into the PLT arena, is that PLT can be rolled out area by area since the network architecture has a cellular structure. These cells can be a group of customers served by a single low voltage (LV) substation or a group of LV substations served by a primary substation. This means that it is not necessary to invest in major infrastructure in order to bring customers on line. Inevitably, as already witnessed in the computer industry, modem technologies will continue to evolve and if different technologies are preferred, cells may have different PLT technologies and still function effectively. This all adds up to a very low-risk roll-out scenario where financial exposure before the receipt of revenue streams is extremely low. This cellular structure supports targeted marketing of specific areas with appropriate demographic profiles to optimise the roll-out density and the PLT economics in the early stages to ensure relatively early commercial success.

The information utility

Probably the greatest opportunity over the next decade for power utilities will be the emergence of the information utility. Modern society consumes information in the same way that it consumes electricity, gas or water. And the commodity of information needs to be harvested, generated, refined and purified. It needs to be collected, reserved and delivered, on demand, instantly in abundance; this is the role of the information utility.

A whole range of important local services relating to public welfare, government, participatory democracy, voting, banking, shopping, video conferencing, security, meter reading, heating and energy control, are provided by the utility. In addition, the information utility is able to cache internet content from all corners of the world, categorising and refining in order to provide instant access to popular sites which would normally involve the all too familiar World Wide Wait.

Possibly even more revolutionary, but technically feasible, is the concept of the dumb terminal in every home, where the latest programmes, huge processing power and professional 24-hour maintenance is provided centrally by the utility - all delivered at high speed to every household using broadband digital PLT.

Leveraging the brand

The power distribution utility is uniquely positioned to shed its traditional identity and take on the mantle of an e-commerce business. Early studies by Norweb confirmed that utility customers trusted the brand of the power utility far better than that of any other service provider, including the incumbent telephone operator. Correctly marketed, many believe that leveraging a strong brand and ubiquitous access, and associating it with the new enabling technology of PLT, the future for the power utility could be spectacular.

Biography:

David E. Hines heads up Electricom, a company specialising in powerline technologies, which offers a range of procurement, analysis and facilitation services. Hines brings over 30 years of business management consultancy and corporate communications experience. He is also co-founder of the International Powerline Communications Forum (IPCF), of which he is currently the general secretary. Hines is joined at Electricom by Dr John Dickinson, a specialist in high frequency modelling of Powerline distribution networks and co-inventor of much of the current base-technology that is founding the new generation of powerline telecommunications industry.

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