Evolution of DSL Technologies Over Copper Cabling

Ioannis Chochliouros
OTE S.A., General Directorate for Technology, Greece

Anastasia S. Spiliopoulou
OTE S.A., General Directorate for Regulatory Affairs, Greece

Stergios P. Chochliouros
Independent Consultant, Greece

Elpida Chochliourou
General Prefectorial Hospital "G. Gennimatas", Greece

INTRODUCTION

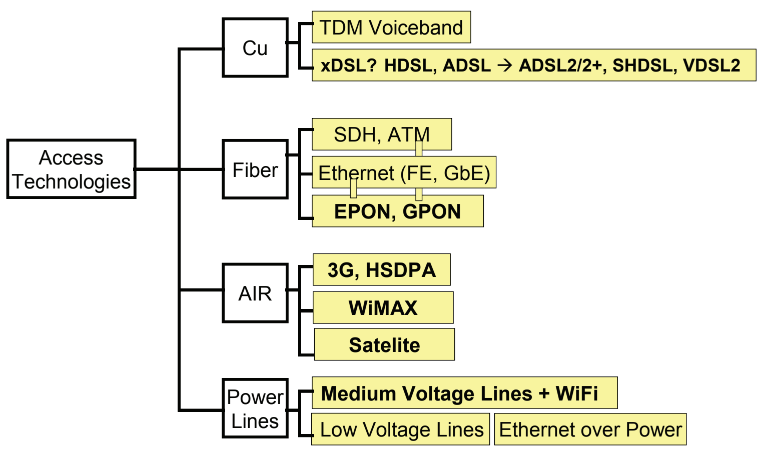
A variety of digital technologies can be used for effective implementation of access networks in fast growing (global) markets. The relative challenge becomes of greater importance, due to the extended penetration and the wider (technical and business) adoption of the much-promising broadband perspective (Chochliouros & Spiliopoulou, 2005). Regarding the four different (and actually "primary") media that can be used to reach several categories of end-users (namely, copper, fiber, air, and power lines), Figure 1 demonstrates possible alternatives that can currently be used in all related cases.

BACKGROUND

Transmission Technology Over Copper

Technological development and scientific evolution, the rapid growth of the underlying (converged) markets and potential exchange of experiences at international level, all require the proper update and/or "transformation" of the corresponding broadband strategies, in multiple instances (European Commission, 2004). However, the immediate success of any potential broadband technology and its effective market implementation: both depend on separate factors, originating from different thematic areas, such as properly implemented regulatory prerequisites/conditions for support of

Figure 1. Available access technologies



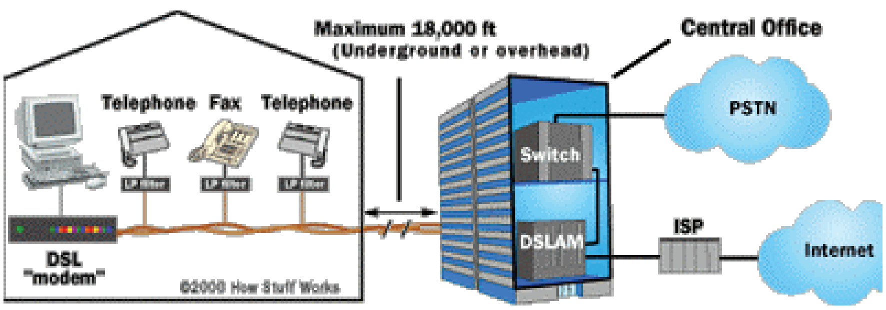
healthy competition, liberalization, and innovation perspectives; strategic priorities for further development; current scientific/technical achievements and/or trends for the promotion of innovation and digital-based convergence; socioeconomics (e.g., economic health, cultural context, political will, international cooperation, funding possibilities, and promotion of education); and sociogeographics (e.g., population density, climate, and topography). In such a "multidimensional" context, due to an extended variety of reasons, of major importance becomes the role performed by the family of the "xDSL" technologies, which are now at the frontline of numerous business efforts to provide adequate broadband capacity (European Commission, 2006).

Digital Subscriber Line (DSL) refers to a set of similar technologies that facilitate the transmission of digital data over copper "twisted pair" cable, without amplifiers or repeaters and without the need for conversion to analogue. This kind of technology has been evolved in order to provide increased bandwidth over the "last (or first) mile" between the customer and the first node within the underlying network, which is typically the local telephone exchange. In this particular context, the extended use of "broadband" connections can open up huge possibilities for market deployment, and so constitutes a "concrete" evidence of the promises of the wider "information society" (Chochliouros & Spiliopoulou, 2003). More specifically, recent competitive policies promoted by the European Commission and covering the scope of the European Union, like the specific one of the "unbundling of the local loop" ("ULL") constitute an important factor that affects DSL roll-out, and certainly any technology that capitalizes on xDSL-existing technical solutions (Chochliouros, Spiliopoulou, & Lalopoulos, 2005).

DSL is currently the predominant access technology in the European Union (EU), and in many countries in the global as well. DSL has increased its importance as the main leading technology at the expense of cable and other technologies (OECD, 2003); its share of fixed broadband lines in 2005 was 80.4%, compared to 16.8% of lines provided by cable and 2.8% by other technologies (Fibre-to-the-Home (FTTH), satellite, wireless local loop (WLL), leased lines, power-line communications (PLC), and so on). More specifically, according to latest European Community estimations, in 2006, DSL reached approximately 85% of households (Commission of the European Communities, 2006). In such approaches, DSL coverage denotes the percentage of population, depending on appropriately equipped switches. However, the exact definition of "DSL coverage" includes individuals and businesses located too far away from the switches to be reached, overestimating any effective coverage.

Given the predominance context of the corresponding delivery technique (at least for the case of the EU market), the figure for the availability of DSL can be taken as a good proxy for the general availability of broadband. Higher bandwidth can be achieved through advanced modulating techniques, which overlay a digital data stream onto a high-speed analogue signal (Starr, Sorbara, Cioffi, & Silverman, 1999). Figure 2 provides a generalized view of the basic structure of the DSL access technology. In the one end of the local loop exists a modem based on xDSL or a router in the end-user premises (home/office), and in the other end of the loop exists a multiplexer on the provider's premises, which is called DSL Access Multiplexer (DSLAM). This is the "cornerstone" of the DSL solution and is used to interconnect multiple DSL users to a high-speed backbone network. In upgraded networks, the DSLAM connects to a suitable infrastructure (occasionally through appropriate Internet services providers, or ISPs) that can aggregate data transmission at gigabit

Figure 2. A generalized depiction of the DSL access technology



Related Content

The Art and Science of User Engagement: Personalization and Recommendations in the OTT Era
Nitesh Behareand Daman Jeet (2024). *The Rise of Over-the-Top (OTT) Media and Implications for Media Consumption and Production (pp. 130-159).*
www.irma-international.org/chapter/the-art-and-science-of-user-engagement/337670

OntoMedia— Semantic Multimedia Metadata Integration and Organization
B. Hüsemannand G. Vossen (2008). *Multimedia Technologies: Concepts, Methodologies, Tools, and Applications (pp. 864-879).*
www.irma-international.org/chapter/ontomedia-semantic-multimedia-metadata-integration/27126

iASSIST: An iPhone-Based Multimedia Information System for Indoor Assistive Navigation
Zhigang Zhu, Jin Chen, Lei Zhang, Yaohua Chang, Tyler Franklin, Hao Tangand Arber Ruci (2020). *International Journal of Multimedia Data Engineering and Management (pp. 38-59).*
www.irma-international.org/article/iassist/267766

Elementary School Students, Information Retrieval, and the Web
Valerie Nesset (2009). *Encyclopedia of Multimedia Technology and Networking, Second Edition (pp. 469-476).*
www.irma-international.org/chapter/elementary-school-students-information-retrieval/17437

A Hierarchical Security Model for Multimedia Big Data
Min Chen (2014). *International Journal of Multimedia Data Engineering and Management (pp. 1-13).*
www.irma-international.org/article/a-hierarchical-security-model-for-multimedia-big-data/109075