FOSTERING CORPORATE NETWORKING IN THE EUROPEAN UNION

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Corporate networks are private communications networks used by corporations or closed-user-groups ("CUGs") to enhance intra-organizational information transfer and communications. Unlike corporate communications supported by traditional "dial up" services via the public service telecommunications network ("PSTN") and public data network ("PDN"), private corporate networks are dedicated networks and, therefore, can be specially tailored to meet a corporation's or CUG's networking needs. As such, private corporate networks help corporations and CUGs reduce overall communications costs, enhance operational efficiencies, pioneer new technologies, and increase reliability and security of internal communications.

For several years, corporations and CUGs based in the United States have had the luxury of freely exploiting private networks, either by establishing such networks themselves, or by purchasing private network services from third parties. They have had this luxury because in the United States telecommunication policy and regulation has long favored the proliferation of private networks. In contrast, corporations and CUGs based in Europe have not, at least
until recently, been able to enjoy the same luxury. Indeed, in Europe the proliferation of effective private networks has long been discouraged by an inhospitable regulatory environment, largely balkanized at the national level. As a consequence, at the end of 1993 it was estimated that over 700,000 private networks had been established in the United States, while only 14,000 or so were established in Europe. This difference in the number of private networks is particularly stark in light of the fact that 5,000 of these networks were located in the United Kingdom, one of the only countries in Europe with a favorable regulatory environment. This relative scarcity of private networks in Europe has meant that corporations and CUGs in Europe have not been able to exploit the works in Europe has meant that corporations and CUGs in Europe have not been able to exploit the competitive aspects of private networks, and, therefore, have been placed at a competitive disadvantage vis-a-vis their American counterparts.

In order to rectify this situation, the European Community ("EC"), now called the European Union ("EU"), decided in 1987 to embark on a determined program of deregulation, liberalization, and harmonization outlined in its famous 1987 Green Paper on the Development of the Common Market for Telecommunications Services and Equipment. In the six years following its adoption, the 1987 Green Paper has spawned a number of significant legislative measures, primarily in the form of EU directives, that in toto have established a rather favorable regulatory environment for the proliferation of private networks in Europe. Particularly noteworthy measures have been: (1) directives aimed at liberalizing the terminal equipment and valued-added services ("VAS") sectors; and (2) directives aimed at harmonizing the conditions for access to the public network and to public services, as well as type-approval procedures and terminal equipment standards.

Coupled with recent advances in communications technology, these directives have gone a long way in dismantling barriers that have heretofore discouraged the proliferation of private corporate networks at both the national and pan-European level.

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7 Peter Heywood & Sam McMaster, PBX Networks in Europe, DATA COMM., Feb. 1992, at 70 (noting that "[r]ight now, private voice networks are a rarity in many European countries"); German Market, Ovum Ltd., Aug. 1992, at F3-3 (noting that "corporate networks are relatively underdeveloped in Germany . . . ").

6 See Ids Zandleven, A Leading Light in Pan-European Networking, INT'L NETWORKING, Sept. 1992, at 113 (noting that the mere "mention [of] 'European Networks' to U.S. net managers and they'll probably think of low-speed links, regulatory hurdles, and equipment that's not quite the state of the art").

9 Survey Telecommunications: The End of Monopoly, ECONOMIST, Sept. 30, 1995, at 10. See also Comments of Hermes Europe to the 1992 Telecommunications Review at 414 (Jan. 1993). Europe and the United States have roughly the same populations with the same telecommunications penetrations level. The total subscriber base lines in the United States and the European Union are 132 million and 146 million respectively. Id.

10 See DTI INFRASTRUCTURE STUDY, supra note 3, at 68 (noting that at the end of 1990, the United Kingdom had 5,000 private networks, France had 2,500 and Germany had about 2,000).

11 See generally id. at 14.

12 See Hermes Paper, supra note 9, at 414 (Europe has a larger population than the U.S. and roughly a similar level of telecoms penetration.)

13 The EU is a supra-national governmental body encompassing 15 European countries and consisting of four main institutions, The European Commission, The Council of Ministers, The European Court of Justice and the European Parliament. The EU succeeded the EC on November 1993 following the ratification of the Maastricht Treaty in 1993. The EU encompasses the following 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

14 Towards a Dynamic European Economy, Green Paper on the Development of the Common Market for Telecommunications Services and Equipment, COM(87)290 final at figure 3 [hereinafter 1987 Green Paper]. The general objective of the 1987 Green Paper was: the development in the Community of a strong telecommunications infrastructure and of efficient services: providing the European user with a broad variety of telecommunications services on the most favourable terms, ensuring coherence of development between Member States, and creating an open competitive environment, taking full account of the dynamic technological developments underway.

15 Treaty Establishing The European Economic Community [EEC Treaty] art. 189. The Treaty states that "a directive shall be binding, as to the result to be achieved, upon each Member State to which it is addressed, but shall leave to the national authorities the choice of form and methods." Id.

16 Study on Current Telecommunications Regulation in the Member States, Final Report to the Commission of the European Communities - Directorate General XIII prepared by Coopers & Lybrand, Sept. 1992, at 3-3 (noting that in the European context VAS are services that do not offer as a separate service either voice telephony or the direct transport of data in real time).

17 Heywood & McMaster, supra note 7, at 70. Note that "technologies such as voice compression and fast packet switching already enable users to squeeze more traffic into less bandwidth, thus reducing line costs. That, in turn, is making private networks more attractive [in Europe]." Id.
However, even with this progress, as compared with the United States, significant regulatory and operational barriers to the proliferation of private networks still persist, albeit at a diminishing rate. This is because in most Member States, public network infrastructure and basic voice telephony will remain under monopoly control until at least January 1, 1998, the date scheduled for full telecommunications liberalization in the EU.

Incumbent telecommunications operators have used this monopoly control to forestall the proliferation of private networks, particularly in situations where private networks would directly compete with monopoly networks and services. However, on balance, it can be said that the initial wave of liberalization, unleashed in the seven years following the adoption of the 1987 Green Paper, has and should hasten the process of dismantling these remaining barriers. This initial wave of liberalization has, for example, spawned the creation of a number of super-alliances that are putting intense competitive pressure on the remaining monopolies in Europe.

In addition, this wave of liberalization has prompted Europe's notorious Public Telephone Organizations ("PTOs") to re-think strategies, rationalize operations, and, in an attempt to adapt to the impending environment, reduce tariffs, remove restrictions, and open up their networks to competing private networks. The initial wave of liberalization has set the stage for private network proliferation in the coming years, notwithstanding barriers that may result from persisting PTO monopolies. Indeed, emboldened by the new regulatory environment, EU businesses spent 13 billion ecus on establishing and upgrading corporate networks in 1993 alone. Analysts believe that such investment will snowball as barriers drop. As such, they are forecasting double digit growth in corporate network investment for the coming years.

Part I of this article briefly describes the various categories and types of corporate networks. Part II provides some historical background on each of these categories and types of corporate networks. Part III discusses the barriers that persist in the EU that hinder the proliferation of corporate networks. Part IV canvasses the EU directives that have fostered corporate networking. Part V discusses the economic implications of telecommunications liberalization in the EU, and how economic imperatives will foster the proliferation of corporate networks in the EU. This article concludes that the initiatives taken in Europe towards liberalization of telecommunications markets have begun the process of fostering corporate networking.

I. CLASSIFICATION OF CORPORATE NETWORKS

Corporate networks come in many forms and varieties. However, in general, they are most often categorized by the type of traffic they support. For in-

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18 See Green Paper On Infrastructure, Part I, supra note 2, at 15-30 (noting that only the UK, Sweden and Finland currently allow infrastructure competition).

19 Alan Cane, Customers Have the Advantages, FIN. TIMES, June 15, 1995, § 3-1 (noting that "[r]egulation, in fact, remains a barrier to progress especially in Europe where little change will be seen before the 1998 deadline. Organisations building private networks today [will still] have to deal with a plethora of authorities and regulations"); ELI NOAM, TELECOMMUNICATIONS IN EUROPE 433 (1992). "European telecommunications will, in the short run, experience a push by PTTs to extend and defend their monopoly position and to expand in the direction of new services and equipment operations. However, long-term forces are at work that are likely to lead in time to an unraveling of the monopoly system." Id.

20 Three major strategic alliances have been formed in Europe in response to the prospect of increased competition: (1) Concert, a joint venture between British Telecommunications and MCI; (2) Atlas, a joint venture between Deutsche Telekom and France Telecom; and (3) Unisource, a joint venture between AT&T, and the Swedish, Dutch, Italian and Swiss PTOs. See generally Alan Cane, Competition Down the Line, FIN. TIMES, Jan. 19, 1995, at 15.

21 PTOs are the successors to the Postal, Telephone and Telegraph administrations ("PTTs") that largely predominated in Europe until recently.
stance, networks that support intra-corporate voice traffic are typically dubbed corporate voice or PBX networks. Those that support data traffic are dubbed corporate data networks, and, depending on their geographical expanse, can be more specifically described as either local area networks ("LANs"), metropolitan area networks ("MANs") or wide area networks ("WANs"). Finally, those that support two or more types of traffic simultaneously are dubbed "integrated networks."

In addition to these three general categories, corporate networks can be further classified into three categories by referencing the ownership, management and operation of the network. For instance, networks that are owned, managed, and operated internally by corporations are typically dubbed private, in-house networks (i.e., insourced networks). Such networks are usually comprised of four basic network elements: (1) terminal equipment that generates, receive and process corporate communications traffic (i.e., telephones, computers, faxes and modems); (2) PBXs, or on-premise switches, that internally switch corporate communications traffic; (3) access lines, or circuits that link a corporation's PBXs to the PSTN, and (4) leased lines (also called private lines, PBX lines, and tie-lines) that are the physical circuits leased from a carrier and used to inter-link a corporation's remote PBXs. By cobbling together these four discrete elements, corporations, in one fashion or another, establish private corporate networks.

Networks that are to some degree owned, operated, and managed by third-party network service providers (i.e., outsourcers) are oftentimes denominated as "outsourced" corporate networks. There are basically three types of "outsourced" networks: (1) facilities management ("FM"); (2) managed network services ("MNS"); and (3) telecommunications.

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87 Typical corporate voice networks support (1) Direct dial-in; (2) call-waiting; (3) conference call; and (4) reminder functions. See generally WILLIAM STALLINGS, BUSINESS DATA COMMUNICATIONS 322 (1990).


A local area network (LAN) is a communications network, which is usually owned and operated by the business customer. A LAN operates over a limited geographic area and enables many independent peripheral devices, such as terminals, to be linked to a network through which they can share central processing units, memory banks, and a variety of sources. Some organizations (e.g., banks) have enough data traffic within a city to make in-tracity networking viable. In this case individual LANs are interconnected to form a metropolitan area network (MAN). A communications network which spans a large geographical area and interconnects remote sites, for example, the national telephone network is called a wide area network (WAN).

Id.

89 See Robbert Daan, Design and Develop Your Own VPN, TELECOMMUNICATIONS, June 1994, at 25 (noting that networking traditionally falls into three categories, private, hybrid and virtual private).

90 See DATAPRO VPN REPORT, supra note 5, at MIT20-900-903.

In many countries, 'private networks' are not really private in the sense of users owning the cables and other media that are used to physically construct the network. Even in the few countries where organizations have the right to lay their own telephone cables, few organizations actually do so since the investment required to dig up roads and install trunk cables is much too high. Usually a private network is built up using lines and other telecommunications facilities that are owned by very large telecommunications companies and are rented or leased by the user.

Id.

91 STALLINGS, supra note 27, at 322.

92 See PETER W. HUBER, ET AL., THE GEODESIC NETWORK II - 1993 REPORT ON COMPETITION IN THE TELEPHONE INDUSTRY § 6.45 (1992), noting that a PBX is [a] small local telephone office - a private switching system located at the customer's premises. It serves extensions in a business complex, campus, government agency, or apartment building. It may operate as a stand-alone switching hub, or remote switching node on a private network comprising several private switches and many private lines. A PBX also provides interconnection with the public local exchange. Other trunks will connect the PBX to various other public or private switches: a long distance carrier, perhaps, or another PBX owned by the same business at some different location. From the user's perspective, identical services are provided by network-based services such as Centrex, offered by local telcos.

Id.

93 Since it is not feasible for a corporate network to provide ubiquitous coverage, it has to at some point connect with the PSTN. This interconnection occurs between a corporate network termination point (PBX) and a public network termination point (local loop). The access line itself can be either a leased line, dial-up line or a cellular link. See generally NTIA INFRASTRUCTURE REPORT, supra note 3, at 150-51.

94 See THE MARKET FOR LEASED CIRCUITS IN WESTERN EUROPE, CIT RESEARCH ANALYSIS, EUROPEAN COMMUNICATIONS NEWSFILE 7 (1994) [hereinafter CIT RESEARCH REPORT].

Leased lines are used by businesses to establish permanent links between offices located in different cities or countries. A leased line solution is often sought on routes which experience high traffic levels in order to escape the usage dependent costs associated with public switched services. Leased data circuits can also provide higher speeds and more secure data communications than those offered by public switched data services.

Id.

95 A MNS provider typically builds an international net-
are also denominated as outsourced networks, but rather than providing data switching and transmission capabilities to the public, they provide voice telephony switching and transmission capabilities. Functionally, Centrex services provide corporations and CUGs with PBX-like capability and functionality by using public exchanges. The obvious advantage of Centrex is that corporations and CUGs do not have to purchase or lease expensive on-premise PBXs. The major disadvantage is that the corporation must rely on public exchanges for the switching of critical corporate or CUG traffic. Because public exchanges are less secure, problems arise if a corporation needs secure communications. Moreover, because public exchanges are not dedicated like PBXs, there are risks that corporate traffic will be held up because of public exchange congestion or downtime.

VPN services are higher level Centrex services that, thanks to the infusion of digital technology and intelligence in the VPN provider’s network, provide corporations and CUGs with the advantage of on-demand bandwidth provisioning and the capability of integrated data and voice communications. As with Centrex services, VPN services obviate the need to purchase or lease expensive on-premise PBXs.

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However, with VPNs there is the added advantage of on-demand bandwidth, which means that a VPN operator simply allocates a virtual circuit with software over its network to a customer and dedicates that circuit for as long as the customer needs it. This capability effectively provides a user with a circuit that is functionally equivalent to a leased line, but unlike a leased line it does not have to be physically installed. This capability also affords corporations the ability to reconfigure their networks to meet changing business demands (e.g., if a new office is set up, a virtual circuit can be requested and allocated almost instantaneously). Other advantages of VPNs over private corporate networks include: (1) increased network redundancy (VPNs can be used to backup a private network during downtime or congestion); (2) the benefits of usage-based tariffs (leased lines are typically tariffed at fixed periodic rates which means a corporation may be paying for unused bandwidth); (3) cost savings resulting from a VPN provider’s ability to exploit economies of scale; (4) lower capital costs and outlay because a corporation does not need to purchase PBXs and maintain expensive in-house staffs; and (5) feature transparency.

II. BRIEF HISTORICAL OVERVIEW OF THE DEVELOPMENT OF THE VARIOUS CATEGORIES OF CORPORATE NETWORKS

A. Private Corporate Voice Networks - PBX networks

Although primitive variations of private corporate voice networks first emerged during the turn of the century, their modern day equivalents did not surface until the late 1950s. Prior to this time, the proliferation of private corporate voice networks was stanchied by prohibitive regulations in many countries. Most of the regulations were justified on the erstwhile belief that the telecommunications sector was a “natural monopoly,” and therefore duplicative networks, such as private voice networks, were not economically optimal and should not be built. However, this belief was dislodged when advances in communications technology during the late 1950s, particularly in the areas of microwave, satellite, and radio, established the economic viability and desirability of building duplicative private networks. In the United States, this prompted the Federal Communications Commission (“FCC”) to elaborate, over a number of years, a regulatory environment that sought to promote the establishment of private networks. However, this did not prompt regulatory

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44 A VPN can provide a customizing dialing plan just as a private network can. For example, a corporate user wanting to call a foreign subsidiary does not need to dial the full 14 digits to reach the subsidiary if it is linked by a VPN all that is needed is the four to five digit number provided in the dialing plan. See id.

45 See Virtual Networking, ELECTRONICS AND COMM. ENG. J., June 1994, at 152.

46 Id.; DATAPro VPN REPORT, supra note 5, at MIT20-900-903, 904 (VPNs support the following corporate services: (1) global digit desk-to-desk dialing plans; (2) abbreviated and flexible dialing; (3) integrated billing and billing by department; (4) logging call details; (5) calling line ID; (6) caller screening; and (7) call forwarding).

47 With VPNs, a corporation pays only for the capacity used. With private networks based on leased lines and PBXs, a corporation may be paying for spare capacity. Alison Classe, UK: Getting Connected-Virtual Private Networks, COMPUTER Wkly., June 1, 1995; see also Marc Beishon, The Virtual Private Network Arrives in Europe, NETWORK EUR., Nov. 1994, at 13. “The VPN is typically more cost-effective than a private network if the traffic is less than 2000 minutes a day.” Id.

48 See OTA REPORT, supra note 6, at 102. Because the VPN provider can provide services to many customers over the same backbone network, (i.e., the sharing of facilities) the VPN provider can spread its costs across many customers. Moreover, cost savings can be realized because corporations can concentrate on core activities. Id.

49 VPN Report, supra note 43, at F1-2. Feature transparency is “possible because the VPN switches can enable operation from a central point, whereas in conventional private networks this facility is provided by the terminating equipment on the periphery of the network.” Id.

50 See NOAM, supra note 19, at 70. “[I]n 1882, [the German PTT] established conditions of private interconnection with the public network. Ten years later there were more than 2000 private lines connecting with the public system, and almost 3000 purely private telephone systems within private properties such as factories.” Id.

51 See id. at 57; see also OTA REPORT, supra note 6, at 135. Since the late 1950s, advances in technology have begun to erode the validity of this theory. Id.

52 Particularly instrumental in fostering corporate networking in the United States have been the following FCC decisions: In re Allocation of Frequencies in the Bands above 890 Mc., Report and Order, 27 F.C.C. 359 (1959) (allowing the use of certain microwave frequencies for private point-to-point communications systems), recon. denied, 29 F.C.C. 825 (1960); In re Applications of Microwave Communications, Inc. for Const. Permits, Decision, 18 F.C.C.2d 953 (1969) (allowing MCI to establish a point-to-point link-up between Chicago and St. Louis to meet the inter-office and inter-plant communication needs of small businesses), aff’d on recon., 21 F.C.C.2d 190 (1970); In Re Establishment of Policies and Procedures, Specialized Common Carrier Services, First Report and Order, 29 F.C.C.2d 870 (1971) [hereinafter Specialized Common Carrier Order](allowing new carriers to provide alternatives to interstate
On the international level, prior to the 1950s, the same regulations that inhibited the establishment of national private networks also inhibited the establishment of international private networks. Moreover, because telecommunication services initially developed at the national level, arrangements were not really in place between PTOs to support such communication needs. However, this began to change when the post World War II push toward global markets created a need for corporations and CUGs to communicate at the international level. This provided the impetus for arrangements to establish private networks to meet these needs. The first such concessions were awarded to international CUGs such as Reuters and SITA (followed later by SWIFT), allowing these first CUGs to establish private networks that conveyed third-party traffic. Multinational corporations had to wait longer for the same concessions, and when they received these concessions they were burdened by restrictions on third-party voice traffic. That is, they were typically restricted to building data networks for the conveyance of intra-company traffic and for the most part their networks could not interconnect with the PSTN.

By the late 1970s, further advances in technology and heightened global competition led multinational corporations and CUGs to demand more concessions from national governments. Corporations and CUGs received such concessions in the United States and United Kingdom when the early 1980s harkened in a wave of deregulation in both countries. As for the rest of Europe, such concessions did not come in earnest until the late 1980s and early 1990s. Consequently, while corporations were building private networks in the United States and the United Kingdom throughout the 1980s, corporations in Europe were forced to rely on public "dial up" services to meet their internal communications needs. However, as international economic realities set in, not only were individual Member States lifting barriers to private networking, but the EU was formulating legislation to ease the pan-European barriers to private voice networking.

B. Corporate Data Networks - LANs and WANs

The proliferation of corporate data networks began in the late 1960s and early 1970s with the introduction of computer technology. As with private voice networks, the proliferation of private data networks was initially hindered by regulations adopted at a time when the concept of the natural monopoly was still tenable. However, unlike the situation with voice networks, corporations and third-party service providers quickly obtained concessions from the national government to build private data networks. Concessions came more easily because data networks were not viewed as duplicative of the traditional transmission services), aff'd on recon., 31 F.C.C.2d 1106 (1971), aff'd sub nom. Washington Uil. & Transp. Comm. v. FCC, 513 F.2d 1142 (9th Cir. 1975), cert. denied, 423 U.S. 836 (1975); In re the Application of Packet Communications, Inc. for Authority Under Section 214(a) of the Communications Act, Memorandum Opinion, Order and Certificate, 43 F.C.C. 922 (1973)(allowing interstate packet-switched communication networks to resell data processing capacity over private leased lines); In re Regulatory Policies Concerning Resale and Shared Use of Common Carrier Services and Facilities, Report and Order, 60 F.C.C.2d 261 (1976)(allowing unlimited resale and shared use of private line services); recon., 62 F.C.C.2d 588 (1977), aff'd sub nom. American Tel. & Tel. Co. v. FCC, 572 F.2d 17 (2d Cir. 1978), cert. denied, 439 U.S. 875 (1978).

...
Competition in traffic.

As electronic data interexchange has proliferated at an increasing rate in Europe, and VAN services are growing accordingly.

In Europe, the proliferation of private data networks did not begin in earnest until the mid-to late 1980s because, unlike the United States, the data processing sector was largely a regulated monopoly. That is, in most European countries, PTOs held “exclusive rights” over the provision of data services to the public, which effectively forestalled the deployment of private data networks well into the 1980s. During this time, the PTOs were notorious for providing poor and inadequate data services. Concurrently, an explosive growth in data traffic and global competition produced new demands for competitive data communications services. This prompted a bevy of European countries to loosen the stranglehold over data communications. For instance, the United Kingdom liberalized its VAN market in 1981, followed by Denmark in 1988, and Germany and the Netherlands in 1989.

Integration networks in both the private and public domain were developed during the 1970s when advances in digital technology made possible the digital integration of various types of communications traffic. While deployment in the United States of integrated networks in the public domain has led users to migrate voice traffic from private networks to public backbone networks (e.g., Integrated Services Digital Networks (“ISDN”)), in Europe a long monopoly tradition has led users to do quite the opposite. That is, to migrate voice traffic from public networks to private networks.

Interestingly, when PTOs developed a standard integrated network for the public domain, i.e., the ISDN during the 1970s and 1980s, their original aim was to draw users back to the public network. Indeed, the ability of ISDN to support voice, data, and video traffic in digitized form was supposed to stave off the threat of bypass created by private networks. However, as mentioned above, ongoing liberalization and user dissat-
satisfaction with PTO practice is making private networking outsourcing and VPNs much more viable in Europe. Additionally, user disaffection with the PTOs in the past has prompted some corporations in Europe to migrate voice traffic onto private networks.

At the same time, Europe currently leads the United States in ISDN deployment and user take-up. ISDN take-up in Europe is more advanced than in the United States because, until recently, private networks were not a viable option in Europe as a result of prohibitive leased line tariffs. Thus, corporations in Europe that have not been able to afford private networks have found ISDN corporate networks to be the only viable option. Other corporations have found that hybrid solutions can be advantageous. These corporations are using ISDN for certain applications, usually non-mission critical, and private networks for other more critical applications. Indeed, one could probably discern a trend towards hybrid solutions, both in Europe and the United States.

D. Outsourced Networks - VAN Providers

As mentioned above, where VANs began proliferating in the United States in the 1960s, they only began proliferating in Europe during the 1980s. Similarly, whereas outsourcing has been experiencing strong growth for years in the United States, it is only now coming of age in Europe. During the 1980s, save for the United Kingdom, the European outsourcing market was dominated by the PTOs. User dissatisfaction with PTO services then created the impetus for the adoption of measures opening up the sector to competition, initially at the Member State level and later at the pan-EU level. Five years after the adoption of the 1990 Service Directive, and the ONP Framework Directive, the European outsourcing market is beginning to burgeon. Although estimates vary widely, the market is valued at approximately 2.2 billion dollars, with future growth expected to average fifteen to twenty percent per annum.

E. Outsourcing by PTOs - VPNs

Centrex services that were introduced in the 1960s are tariffed: annually. ISDN is best suited for providing bandwidth to recover from leased line failure, node failure by routing to a different node, augmenting the bandwidth provided by the leased line, or for applications where there is no steady state.

Id.; see, e.g., Nuri Dagdeviren et al., Global Networking With ISDN, IEEE COMM. MAG., June 1994, at 26, 29.

76 Stallings, supra note 27, at 323 (noting that “[w]ith the use of digital technology, a private network can support both data devices and telephones”).

77 See NOAM, supra note 19, at 372 (noting that in Europe, liberalization in the VAN market first took place in the UK).

78 Id. at 144. For example, prior to 1990 in France, VAN providers were limited to a single connection to the PSTN. Id.

79 See Williams, supra note 65, at 57. “European businesses are thirsty for the data and value-added services that were previously tied to PTTs, often at monopolistic prices more than 80% higher than in the United States.” Id.


82 See CIT RESEARCH REPORT, supra note 34, at 8. “In public switched data communications, the erosion of monopoly provision started in Europe in the 1980s with the introduction of value added network services.” Id.

83 Id.
in the United States and Europe have recently been largely supplanted by VPNs. VPNs were first introduced in the United States by AT&T, Sprint and MCI following deregulation in 1984. Their introduction into the American market has been instrumental in bringing down long-distance tariffs. Moreover, after a decade in the market, providers of VPNs in the United States have managed to attract a major portion of corporate voice traffic onto their networks and away from private networks. Although VPNs can support data traffic, American corporations have been less inclined to outsource voice and data traffic. As a consequence, it is now becoming commonplace for corporations in the United States to employ both VPNs and private networks; in essence, hybrid networks that optimally support voice and data traffic.

Although VPNs were introduced in Europe years before they were introduced in the United States (France Telecom introduced the first VPNs in 1975), deployment and take-up has been rather lackluster as a result of regulatory barriers. For example, where ninety percent of American based corporations use VPNs, only sixteen percent of EU based corporations are currently using such VPNs. At the pan-EU level, market and regulatory disparities have further forestalled VPN takeup. However, more recently, following the 1990 Services and ONP Framework Directives, international alliances have been formed aimed at providing pan-EU VPNs. In addition, most PTOs have now established, or are planning to establish, both domestic and national VPNs. Consequently, it can be said that the preexisting barriers in Europe to VPNs are progressively being removed.

F. Hybrid Networks

As mentioned above, some large corporate users deploy hybrid networks that combine private ("leased line") networks with outsourced ("ISDN"/"VPN") networks. Such corporations typically use leased line networks where constancy and redundancy are important and where usage can be optimized. They outsource networks or use ISDN connections to back-up leased line networks in case of local system failure, for all other less-critical traffic, or for overflow control during periods of peak utilization. ISDN is well-suited for such hybrid arrangements because the ISDN can easily be accessed by existing switched networks or dedicated lines. In short, the inherent benefits of both private networks and ISDN has become an attractive option for some corporate users.

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Footnotes:

80. **DataPro VPN Report**, supra note 5, at MIT20-900-905 (noting that VPN voice services have gained wide acceptance in the US); Classe, supra note 47 (noting that "the market for telephony VPNs is pretty well saturated . . . [in the United States it is estimated] that as many as 90% of the Fortune 500 companies are using VPN.").
81. See Beishon, supra note 47, at 13.
82. See OTA Report, supra note 6, at 57.
83. See Classe, supra note 47, "Most VPN activity in the US to date has proved to be in the voice telephony area . . . although the same VPN facilities are also used for switched data." *Id.* Valiant & Rosenberg, supra note 2, at 28 (noting that "[c]ompanies remain reluctant to entrust their data to a virtual network."); DTI Infrastructure Study, supra note 3, at 29 (noting that "[i]n the US, many users are now using their leased lines for data only, having migrated their voice traffic to VPN and switched network services in response to recently introduced attractive tariff packages for bulk users.").
86. See Beishon, supra note 47, at 13.
88. See Weisman, supra note 2, at 353.
89. **VPN Report**, supra note 43, at F1-2; Classe, supra note 47, "[S]ome U.S. users of VPNs operate 'hybrid' networks, retaining elements of their own private networks, especially on their heaviest traffic routes." *Id.*
90. Weisman, supra note 2, at 353.
   a company might outsource data center operations and applications support modules to a systems integrator, wide-area network modules such as the operation and management of modems, multiplexers and private branch exchanges to a carrier, and local-area network and client/server application installation and operation to a computer vendor.
92. *Id.*
III. HISTORICAL, CONTEMPORARY AND FUTURE BARRIERS TO PRIVATE NETWORKING IN THE EU

Many of the historical barriers to corporate networking have been dismantled in the last few years as a result of directives and policies adopted by the EU. As mentioned above, particularly instrumental in this process have been the 1990 Services and ONP Framework Directives. Nevertheless, a long legacy of monopoly telecommunications and a fragmented market coupled with the exclusive rights PTOs will continue to exercise over network infrastructure and basic voice telephony until at least January 1, 1998 mean that barriers to corporate networking in the EU will persist in the coming years. In 1993, the United States Office of Technology Assessment summarized some of the persisting barriers to private networking in Europe as follows:

American firms operating in Europe feel seriously hampered by the necessity of relying on European technology and services for communications within Europe . . . . Many of them complain of the scarcity of high-grade leased lines, restrictions on the use of all leased lines, lack of access to fast data networks, severe restrictions on or delays in approving customer-premises equipment, irregular and inconsistent billings, and above all, excessively high costs.

Most of these barriers result when PTOs abuse their monopoly power in order to discourage private networks from being established. Of course, PTOs have an incentive to forestall the establishment of private networks because private networks bypass their networks and services, and as such deprive them of significant revenues. Moreover, PTOs have an incentive to forestall competitors from setting up private networks because competitors have the ability to "cream skim" lucrative corporate business from the PTOs, while not having to similarly contribute to meet universal service goals. The following is a short review of the barriers that result from PTO monopoly abuse and the barriers that result from Europe's mosaic telecommunications market.

A. Barriers Resulting From Monopoly Control

1. Network Infrastructure (i.e., Leased Lines)

Apart from Finland, Sweden, and the United Kingdom, PTOs in the remaining Member States of the EU hold exclusive rights over the provision of public network infrastructure. According to the European Commission, this monopoly environment has led to:

high tariffs for and lack of availability of the basic infrastructure over which such liberalised services are operated or provided to third parties [which has] delayed the widespread development of high speed corporate networks in Europe . . . .

In the United States, competition in private line services (leased lines) began in 1971 pursuant to the FCC's Specialized Common Carrier Order, supra note 52, para. 1. In that Order, the FCC gave MCI permission to build intercity microwave as well as allowing other carriers to lease private lines for resale. Id. This paved the way for competition in the market for private network services; private line service is defined as a service that consists of communication facilities linking two or more points which is set aside for the exclusive use or availability of a particular customer and/or authorized users for a predetermined period of time; see, e.g., 47 C.F.R. § 22.2.

See Noam, supra note 19, at 80. Exclusive rights over network infrastructure has been the norm for the better part of this century. For example, the Telecommunications Facilities Law of 1928 gave the German PTT, or the Bundespost, permission to construct and operate telecommunications facilities. There was an exception to the monopoly - for private services, but only those facilities not crossing property lines or facilities connecting the properties of a single owner. Id.


107 See Analysys Ltd., supra note 65, at 7.
108 OTA REPORT, supra note 6, at 7.
109 See Analysys Ltd., supra note 65, at 7.
110 See Green Paper on Infrastructure, Part I, supra note 2, at 12;
In those Member States where network infrastructure is under monopoly control, the prospect of a corporation or third-party service provider establishing a private network is, for practical purposes, unlikely, because the PTOs can and do make "dial-up" solutions more attractive by overpricing and undersupplying leased lines.\textsuperscript{108} Of course, this situation is exacerbated in those Member States that do not allow the use of alternative infrastructure for the provision of leased lines.\textsuperscript{108} However, even though the EU has not scheduled infrastructure liberalization until January 1, 1998, competitive services already introduced by the 1990 Services Directive, along with the introduction of international competition and new technologies, are beginning to whittle away at the infrastructure monopoly enjoyed by the PTO. As such, there is de facto hastening of the process of network infrastructure liberalization in advance of the January 1, 1998 date.\textsuperscript{110}

In the post-January 1, 1998 era, to what extent mandated competition will lead to cost-oriented tariffs and an adequate supply of high capacity leased line will certainly depend on the level of dominance the PTO will retain in the respective markets. Gaging from experience with liberalization in the United States and United Kingdom, experts believe that PTOs will retain dominance for a number of years after the January 1, 1998 date.\textsuperscript{111} To what extent they will retain dominance will, in large measure, depend on how national governments deal with the issue of competitive "cream skimming,"\textsuperscript{112} and its affect on the provision of universal service.\textsuperscript{113}

2. Member State Restrictions on the Use of Leased Lines

In the past, Member States and PTOs have placed unduly restrictive conditions on the use of leased lines.\textsuperscript{114} Although these restrictions are now slowly being removed, they still exist to varying degrees in some of the Member States. Some of the more notable restrictions include: (1) restrictions against the transmission of third-party traffic over private ("leased-lines") based networks;\textsuperscript{117} (2) restrictions against interconnecting leased lines to the PSTN; (3) restrictions against the direct interconnection by leased lines of corporate sites in different Member States;\textsuperscript{118} and (4) restrictions against the transmission of voice telephony over leased lines networks.\textsuperscript{117} These restrictions, taken together, have, in the past, eviscerated private networks of their utility and effectiveness, and, as such, made public "dial up" solutions more attractive.

3. Barriers Due to Extortionate Pricing of Leased Lines

As compared with leased line prices in the United States, leased lines in Europe can be tariffed at prices ten to fourteen times those in the United States, with price differentials for pan-EU lines (as infrastructure liberalization in the U.K. in 1981 and 1984).

\textsuperscript{111} See CIT RESEARCH REPORT, supra note 34, at 9. "We expect only a few providers to challenge the dominance of the incumbent PTO in the provision of simple leased capacity." Id.

\textsuperscript{112} PTOs argue that "cream skimming" would deprive them of significant revenue necessary to provide universal service. See, e.g., Analysys Report, supra note 104, at 70. "Under the traditional monopoly model of telecommunications, tariff structures were influenced more by the political desire for network expansion than by commercial requirement. This led to a retail tariff structure which in effect bought network expansion at the expense of business customers." Id.

\textsuperscript{113} See DTI INFRASTRUCTURE STUDY, supra note 3, at 14. "Traditionally, Germany was extremely restrictive on the provision of leased lines, which were only available for data at prohibitive high tariffs." Id.


\textsuperscript{117} See Heywood & McMaster, supra note 7, at 70.

\textsuperscript{118} See International Networks, NETWORK WORLD, Dec. 24, 1990, at 15 (discussing restrictions on direct interconnection of leased lines).

\textsuperscript{119} NOAM, supra note 19, at 145 (noting that in 1987, France limited resale of leased line capacity to data services but tariffs were set to prevent "cream skimming").
compared to United States long distance leased lines) being even greater.\textsuperscript{118} Moreover, whereas in the United States leased line tariffs are typically non-traffic sensitive and relatively neutral in terms of bandwidth pricing,\textsuperscript{119} leased line tariffs in Europe are often quite the opposite, i.e., traffic-sensitive and premiums are often levied on digital lines.\textsuperscript{120}

4. Low Supply of High-Speed Leased Lines

Whereas high-speed leased lines (i.e., 2Mbit/s and above) are readily available at affordable rates in the United States, they are in short supply and prohibitively priced in Europe.\textsuperscript{121} In today's highly competitive world, corporations require such high-speed leased lines in order to support traffic intensive applications such as LAN-to-LAN interconnection, video-conferencing, and other high-bit rate business applications.\textsuperscript{122} As a direct consequence, European-based corporations have been disadvantaged vis-a-vis their United States counterparts, who, because of affordable access to high capacity digital leased lines, have implemented competitively advantageous business applications.\textsuperscript{123}

The shortfall of high-capacity digital lines in Europe is rather stark. For instance, it is estimated that only about ten to twenty percent of the overall European supply of leased lines consists of high-speed digital leased lines. The rest of the supply consists of low-speed analogue lines.\textsuperscript{124} Interestingly, the United Kingdom (a country with a liberalized network infrastructure sector) has eighty percent of the European supply of high-speed digital leased lines.\textsuperscript{125} However, notwithstanding the current supply and price differentials in leased lines in relation to the United States,\textsuperscript{126} in a European context, the 1990 ONP Framework and the 1992 Leased Lines Directive (see below) have undoubtedly resulted in a reduction in tariffs and overall growth in the supply of 2Mbit/s digital leased lines, with current estimates stating as much as fifty percent growth per annum.\textsuperscript{127}

5. Poor Servicing, Reliability, and Delayed Installation of Leased Lines

European PTOs have been notorious for delaying the actual installation of physical leased lines.\textsuperscript{128} Anecdotal evidence from business users reveals that delays in installations can extend from six weeks to six months, to even a year or more, particularly when

\textsuperscript{118} See Green Paper on Infrastructure, Part I, supra note 2, at 22, tbl. 3; see also Alan Cane, \textit{Phone Call Prices 'Lowest of Main Industrial Nations,'} \textit{FIN. TIMES}, Feb. 20, 1995, at 7 (noting that in Germany a typical business must pay four times as much for leased line as its American counterpart); see DTI \textit{INFRASTRUCTURE STUDY}, supra note 3, at ix (noting that it was also reported that the international news company, Reuters, would realize 90% cost savings if its world-wide network was based in the United States); see also Cane, supra note 19, at § 3-1.

Analysis - a Cambridge, UK-based consultancy which specialises in telecommunications costs-estimates the total average cost per line in European Currency Units, for a 12-line business customers as Ecu2,456 for a customer of Deutsche Telekom, Ecu2,269 for a customer of France Telecom but only Ecu1,585 for a customer of Mercury Communications in the U.K.

\textit{Id.}

\textsuperscript{119} Compared with Europe, users in the United States (i.e., corporations and VAN providers) enjoy a proportionally low increase in cost for high speed circuits. This, in effect, means that users in the United States view bandwidth as an inexpensive commodity, see, e.g., DTI \textit{INFRASTRUCTURE STUDY}, supra note 3, at ix; Analysis Report, supra note 104, at 13 (noting that in the United States competition in the leased line sector has resulted in lower costs, quicker installation times, greater variety of services and improved maintenance and repair service).


\textsuperscript{121} See Green Paper on Infrastructure, Part I, supra note 2, at 21. "European corporate networking and competitive service provisions . . . depend critically on the availability of high-capacity digital leased circuits operating at 2Mbit/s and above." \textit{Id.}

\textsuperscript{122} Therefore, in order to realize effective interconnection that interconnects two or more such LANs, high-speed leased lines are required. Ron Biessart, \textit{LAN Interconnection: ISDN in its Own Right, TELECOMMUNICATIONS}, Oct. 1994, at 49.

\textsuperscript{123} See generally The Commission Opens Cable TV Networks to Liberalised Telecoms Services, I&T MAC., Winter 1994-95, at 3.


\textsuperscript{125} \textit{Id.} France has 10% of the overall supply. \textit{Id.}

\textsuperscript{126} Analysis Report, supra note 104, at 21 ("The total number of T1 lines expected to be installed in the USA in 1992 was 100000 - 120000 lines. The equivalent number for the EC was estimated to be around a fifth of this."). However, the European supply of T1-equivalent lines is experiencing strong growth. See DGXIII OVERVIEW, supra note 124, at 4.

\textsuperscript{127} \textit{Id.} Communications to the Council and European Parliament on the Consultation on the Review of the Situation in the Telecommunications Services Sector, COM(93)159 final at 5 (noting that the European Commission has identified as a bottleneck to telecommunications services the delays experienced when requesting new networks and services, in particular intra-European high-speed lines).
high-capacity lines are requested.\textsuperscript{120} In fact, in certain instances, PTOs have simply refused to install leased lines.\textsuperscript{120} The adoption of the ONP Leased Lines Directive in 1992 has, however, begun to improve this situation by requiring PTOs to meet certain predetermined supply conditions when supplying leased lines to competitors and users.

6. Lack of Trans-Border Coordination in Relation to One-Stop-Shopping, Billing and Trouble Shooting

Historically, and to some extent today, the provisioning of leased lines in Europe has occurred at the Member State level. As a consequence, few arrangements have existed between PTOs for the provisioning and maintenance of pan-European leased lines. This has meant that corporations have had to contend with a myriad of PTOs and national authorities when ordering leased lines for the establishment of pan-European networks. This has also meant that when leased lines fail, the lack of coordination between the PTOs oftentimes leaves the corporate user with a handicapped network while the PTOs decide whose responsibility it is to repair the leased line.

B. Barriers Arising from PTO Monopoly Control Over Basic Voice Telephony

As with public network infrastructure, save for Finland, Sweden, and the United Kingdom, all Member States in the EU still maintain national monopolies over public voice telephony and will continue to do so until at least January 1, 1998.\textsuperscript{181} As a result, voice telephony is, in large measure, dealt with at the national level, with pan-EU telephony services provided as international telephony rather than domestic long-distance. This has kept pan-EU telephony rates rather high. As a result, corporations and CUGs are trying to establish private networks, as allowed by the 1990 Services Directive, in order to avoid these high rates. However, because pan-EU telephony is a very lucrative market for PTOs, the PTOs have been using their monopoly power to try and limit the ability of these corporations and CUGs to set up private networks. Ambiguities in the 1990 Services Directive as to the scope of the “voice telephony” monopoly have provided PTOs with extra leverage in forestalling the establishment of private networks.\textsuperscript{123} With voice telephony accounting for eighty percent of overall PTO revenues, and corporate users representing a majority of those revenues), PTOs are expected to restrict the establishment of private networks so long as their monopoly power enables them to do so. However, their ability to do so will continue to erode in the coming years as international alternatives such as call-back, refile, and calling card services begin to take root. The introduction of “simple resale”\textsuperscript{183} after January 1, 1998, of course, will further erode their monopoly power.\textsuperscript{184} Although barriers will persist, the ongoing introduction of competition in the EU should remove many of them as the January 1, 1998 deadline approaches and is passed.\textsuperscript{128} As this occurs, long-distance competition in the EU should heat-up, and “one-stop shopping” for pan-EU services should be-
come increasingly commonplace.\textsuperscript{188}

C. Absence of Centralized or Coordinated Licensing at the Pan-European Level

Unlike the United States, which has a single regulatory body (the FCC) for purposes of licensing new interstate service providers and users, in Europe, service providers must obtain authorization and licenses in each Member State in which they desire to provide services. This can obviously be expensive and burdensome. In addition to this cumbersome process, service providers and users must contend with restrictive national rules that limit the utility of private networks.\textsuperscript{189} For example, in Germany the national licensing authority in granting licenses for the construction of private networks has limited such networks to areas within a twenty five kilometer circumference unless a showing was made that the network could conform to certain predetermined technical configurations.\textsuperscript{188}

Although the establishment of a central EU licensing authority is unlikely in the near future, the EU Commission has helped to establish the European Telecommunications Office ("ETO") to serve as a clearinghouse for pan-European license applications.\textsuperscript{190} In particular, the ETO will accept applications for licenses in Member States and will undertake to obtain approval on behalf of the applicant from each relevant national licensing body.

D. Absence of Pan-European Standards for Networks/Services/Equipment

Because European telecommunications developed at the national level,\textsuperscript{140} corporations and service providers seeking to establish pan-European private networks have been faced with a host of differing standards leading to problems of interoperability.\textsuperscript{143} This contrasts with the United States, which, as a result of AT&T's preeminence over the national network for more than a century, has inherited a largely standardized, homogeneous, and interoperable national network.\textsuperscript{142} Consequently, corporations seeking to establish long-distance private networks in the United States have enjoyed standardized offerings while corporations in Europe have not had the same luxury because of the disparate national networks and services offerings that still comprise the pan-EU market.\textsuperscript{144}

Although a pan-European regime is in place to rectify the problems of standardization, this regime has been plagued by delays.\textsuperscript{144} The delays in the adoption of pan-EU standards means that corporations with pan-EU networks cannot diffuse certain business applications in all Member States.\textsuperscript{144} Granted, the establishment of the European Telecommunications Standards Institute ("ETSI") in 1987 was intended to change this state of affairs, and has, to some extent, made significant inroads in the European standardization process.\textsuperscript{146}

E. Lengthy Type-Approval Procedures

The type-approval process for terminal equipment in Europe is largely administered at the national level. Because the approval process differs in every Member State, a company seeking to get approval for, say, a new PBX, is faced with the daunting task of sheparding approval applications in a myriad of Member States. This has had the effect of driving up the overall costs of terminal equipment which, in turn, has diminished the attractiveness of establishing private networks.\textsuperscript{147} This situation is exacerbated

\textsuperscript{140} See Zandleven, supra note 8, at 113 (noting that in the past there was a \textquoteleft\\textquoteleft lack of cooperation among PTTs when it comes to one-stop shopping, billing, and troubleshooting\textquoteright\textquoteright).

\textsuperscript{141} NOAM, supra note 19, at 249. In Italy dedicated facilities were \textquoteleft\\textquoteleft permitted only for services not provided by the public network\textquoteright\textquoteright\ and they existed, and still exist, \textquoteleft\\textquoteleft in a gray zone of tacit agreement among large corporations\textquoteright\textquoteright. Id.

\textsuperscript{142} See Green Paper on Infrastructure, Part I, supra note 2, at 17.

\textsuperscript{143} See Zandleven, supra note 8, at 113 (noting that in the past there was a \textquoteleft\\textquoteleft lack of cooperation among PTTs when it comes to one-stop shopping, billing, and troubleshooting\textquoteright\textquoteright.).

\textsuperscript{144} See DataPro VPN Report, supra note 5, at MIT20-900-904.

\textsuperscript{145} See Green Paper on Infrastructure, Part I, supra note 2, at 24. \"European telecommunications transmission infrastructure has evolved as a series of national geographical monopolies. For customers with pan-European telecommunications requirements or for potential providers of pan-European services, this has led to a patchwork of interconnected, but not fully interoperable transmission networks.\" Id.

\textsuperscript{146} See generally John Horrocks, European Guide to Telecommunications Liberalisation § 9 (1993).
by the complications that arise with the involvement of numerous standards bodies in the type-approval process and the undue influence exerted on these bodies by PTOs. As compared to the United States, the EU type approvals process is long and arduous. This has caused the price of European terminal equipment, such as PBXs, to be more expensive than PBXs bought in the United States. Indeed, a recent report revealed that the delays and administrative red tape associated with the European type-approval process accounts for between four and ten percent of the overall cost of terminal equipment.

F. Interconnection

As mentioned, public network infrastructure and services are monopolized by PTOs in Europe. As such, European PTOs have had power, and have used this power, to prevent competitive networks from emerging and "cream skimming" lucrative corporate business, while at the same time not contributing to meet universal service obligations. PTOs have been able to abuse this power to their advantage against those wishing to establish private networks by delaying the conclusion of necessary interconnection agreements. Indeed, anecdotal accounts indicate that PTOs can delay the consummation of such agreements by up to one or two years. This situation, coupled with some persisting restrictions on the interconnection of PBXs to the PSTN and restrictions on the conveyance of third-party traffic are prohibited from interconnecting with the PSTN. See DTI INFRASTRUCTURE STUDY, supra note 3, at 13-14; John Blau, Services Directive Applied Unevenly, COMM. WK. INT'L, Mar. 22, 1993, at 42.

In the United States, since 1967 corporate users have been allowed to interconnect non-Bell equipment such as PBXs to the PSTN in order to set up end-to-end private networks. In re Carterfone, 13 F.C.C.2d 430, 434-35 (1967).

In addition, Article 4 of the directive, which requires Member States to ensure users have access to the termination points of the public network and the physical characteristics of these points are published, has facilitated the process of interconnection.

See Amsterdam Conference Paper, supra note 41. Because Europe has to contend with at least five standard service bodies, delays in type acceptance are common. The five bodies are: (1) CEN/CENELEC; (2) CCITT; (3) ECMA; (4) ETSI; and (5) ISO/IEC/JTC1. ETSI is the standards body responsible for private telecommunications networks. Id.

NOAM, supra note 19, at 309 (noting that in 1990, France was accused of delaying type-approvals for foreign companies).

NOAM, supra note 19, at 177 (noting that even after the 1989 restructuring, the Dutch PTO continued to prohibit interconnection with the public network).

For example, in France and Germany, although private networking has been allowed, private networks conveying public traffic are prohibited from interconnecting with the PSTN. See DTI INFRASTRUCTURE STUDY, supra note 3, at 13-14; John Blau, Services Directive Applied Unevenly, COMM. WK. INT'L, Mar. 22, 1993, at 42.

In the United States, since 1967 corporate users have been allowed to interconnect non-Bell equipment such as PBXs to the PSTN in order to set up end-to-end private networks. In re Carterfone, 13 F.C.C.2d 430, 434-35 (1967).


Art. 1 of The Terminal Equipment Directive defines terminal equipment as:

equipment directly or indirectly connected to the termination of a public telecommunications network to send, process or receive information. A connection is indirect if equipment is placed between the terminal and the termination of the network. In either case (direct or indirect), the connection may be made by wire, optical fiber or electromagnetically.

Id. at 1998 O.J. (L 131) 75.
Regarding type-approval of terminal equipment, in 1986 the EU adopted the First Phase Directive in order to reduce the barriers associated with the type-approval of terminal equipment in the Member States.169 In particular, the directive required Member States to recognize, when performed by approved national laboratories, conformance tests that satisfied certain common specifications. The upshot of the directive was to obviate the need for terminal equipment that passed tests in one Member State to be re-tested in other Member States for purposes of type-approval. In 1991, the EU adopted the Second Phase Directive, which repealed the First Phase Directive and put in place a regime requiring Member States to implement an EU-wide type-approval procedure whereby terminal equipment approved in one country would be capable of interconnection to the PSTN in another Member State, without any further approval.160

B. The 1990 Services Directive161

The crux of the 1990 Services Directive was the liberalization of the European valued-added services market including the market for corporate and CUG communications services.162 In particular, the directive required Member States to “withdraw all special and exclusive rights for the supply of telecommunications services other than voice telephony . . . and to ensure that any operator is entitled to supply such telecommunications services.”163 Although the implementation of the directive has been instrumental in facilitating corporate and CUG networking in the EU, at the same time it has also been somewhat problematic because of the directive’s definition of “voice telephony” which has allowed Member States and their respective PTOs to forestall the establishment of certain corporate and CUG networks.164 In particular, it has allowed Member States and PTOs to give voice telephony a broad definition and corporate and CUG telephony a narrow definition under the national laws and regulations that implement the 1990 Service Directive.165

Unlike e-mail, remote database access, voice paging, least-cost routing, and intelligent network functions that are clearly liberalized because they are not considered “public” voice telephony and do not typically interconnect at both ends of the PSTN,166 corporate, and particularly CUG telephony services have run up against restrictive national rules because they are much closer to “public” voice telephony and may interconnect at both ends of the PSTN.167 Nevertheless, the Commission has clarified that CUG telephony should be liberalized as long as CUGs meet the following definition:

[CUGs are] those entities, not necessarily bound by economic links, but which can be identified as being part of a group on the basis of a lasting professional relationship among themselves, or with another entity of the group, and whose internal communications needs result from the common interest underlying the relationship. In general, the link between the members of the group is a common business activity.168

Corporate telephony services, which are less problematic than CUGs telephony services, are liberalized under the directive as long as the provision of such services does not involve connection to the telephone service. Id.; Ravaioli & Sandler, supra note 141, at 8. The rationale behind the exception for public voice telephony is the need for public operators to retain the revenue derived therefrom in order to maintain a universal service network. Id.169


Art. 1 of the 1990 Services Directive defines voice telephony as: the commercial provision for the public of the direct transport and switching of speech in real-time between public switched network termination points, enabling any user to use equipment connected to such a network termination point in order to communicate with another termination point. Id.

See Blau, supra note 155, at 42 (discussing the various definitions Member States have given CUGs and corporations).

The 1990 Services Directive liberalized VPNs. See, e.g., Blaug, supra note 47, at 12.

Id.

See 1995 Services Status Report, supra note 107, at 18.
PSTN at both ends.\textsuperscript{160} In other words, such services must not provide "break in" and "break out" capability.\textsuperscript{170} Break in and break out occurs when someone outside a corporation calls the corporate network (breaks in) and then uses the corporate network to bypass the long distance network by breaking out of the corporate network at a different site, and thus reconnecting back to the PSTN (i.e., a non-corporate user would get charged for a local call rather than a long-distance call).\textsuperscript{171}

On another note, the directive has been instrumental in fostering corporate networking by removing certain barriers associated with leased line provision. For instance, Article 4 of the directive requires that "Member States . . . ensure that operators who so request can obtain leased lines within a reasonable period . . . ". In addition, Article 5 of the directive requires Member States to "ensure that the characteristics of the technical interfaces necessary for the use of public networks are published.\textsuperscript{172}

Overall, these provisions and the directive's general liberalization provisions have, notwithstanding some definitional problems associated with "voice telephony," been instrumental in fostering corporate and CUG networking in Europe.\textsuperscript{173}

C. The 1990 ONP Framework Directive

The 1990 ONP Framework Directive was adopted to ensure the success of the 1990 Services Directive. In particular, whereas the 1990 Services Directive liberalized the provision of value-added services, the 1990 ONP Framework Directive established conditions for service providers and users of value-added services to access public network infrastructure and services under fair, transparent, and non-discriminatory terms.\textsuperscript{174} The directive furthers this goal by harmonizing the general terms and conditions of such access throughout Europe.\textsuperscript{175} The three principal areas of harmonization under the directive are harmonization of: (1) technical interfaces (i.e., network termination points); (2) usage and supply conditions (i.e., standardized terms for delivery time, repair time, and conditions for resale of capacity, etc.); and (3) cost orientation and unbundling of tariffs for basic network elements.\textsuperscript{176} These provisions have, in the five years since their adoption, been instrumental in aiding the general liberalization of VAN services and international telecommunications, as mandated by the 1990 Services Directive.\textsuperscript{177} They have also placed a notable downward pressure on tariffs.\textsuperscript{178}

D. 1992 ONP Leased Lines Directive\textsuperscript{179}

The 1992 ONP Leased Lines Directive applies the principles of the ONP Framework Directive to the provision of leased lines throughout the EU. The most notable provision of the directive is probably Article 7, which requires Member States to ensure the "provision of a minimum set of leased lines in accordance with harmonized technical characteristics ("ONA") concept used in the United States. In particular, "ONA [in the] U.S. permits enhanced or information services providers to interconnect to the basic network and choose from a variety of network services." See Commissioner Susan Ness, Fundamental Regulatory Principles for the Information Infrastructure, Remarks to OECD Special Session (Apr. 1995), in Daily Dig., Apr. 19, 1995; see also Lusa, supra note 114, at 22.

\textsuperscript{160} Levine, supra note 135, at 50 (noting that under the 1990 Services Directive, "competitive carriers can provide private networks, including switched virtual private voice networks . . . for single users or closed user groups as long as at least one end of each call is directly linked to a customer's premises — for example, to a PBX").

\textsuperscript{170} See Ravaioli & Sandler, supra note 141, at 13. "Break out" occurs when a customer calls the corporation (the call originates on public network), and the corporation switches the call internally to a remote office over its own private network. "Break in" occurs when a call originates on a private network and terminates on the public network. Id.

\textsuperscript{171} See 1990 Services Directive, art. 4, supra note 69, at 1990 O.J. (L 192) 16.

\textsuperscript{172} Art. 4 and Art. 5, see id. at 1990 O.J. (L 192) 16.

\textsuperscript{173} See 1995 Services Status Report, supra note 107, at 10-

\textsuperscript{174} ONP Framework Directive, supra note 85, at 1990 O. J. (L 192) 1. As a framework directive, the ONP Directive is intended to be a blueprint for more specific directives in the areas of: (1) leased lines; (2) packet-and circuit switched data services; (3) integrated services digital networks; (4) voice telephony service; (5) telex service; and (6) mobile services. Id., Annex 1, at 1990 O. J. (L 192) 6.

\textsuperscript{175} The ONP concept is similar to the Open Network Architecture ("ONA") concept used in the United States. In particular, "ONA [in the] U.S. permits enhanced or information services providers to interconnect to the basic network and choose from a variety of network services." See Commissioner Susan Ness, Fundamental Regulatory Principles for the Information Infrastructure, Remarks to OECD Special Session (Apr. 1995), in Daily Dig., Apr. 19, 1995; see also Lusa, supra note 114, at 22.


\textsuperscript{178} Id.

E. Public Voice Telephony Council Resolution

On July 22, 1993, the European Council set January 1, 1998 as the date for full liberalization of voice telephony services to the general public.188 However, there are certain derogations from this deadline for the EU's smaller Member States that would permit them to put off liberalization for another three or five years. Nevertheless, when liberalization of this sector comes, it is expected to galvanize both facilities based long-distance and resale competition throughout Europe and at the Member State level.

F. Proposal for ONP Voice Telephony Directive189

This directive was submitted by the European Commission for formal adoption on March 31, 1995. The directive will apply the principles of the 1990 ONP Framework Directive to the post January 1, 1998 liberalized voice telephony market. The directive will also establish harmonized terms and conditions for resale of voice telephony services. In particular, it will seek to establish fair and efficient access to fixed public telephone networks and public telephony services, and will seek to assure the availability throughout the EU of a harmonized voice telephone service.191 The directive will also apply the ONP principle of nondiscrimination to the general areas of technical access, tariffs, quality of service, delivery and repair time, network and customer information, and the fair distribution of capacity.

180 Art. 7 of the ONP Leased Lines Directive requires that Member States ensure that their PTOs offer: (1) two or four wires analogue, ordinary quality voice bandwidth; (2) two or four wires analogue, special quality voice bandwidth; and (3) 2Mbit/s digital structured. For specific technical specifications, see id. at 1994 O.J. (L 181) 41.
181 Transparency essentially requires that information be published in a way that offers users easy access and that reference be made to the publication in the National Official Journal. Such information includes, information about technical characteristics, tariffs, supply conditions, licensing requirements, and conditions for attachment of terminal equipment. See Harmonisation of Legislation, Telecommunications and Information Technology, COMMON MARKET REP. (CCH) 13516G (1995).
182 Art. 6 (1) of the Directive provides that access to and usage of leased lines can only be restricted on the basis of conditions aimed at ensuring essential requirements. Essential requirements include conditions to safeguard the security of network operations, maintenance of network integrity, interoperability of services, and the protection of data. Essential requirements do not include technical restrictions such as the limitation of transmission speeds. ONP Leased Lines Directive, supra note 179, at 1992 O.J. (L 165) 30.
183 Art. 10 (2) of the ONP Leased Lines Directive requires that Member States ensure that a suitable cost accounting system was implemented by their TOs by December 31, 1993. Id. at 1992 O.J. (L 165) 32.
184 See generally Implementing European Telecommunications Law, Conference Reports, European Commission DGXIII (Nov. 21-22, 1994).
187 Id.
188 CIT RESEARCH REPORT, supra note 34, at 9 (noting that "[w]e expect only a few providers to challenge the dominance of the incumbent PTO in the provision of simple leased capacity.").
189 Council Resolution of 22 July 1993 on the Review in the Telecommunications Sector and the Need for Further Development in that Market, 1993 O.J. (C 213) 1. Possible derogations of up to five years were provided for Greece, Ireland, Portugal, and Spain. The very small Luxembourg network can, where justified, be granted a transition period of two years. In the meantime, Spain has announced that it will attempt to abide by the deadline of January 1, 1998 for full liberalization. 1995 Services Status Report, supra note 107, at 8 n.6.
G. Mutual Recognition of Services

The European Commission has twice proposed directives aimed at implementing a pan-EU licensing system for the mutual recognition of services. These directives would have established procedures allowing a provider of telecommunications services in one Member State to provide services in other Member States without the need for the provider to obtain individual authorizations from each of the national licensing authorities. However, due to Member State sensibilities over the concentration of power at the EU level, the adoption of these directives has been forestalled. In the interim, the European Telecommunications Office ("ETO") in Copenhagen, Denmark has been established as a clearing-house for pan-EU service provision applications. Although this office will fall short of mutual recognition of license, it will go a long way in facilitating the provision of pan-European services by providing an applicant with a one-stop-shop filing procedure. Recently, the idea of establishing an FCC-like authority to administer licensing in the EU has been broached in the context of the Bangemann Report, a report prepared by a committee of EU wisemen, as requested by the EU Council. The issue has since stimulated a great deal of interest, but its feasibility within the present EU political environment is dubious.

H. Public Network Infrastructure Council Resolution of November 17, 1994

On November 17, 1994 the EU Council agreed to liberalize network infrastructure throughout Europe by January 1, 1998. As with basic voice telephony, the smaller and less developed Member States (Greece, Ireland, Portugal, Spain, and Luxembourg) have been given limited derogations from implementing the January 1, 1998 deadline. In any event, the liberalization of this sector is expected to significantly reduce leased lines tariffs and augment the supply of high capacity leased lines.

I. Proposed Directive on Cable TV Infrastructure

Because of the current shortfall in high capacity digital leased lines and the associated competitive disadvantages suffered by EU businesses, the Commission decided in December 1994 to adopt this directive in order to liberalize cable TV infrastructure for the provision of leased lines to users and providers of services liberalized under the 1990 Service Directive. Although the Commission has the authority to directly adopt such a directive under its competition authority (Article 90 of the Treaty of Rome), it has decided to circulate the directive among the other institutions of the EU in order to garner the necessary political support. The directive should be formally adopted by the Spring of 1996. As it stands, it would require a cable operator to offer capacity to a service provider at a fair-market price (i.e., equal access), which, in effect, would make cable operators wholesalers of transmission capacity. It should also help reduce overall costs for leased lines, and enhance the supply of high capacity leased lines (as with full liberalization in 1998).

J. Proposed ONP Directive on Interconnection

The Commission is currently drafting a directive

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102 See Harmonisation of Legislation, supra note 181, ¶ 3518.
104 The ETO is an office being established under the umbrella of European Committee for Telecommunications Regulatory Affairs (ECTRA). See Green Paper on Infrastructure, Part II, supra note 102, at 132-33.
107 Council Resolution of 22 December 1994 on the Principles and Timetable for the Liberalisation of Telecommunications Infrastructures, 1994 O.J. (C379) 4. As is the case with the liberalization of telecommunications services, Greece, Ireland, Portugal and Spain have been given until the year 2003 to liberalize. Luxembourg has until 2000. See generally id.
108 See, e.g., The Commission Opens Cable TV Networks to Liberalised Telecoms Services, supra note 123, at 3.
109 See generally id.
200 Currently, within the EU, only the UK permits cable carriage of services other than simple one-way broadcasting. Id.
that will apply the principles of the 1990 ONP Framework Directive to the area of interconnection.301 This directive would establish the conditions for interconnection in the post-liberalized environment in 1998, and would be aimed at fostering the development of pan-European services.302 Generally, the directive would require that fair, nondiscriminatory, and proportionate conditions are applied to all interconnection arrangements. It would also require that PTOs entertain all reasonable requests for interconnection by competitors. However, the directive would leave the actual supervision of interconnection arrangements to the Member States, unless EU type antitrust questions arise.303

K. Commission’s Policies and Decisions

Apart from directives liberalizing the EU telecommunications sector, the EU has adopted other measures aimed at fostering trans-European networks, such as measures to develop Euro-ISDN, which should help to establish a homogeneous European public network accessible to the general public at affordable rates. In regard to Euro-ISDN, the Commission has adopted two specific proposals regarding the implementation of Euro-ISDN, and has adopted a general program of funding research projects that support ISDN and other similar projects.304

In addition, by virtue of its competition authority under the Treaty of Rome, the Commission has been able to condition merger approvals on market liberalization, such as the recent Atlas merger application. In turn, this is helping to facilitate liberalization at the Member States level.305 The Commission has also used this authority to give clearance to mergers that facilitate pan-EU networking, such as the informal clearance it has given to the European Virtual Private Networks Users Association (“EVUA”), a closed user group aimed at obtaining for its forty or so multinational members economically advantageous pan-EU VPN services.306

V. HASTENING THE PROCESS OF DEREGULATION

Because of the microeconomic and macroeconomic importance of telecommunications to Europe’s economy, marketplace forces are driving liberalization with little regard for PTO concerns over “cream skimming,” bypass, and universal service. As a result, even though full liberalization is not scheduled until 1998 for most Member States, economic considerations and competitive forces will hasten the process in advance of 1998.

A. Microeconomic Considerations

Europe’s domestic telecommunications industry currently constitutes three percent of Europe’s overall gross domestic product (“GDP”) and is expected to reach seven percent by the year 2000.307 The

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302 The directive will set forth general rules regarding cost-orientation, cross-subsidization, collocation of equipment, facilities sharing, number portability, technical standards, publication and access to information and resolution of cross border disputes. See Interconnection Proposal, supra note 201.


304 See Communication from the Commission to the Council and the European Parliament on Preparatory Actions in the Field of Trans-European Networks: Integrated Broadband Communications (TEN-IBC), COM(93)372 final; see also 1993 ISDN Communication, supra note 74.

305 For example, the recent approval by the European Commission and the U.S. Justice Department of the Sprint alliance with France Telecom and Deutsche Telekom was hinged on the liberalization of the German and French markets. More precisely, Sprint has entered into a consent decree that will prohibit the joint venture from buying services from either France Telecom or Deutsche Telekom until Germany and France open up their markets to competition. The decree also prohibits the joint venture from owning a public data network or any other monopoly assets owned by France Telecom or Deutsche Telekom. Similar deregulatory pressures have also followed in the wake of the AT&T/Unisource and BT/MCI alliances. European Official Scrutinizing New Plan For Global Telecom Venture, WASH. TELECOM WK., Sept. 22, 1995, at 1.

306 The EVUA arrangement was approved so long as the telecommunications services provided thereto complied with the 1990 Services Directive. Accordingly, the Commission conditioned its approval. The virtual private network upon which the members of EVUA were to receive the networking services had to be structured so that none of the members could inter-communicate, i.e., no simultaneous “break out” and “break in” facility. However, this provision allowed for communication between an individual company and its customers and suppliers, who could either break in or break out, but not both. See Viatel Goes Cross-Border with Europe’s First Voice Network, FIN. TIMES TELECOM MARKETS, Nov. 25, 1993; see also Dawn Hayes, Euro-VPN Deal Stuck, COMM. Wk. INT’L, Apr. 11, 1994, at 1.

specter of losing this sector to foreign competition has begun to galvanize most of Europe's PTOs into preparing for the impending post 1998 liberalized environment. Indeed, in the aftermath of international deregelation, the competitive threat is ever present as a multitude of large foreign carriers set out to capture part of the lucrative fifty billion dollar market for international corporate voice and data services. At the EU-level, a similar competitive threat introduced by the 1990 Services Directive and ONP Directives has allowed foreign competitors to forge alliances with PTOs in order that they may compete with incumbent PTOs in their home markets through the hubbing of corporate networks, the provisioning of pan-EU VPNs, call-back, and calling card services.

Having been mistreated by the smug and complacent PTOs for years, large multinational corporations in Europe have welcomed this dose of foreign competition and are showing a willingness to jump ship. Because multinational corporations and business clients in general represent the most important revenue sources for PTOs, (indeed, revenues derived from business clients represent fifty to sixty percent of the total EU telecommunications market, which is roughly valued at forty-one billion ecu), PTOs can no longer risk alienating these customers. Thus, European PTOs have begun to change their ways in order to maintain this revenue source over the long term. In short, the specter of full competition in 1998, along with the present competition taking place in various niche telecommunications markets, is spurring liberalization in the EU at an increasingly quicker pace. This, in turn, is helping to foster corporate networking in the EU.

B. Macroeconomic Considerations

Because the EU telecommunications market is not as liberalized as that of the United States, telecommunications costs have been heavier for EU businesses. In fact, European companies must spend, on average, two to three times more for telecommunications services than companies in the United States.

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208 See Arthur D. Little Report, supra note 4, at 9. "In the past, European TOs have tended so far to avoid intrusions on each others' territories. The U.S. TOs have no such inhibitions in Europe. European TOs are now beginning to compete directly with each other - particularly in the market for building and operating private international networks for large multinational user companies." Id.; see also Dawn Hayes, MFS Plots ATM Data Hubs in Europe, COMM. WK. INT'L, Feb. 21, 1994, at 34 (noting that "U.S. competitive access provider MFS Communications Co. plans to roll out commercial ATM-based data services in France, Germany, and the United Kingdom by June—before most European Telecommunications operators.").


210 Heywood, supra note 186, at 55. "Within Europe, PTOs wanting to establish themselves as global companies, are competing with one another to hub corporate networks." Id.

211 Lyle Ginsburg & Yves Londenchamp, The Process for Dynamic Service Provisioning, TELECOMMUNICATIONS, Oct. 1994, at 27 ("The PTOs are vulnerable to competition because of their high-cost, relatively inefficient operations, their rigid pricing structures, and their traditional civil-service cultures. Newer entrants, with their smaller size, lower-cost operations and customer-service orientation, will be able to offer rapidly a wide range of customized, flexibly priced services."); see also McAdam, supra note 53, at 39.

212 Customers, particularly multinationals, have begun to exercise their right of choice between telecommunications services, choosing to place network hubs, and often business operations, in countries with liberal regimes, and routing only peripheral traffic to and from monopoly and high priced countries where service provision is inflexible and technologically underdeveloped.

213 See id. at 38. "Arbitrageurs do not need to operate within a country to attack international telecommunications revenues. They can be attacked from long range, through refile, calling cards and leased line bypass." Id. See also Arthur D. Little Report, supra note 4, at 9. "Hub competition will grow stronger as transmission costs decrease, as network intelligence increases, and as more and more value-added telecommunications suppliers emerge with liberalization." Id.

214 See NOAM, supra note 19, at 45.

215 Ginsburg & Londenchamp, supra note 211, at 27.

216 See Cane, supra note 19, at 1, quoting: In Europe it will be years before the bureaucratic and arrogant attitudes ingrained in many telecoms operators - through a deadly combination of state ownership and monopolistic service provision—are eliminated . . . This is the justification for the formation last year of the European Virtual Private Network Users’ Association, a lobby of 40 of Europe’s largest companies . . . [which] aim to force the large telecoms operators to listen to their requirements.


218 See DTI INFRASTRUCTURE STUDY, supra note 3, at ix, 69 (stating that ten percent of Reuters overall operational costs are for telecommunications services, and that Reuters, which has the largest private network in the world, has prepared a comparison of costs it would incur in Europe with the costs it would
For example, whereas overall telecommunications costs as a percentage of business turnover are about sixteen percent in the United States, they are nearly thirty percent in Germany.²¹⁸ Although the PTOs may benefit from these high telecommunications costs, the rest of the EU economy suffers competitive disadvantages because high telecommunications costs make European made or produced products and services more expensive.

If the EU is to become more competitive in the evolving international marketplace, it must be able to obtain high quality and affordable communications, particularly now that it stands at the doorstep of the "information age."²¹⁹ In a world of "networked capitalism,"²²⁰ effective corporate networks and low communications costs will be a sine qua non for corporate survival.²²¹ Thus, it is no surprise that this existing disparity in costs between the EU and the United States has spurred European users to demand from PTOs and national governments a hastening of liberalization in the European telecommunications market. PTOs who fail to meet these demands and abuse their dominant positions for short term gain, will lose user traffic to savvy United States and United Kingdom operators who for years have been schooled in competitive and consumer oriented business practices. This threat has also created a trend toward liberalization in advance of 1998 and this is further fostering the establishment of private networks in the EU. Evidence of this trend can be gleaned from statistics on the growth in investment in the investment level of information technology being made by European industry, a growth rate that has been growing at two to three times the rate of the EU's overall economy.²²²

VI. CONCLUSION

The United States has long had a favorable regulatory environment that has fostered the proliferation of private networks. Europe has only recently begun to establish a similar regulatory environment. The establishment of the EU regulatory environment harkens back to a 1987 Green Paper that spawned a number of European directives, such as the 1990 Services Directive, liberalizing corporate and CUG communications services, and the ONP Directives, harmonizing the conditions for fair access to public network infrastructure and services. These directives have established an environment in which many of the preexisting barriers to corporate and CUGs networking in Europe have been removed. However, because the sectors of public voice telephony and network infrastructure may remain under de jure monopoly control until January 1, 1998, or even longer for some Member States, PTOs are able to erect (and have been erecting) barriers to corporate and CUG networking in order to protect important revenue streams. At the same time, international competition in the areas of international VPNs, international simple resale, private lines, call-back, re-file, and calling cards, has and will continue to threaten the ability of PTOs to continue to use their monopolies to erect such barriers. As a consequence, the ability of corporations and CUGs to establish corporate networks in the coming years should be progressively facilitated as competitive alternatives force the PTOs to remove remaining barriers. PTOs will be further forced to remove these barriers as a result of economic imperatives at the microeconomic and macroeconomic level, which will lead governments and industry to demand that barriers to corporate communications be removed. In upshot, it can be discerned that the initial deregulatory directives taken by the EU and the competition that has flowed therefrom, along with the present directives being formulated by the EU in toto, have begun the process of truly fostering corporate networking in the EU.

²¹⁸ Id. at 66.
²¹⁹ See Brittan, supra note 207, at 4, 5.
²²⁰ Competitiveness depends on access to efficient, high quality and low cost communications. European industry must be able to communicate at low-cost and to take advantage of the most modern ways of transmitting information electronically if it is to compete in world markets. Trade in telecommunications is thus a facilitator of trade in other sectors.
²²¹ See Amsterdam Conference Paper, supra note 41. “Business communications networks crossing national boundaries, providing full feature integration are being demanded more and more by companies wishing to maintain their competitive edge in the multinational business market.” Id.