

# Dark Optical Fibre as a Modern Solution for Broadband Networked Cities

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## INTRODUCTION: BROADBAND PERSPECTIVE

The world economy is moving in transition from the industrial age to a new set of rules—that of the so-called information society—which is rapidly taking shape in different multiple aspects of everyday life: The exponential growth of the Internet, the explosion of mobile communications, the rapid emergence of electronic commerce, the restructuring of various forms of businesses in all sectors of the modern economy, the contribution of digital industries to growth and employment, and so forth are some amongst the current features of the new global reality. Changes are usually underpinned by technological progress and globalisation, while the combination of global competition and digital technologies is having a crucial sweeping effect. Digital technologies facilitate the transmission and storing of information while providing multiple access facilities, in most cases, without significant costs. As digital information may be easily transformed into economic and social value, it offers huge opportunities for the development of new products, services, and applications. Information becomes the key resource and the engine of the new e-economy. Companies in different sectors have started to adapt to the new economic situation in order to become e-businesses (European Commission, 2001c). The full competitiveness of a state in the current high-tech, digitally converging environment is strongly related to the existence of a modern digital infrastructure of high capacity and high performance that is rationally deployed, properly priced, and capable of providing easy, cost-effective, secure, and uninterrupted ac-

cess to the international “digital web” of knowledge and commerce without imposing any artificial barriers and/or restrictions.

Broadband development is a major priority for the European Union (EU) (Chochliouros & Spiliopoulou-Chochliourou, 2003a). Although there is still a crisis in the sector, the information society is still viewed as a powerful source of business potential and improvements in living standards (European Commission, 2001b). To appropriate further productivity gains, it should be necessary to exploit the advances offered by the relevant technologies, including high-speed connections and multiple Internet uses (European Commission, 2002). To obtain such benefits, it should be necessary to develop new cooperative and complementary network facilities. Among the various alternatives, Optical-Access Networks (OANs) can be considered, for a variety of explicit reasons, as a very reliable solution, especially in urban areas.

The development of innovative communications technologies, the digital convergence of media and content, the exploitation and penetration of the Internet, and the emergence of the digital economy are main drivers of the networked society, while significant economic activities are organized in networks (including development and upgrading), especially within urban cities (European Commission, 2003). In fact, cities remain the first interface for citizens and enterprises with the administrators and the main providers of public services. In recent years, there have been significant advances in the speed and the capacity of Internet-based backbone networks, including those of fibre. Furthermore, there is a strong challenge for the exploitation of

dark fibre infrastructure and for realising various access networks. Such networks are able to offer an increase in bandwidth and quality of service for new and innovative multimedia applications.

## **NETWORKED CITIES: TOWARD A GLOBAL AND SUSTAINABLE INFORMATION SOCIETY**

Information society applications radically transform the entire image of the modern era. In particular, a great variety of innovative electronic communications and applications provide enormous facilities both to residential and corporate users (European Commission, 2001a), while cities and regions represent major “structural” modules. Local authorities are key players in the new reality as they are the first level of contact between the citizens and the public administrations and/or services. Simultaneously, because of the new information geography and global economy trends, they act as major “nodes” in a set of interrelated networks where new economic processes, investments, and knowledge take place. Recently, there is a strong interest for cooperation between global and local players (through schemes of private or public partnerships) in major cities of the world, especially for the spread of knowledge and technology. Encouraging investment in infrastructure (by incumbent operators and new entrants) and promoting innovation are basic objectives for further development.

In particular, the deployment of dark-fibre-optics infrastructure (Arnaud, 2000) under the form of Metropolitan Area Networks (MANs) can guarantee an effective facilities-based competition with a series of benefits. It also implicates that, apart from network deployment, there would be more and extended relevant activities realised by other players, such as Internet Service Providers (ISPs), Application Service Providers (ASPs), operators of data centres, and so forth. Within the same framework, of particular importance are business opportunities, especially for the creation of dark customer-owned infrastructure and carrier “neutral” collocation facilities.

In recent years, there have been significant advances in the speed and capacity of Internet back-

bone networks, including those of fibre-based infrastructure. These networks can offer an increase in bandwidth and quality of service for advanced applications. At the same time, such networks may contribute to significant reductions in prices with the development of new (and competitive) service offerings. In the context of broadband, local decision-making is extremely important. Knowledge of local conditions and local demand can encourage the coordination of infrastructure deployment, providing ways of sharing facilities (European Parliament & European Council, 2002a) and reducing costs. The EU has already proposed suitable policies (Chochliouros & Spiliopoulou-Chochliourou, 2003d) and has organized the exchange of best practices at the total, regional, and local level, while expecting to promote the use of public and private partnerships.

At the initial deployment of fibre in backbone networks, there was an estimate that fibre could be deployed to the home as well. A number of various alternate FTTx schemes or architecture models such as fibre to the curb (FTTC), fibre to the building (FTTB), fibre to the home (FTTH), hybrid fibre coaxial (HFC), and switched digital video (SDV) have been introduced (Arnaud, 2001) and tested to promote not only basic telephony and video-on-demand (VOD) services, but broadband applications as well. Such initiatives have been widely developed by telecommunications network operators.

## **DARK FIBRE SOLUTIONS: CHALLENGES AND LIMITATIONS**

Apart from the above “traditional” fibre-optic networks, there is a recent interest in the deployment of a new category of optical networks. This originates from the fact that for their construction and for their effective deployment and final use, the parties involved generate and promote new business models completely different from all the existing ones. Such models are currently deployed in many areas of North America (Arnaud, 2002). As for the European countries, apart from a successful pilot attempt in Sweden (STOKAB AB, 2004), such an initiative is still “immature”. However, due to broadband and competition challenges, such networks may provide

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