Monopolistic Competition in European Telecommunications: Market Structure and Emerging Global Operators

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I. INTRODUCTION

Apparently radical changes in the global telecommunications market reflect only a more gradual evolution. The market power of TOs both in Europe and in the Pacific Rim -- almost all of whom are experiencing new competition in local access, long-distance, and international services -- has yet to be seriously challenged. The monopoly status of European TOs is particularly durable. To date they have managed to relegate nascent competitive pressures to the margins, and -with the exception of the UK's Mercury and Sweden's Tele2 -- entirely within the realm of so-called enhanced services. In the meantime, older monopoly market boundaries are being recast by larger players, who now seek to establish themselves, first regionally and subsequently on the global stage.

How should the evolving global telecommunications market structure -- generating over $500 billion in annual revenues -- be conceptualised? The relative positions of would-be global players is hardly fixed. In ongoing negotiations over a relatively narrow set of markets, core characteristics - regulation, financing, management, services - are significantly redefined. Incentives for cartel behaviour in service-provider negotiations are strong because the services market remains essentially supply-driven.

Monopolistic Competition: Regional and Global

The analysis which follows involves three interdependent levels. We argue that:

• With rare exceptions (the UK, Sweden, Australia, Japan) domestic voice markets both in Europe and the Pacific Rim remain monopolies. Today approximately 87% of European voice telephony (worth an estimated Ecu 110bn in 1993) is conducted within national borders by traditional carriers.

• Competition in domestic non-reserved/enhanced services - introduced throughout the European Community in line with EC Directives and (excepting Malaysia) in the Pacific Rim, partly in response to GATT negotiations - remains marginal especially so in Europe. There are important political causes which we shall discuss. However this particular scenario is rapidly changing because

• Regional enhanced-services markets --both European and Asian -- are evolving along the lines of monopolistic competition. Each is characterised by a significant number of differentiated product suppliers (rather than just a few, as in the case of differentiated oligopoly). Virtually every TO provides a range of domestic data networking capabilities and services; other new panEuropean providers -- SITA, SWIFT, Reuters, - are also emerging.

But the developmental logic is similar in both regions, driven by rivalry between (on the one hand) strong domestic TOs seeking to establish themselves regionally and (on the other) international value-added service providers -- IVANS -- carving up foreign turf in response to intensifying competition in former core businesses.

The present balance of power is unlikely to shift in the five-year timeframe. Change will be preceded by transborder voice liberalisation reflecting both internal drivers (CEC initiatives, user demand) and external catalysts (notably the activities of non-European service providers).

• The global services market is thus being colonised by IVANS, whose presence is significant in each of the three major geographic markets (increasingly too in Latin America), in addition to those regional players with near-term global potential.

Today there are ten such entities. They are AT&T, BT, Cable & Wireless, Infonet, France Telecom, GEIS, IBM Information Network, MCI, Sprint, and (although this judgement is premature) Unisource. Figure 1 documents vertical and horizontal integration on the part of each service provider by service domain.

Note that with three exceptions, these players are properly called IVANS. There remain France Telecom and Unisource (both of which have initially targeted the panEuropean market), and Cable & Wireless (which has established a foothold in both Europe and Asia). The geographical scope of these players is less comprehensive today, but is destined to expand.

If we add the range of strategic partnerships, alliances, joint ventures, and holding companies forged by each to date - with competitors, traditional partners, systems integrators, equipment vendors and computing sector players - the volume of data will quadruple.

Adding a timeline will bring NTT and KDD into the picture by 1996, and 3-5 years later include Deutsche Telekom, AOTC and Telefonica.

We could also add further dimensions, including one comprising such second tier players as US West, Bell South, Ameritech, NYNEX, EDS, DEC, and Cap Gemini Sogeti.

A fourth tier would include Southwestern Bell, STET, Belgacom, Singapore Telecom, as well as emerging international carriers (SITA, SWIFT, Reuters, Amadeus, DACOM Corp., etc.). Thus we descend to the global hierarchy's base which is inhabited by minor domestic service providers. Cooperative partnering defines the path of least resistance upward. The consolidation which this produces, however, will continue to be counterbalanced by competition as new formations arise. And the dispersion of intelligent networking capabilities will accelerate such tendencies.

Through the foreseeable future, the global telecommunications services market must be characterised as competitive rather than oligopolistic (noting that the significance of these analytical categories shifts as the concrete realities they describe change). But today it is monopolistically so: the market is imperfectly competitive because those products and services produced by the established and emerging players continue to converge whilst maintaining differentiation. [1]

Several examples of this phenomenon spring to mind.

Every major regional and global carrier/supplier is promising to introduce LAN interconnect services and deploy ATM switches. In the market for service packages including technologies such as frame relay or VPNs every major supplier today targets the same set of customers (the elusive Global 1000), simultaneously responding to rivals' rollout schedules.

II. An Impending Shakeout?

This global shakeout in the market for digital switching equipment has left less than a dozen firms with the expertise and R&D budgets to maintain competitive prowess.[2] This is an ongoing process, another round of which seems imminent given the narrow margins in some product segments. How plausible are similar predictions for the services sector?

Scenarios for the rise of half a dozen "super-carriers" ignores the terms of equipment industry consolidation, and so far has not spelt disproportionate death for smaller players. In fact, specialised vendors and software firms have flourished, filling market niches for networking equipment - bridgers and routers, modems and multiplexers. Nor did it erase overnight the advantage of firms with proprietary technologies (such as Stratacom). Smaller networking firms - initially at the mercy of the larger players' pricing strategies - have exploited near-term advantages to secure profitable niches.[3] What may be changing is the formerly stable equilibrium between customer desires for forward compatibility (to protect investments in sunk plant), and the need for hardware providers to churn through successive product generations.[4]

In services, the historical weakness of TOs in serving niche markets with cutting-edge technology affords similar opportunities to new entrants. Competitors play a vital role in prodding less agile TOs to keep pace with technical achievements by competitors and customers (this is most apparent in high-end markets). Yet none of the short list of global carriers - AT&T, MCI, Sprint, BT, C&W, FT, DT, GEIS, NTT, KDD, IBM, DEC, Unisource, Infonet - seems likely to disappear. These firms cannot afford simply to renounce the global ambitions which took them years to grudgingly embrace. Most remain too ambitious to subordinate their plans to competitors in exchange for the security of market access opportunities conferred by alliance. In this process one sees consolidation without death penalties, around complementary strengths and market access. European TOs are entering into service arrangements with non-European firms to penetrate other markets; to secure access to technological expertise; and to protect relationships with large domestic customers. And software-based services lend an increased advantage to non-traditional outsiders such as Cap Gemini or EDS.[5]

Modelled after Silicon Valley computer pioneers, smaller creative service providers build demand and generate new applications for increasingly software-driven networks.[6] , TOs meantime are shedding personnel which may return to haunt them. This surplus labour may initially be small, but it is expertise which can be absorbed at lower costs.[7]

Moreover, market growth inspiring radical changes in market structure is not a fait accompli. The global services market will still be dwarfed by revenues from steadily increasing residential and business demand for voice service. Data may overtake voice as the main source of traffic volume, but the latter's price inelasticity provides reliable insurance for Europe's TOs (who are not about to surrender these monopolies). If they continue to foster a so-called 'telephone culture' and generate greater usage-per-line (essentially pure profit, given that investment in capacity has already been made), voice may yet increase in stature.

Market growth is also constrained by existing network architectures which evolved to serve specific industrial structures. TOs are generally un-prepared to stimulate traffic levels to serve alternative carriers, and many European networks can only handle incremental traffic increases. Mercury's initial customers were often at BT's mercy, depending on how efficiently the latter could provide interconnection at various nodes in the City.[8]

III. The Research Perspective

The research perspective whose assumptions and conclusions we have briefly outlined shifts analysis away from the global market in telecommunications services as an entity *in itself*, and towards its conception as an collection of regional markets. Territory must be won in each by aspiring global providers: world-wide presence hinges upon the aggregation of submarkets.

This paper focusses upon developments within the panEuropean market. The dynamics are specific to this region, but there are important similarities with the Pacific Rim: the structures according to which IVAN penetration proceeds, the patterns of submarket rivalry established between outsiders and domestic players, etc. The discussion focusses on upon developments in data networking and services because market liberalisation occurs first on this level and the same patterns may well be repeated with competition in voice services, and (in any case) because the voice-data distinction is rapidly being eroded both by technological development (a truism) and by market logic (witness the move of formerly data-only carriers proposing to provide panEuropean voice, and the significant level of voice traffic commonly found in corporate 'data' networks).

Our discussion will move through three stages. We explore the dynamics perpetuating domestic voice and (in general) data monopolies. It is these which underpin the capacity of larger TOs to cooperate on a regional level, which in turn limits market colonisation by outsiders. We analyse the patterns of competition and cooperation which produce market equilibrium between insiders and entrants; the critical factors which constrain market expansion by providers; and the various strategies in developing regional, ultimately global businesses. In closing, we summarise key issues.

IV. Strategic Response by TOs to Competition

The corporate strategy literature relies largely upon industry characteristics in analysing company response to market forces.[9] It tends to focus on portfolio restructuring , diversification, lines of business, and (recently), technological capabilities for process/product innovation. Where inter-firm or inter-industry variations do not account for differences of conduct or performance, a corporate culture explanation is often explored. However, this literature focusses on tactics - product launches, deals, collaborations - rather than strategies used to address broader market and political issues.[10]

Some responses exploit historical advantage - leveraging access to domestic customers in building alliances. Some involve more creativity: developing complex outsourcing arrangements with customers and commercialising corporate culture. Depending on one's perspective, these actions reflect merely shared response to common circumstances, or (more deterministically) the coordination of capital interests in establishing domination of markets and labour.

Traditional monopoly carriers are generally beginning to address cash flow management, disengage from state finances, and introduce new services at marginal cost.[11] However, stable nationally-based revenue streams continue to support markets which remain supply- and investment-led, which perpetuates the position of incumbents.

Competition at the margins benefits TOs.

The central assumption in European policy debates must be that both TOs and national regulators gain from modest liberalisation. While we do not subscribe to the fashionable (if facile) North American tendency to see European markets as ten years behind their US counterparts, European players are now confronting the same contestable markets issues raised early in the 1980s in defence of the Bell System monopoly. Europe's TOs - and in many cases, their regulators - prefer the threat of competition to the actual item.

As long as core voice business is not significantly threatened, TOs experience significant incentives to welcome new entrants. The competitive threat spurs greater efficiency (in BT's case perhaps it justified efficiency measures deemed politically unpalatable under monopoly) and stimulates usage of already capitalised resources. Further benefits accrue from fostering a dynamic, entrepreneurial segment which accelerates innovation in core markets. There are several recent examples of this dynamic, notably within the computing sector.

From the pro-competitive stance, BT serves as a model for the increased strength and regulatory relaxation associated with marginal competition. The company may be responsible both to shareholder and regulatory scrutiny, but enjoys greater freedom to pursue its ambitions within a liberalised framework. The example is strengthened by the failure of the UK (and other) competitive experiments to exceed deregulatory expectations (to date Mercury for example has provided little benefit to individual consumers). This may not deter new entrants from deploying infrastructure under a supply-side approach.[12]

Considerable progress has been made in legitimating fringe competition as a palatable alternative to national monopolies, yet there remains (except in Scandinavia) an inbred suspicion of the British model. TOs on the Continent are still wary. In the long term, competitive areas may become increasingly difficult to cordon off, as in the case of mobile service operators providing local loop access to trunk carriers. The space for competitors (contrary to industry rhetoric) is undeniably modest. Mussolini would be disappointed with the timetable for the liberalisation train, ever pulling out of the station. The European TOs continue to dominate markets for non-reserved services, which comprise 20% of overall revenues.

For example, central to the EC's argument for intra-Community voice liberalisation is that TOs derive only a small revenue share - between 4% and 15% - from cross-border voice services. Furthermore this entire margin would not be jeopardised, as new operators need time to build significant market share (c.f. Mercury). Yet liberalising this sector has nonetheless been opposed by most TOs.

The "no compromise" strategy adopted by advocates both of monopoly and competition reflects the entrenched mentality which must be overcome. For example, the DGIV's argument[13] linking the cost of universal service obligations to the inflated sums paid to national champion equipment suppliers conflicts with the industrial policy-oriented DGXIII world view. The former suggests that under competitive threat - real or promised - Europe's TOs might dramatically improve efficiency (although the equipment industry would undoubtedly suffer, as has GPT from BT's moves). This point will remain critical to discussion of near-term futures.

National regulators also understand the benefits of modest competition, which can be accomplished without adopting an adversarial stance via a vis TOs. Pushing the TOs to be more efficient is an important goal for regulators under public scrutiny (Oftel, the German MPT), and highlights problem areas (e.g. service quality) where intervention is socially desirable.[14] Finally the veneer of competitive markets must be preserved in line with the EC's Single Market goals.[15]

Yet other influences are equally clear. So long as states retain significant economic and political stakes in telecommunications networks and policy, competition will remain carefully coordinated and gradually implemented.[16] And some braking forces are structural, rather than a product of TO or political intransigence. For example, the consistent gulf between technology and regulation is unlikely to change under competition. (Alluding to tensions between increasingly independent TOs and regulators with little expertise in crafting commercial policies, one ONP Committee member noted pragmatically that "you can't regulate a service into existence.")

If both regulators and operators accept competition at the margins, what market forms is this producing? Today alliances, consortia, and joint ventures link European service providers with one another but also with outsiders. These forms of collaboration have captivated the business press and senior management but are not new: TOs are hardly autonomous actors, having long been nested in complex chains, webs, matrices, fillieres, and so on, which link their destinies with other industrial and public sector interests.[17] What is new is the dynamic balance of power struck between traditional monopolists and extra-European entrants.

What forces are driving these new forms of cooperation? We turn now to this questions.

V. The IVANs and the Regional Players

Market Boundaries

Despite aggressive service introduction and switch deployment, several factors will limit the international value-added network (IVAN) providers' profitability in Europe. Market liberalisation produces countervailing protectionist tendencies. These include a noticeable preference among diversifying domestic players for cooperation - given the right circumstances -with members of the European club. The same is true for TOs venturing further abroad (where partnerships with the dominant domestic provider are the favoured course) and/or entering neighbouring markets. (The UK is the only market where US RBOCs have acted without local partners.)

This is not a new development, either in service provision or the equipment sector. (For example, there remains considerable fear of technical lock-in to AT&T systems beyond the US market, despite the several phases of equipment liberalisation mandated by the European Commission.) There is also the problem of adapting both services and products to regions for which these were not originally developed. Unless they are tailored to local requirements with appropriate sales and service channels, these may assume the status of pure commodities or fail completely.

The European TOs control (with rare exceptions) domestic access to all but the largest customers. The most sophisticated players have global ambitions in the longer timeframe. Today, however, their primary focus is regional, and the Franco-German axis sets Europe apart from both the US and Asia-Pacific regions. This is precisely because of the size of the partners' combined home markets - a prerequisite for global performance - and the fact that the distinctive form of cooperation which has evolved over the past 6-7 years between France Telecom and the former Bundespost is being reproduced with variations elsewhere within the region, and towards similar ends. (The emergent Dutch/Swedish/Swiss cooperation under the Unisource umbrella provides a high-relief example.)

The Emerging European Equilibrium

Thus ultimately the potential of all players with outsider status -AT&T, Sprint, IBM IN, and (ironically) BT which has cast itself as a global rather than European player - will be limited by the ambitions of the continental TOs, both large and small. (This is less of a constraint upon GEIS, which has historically maintained strong relations - beyond the level of mere traffic hand-off - with the continental European carriers.)

In 1992 both BT and AT&T Istel launched ambitious panEuropean network-building projects. These highways are part of an emerging hub-and-spoke infrastructure linking European capitals with key outlying cities. They challenge both the cooperative transEuropean broadband project GEN - announced first in 1989 by Italy's STET, France Telecom, Deutsche Telekom, Telefonica and BT itself - as well as the aspirations of every IVAN. Along these corridors competition will be intense, rate arbitrage prevalent, and margins lowest.

Domestic Market Penetration Generates Highest Returns

Today 75-80% of European data traffic is conducted within national borders. Although market liberalisation is well underway (but never further than EC policy mandates) there is little immediate threat to incumbent providers.

The IVANs may colonise transborder markets for managed data network services (MDNS), network outsourcing, and high-speed LAN interconnect across the Continent. But their access to domestic packet-switched networks, and consequently opportunities to develop so-called industry solutions exploiting these facilities, will be restricted by former monopolies. Yet this is where the largest profits will be generated in the 5-10 year timeframe.

Cooperation with domestic players - which means profit-sharing -will therefore be crucial to business development. Today the IVANs package network services as MDNS (added value translates into higher tariffs), and market horizontal VAN capabilities - messaging, transactional, and online services - to targeted subgroups via direct sales teams or agent resellers. But their access to small- and medium-sized business customers is everywhere limited.

Corporate TO Strategy

In contrast, the larger and more progressive European TOs are developing VANS capabilities along the trajectory toward established industry-standard applications: ones which coordinate the multiple steps of inter-enterprise communications in every business-cycle, and which depend upon comprehensive network penetration for access to the small- and medium-sized business user.

These they intend to systematically exploit - via control over switching, transmission, interconnect arrangements, distribution channels, licensing agreements, pricing, and all of the remaining parameters - so as to recoup significant infrastructural investments to date in networks whose raison d'etre is now taking shape (ISDN, GSM, X.25), as well as emerging commitments to broadband LAN and WAN capabilities.

Today the model established by the French Télétel system has been reinvented by the French and Germans acting in concert. The engine for this is EUCOM, which may ultimately paralleled by Unisource. These far-reaching co-operative initiatives among the stronger domestic players will shape the evolution not simply of European voice and data businesses, but also of related industries throughout the region.

V. A HIERARCHY OF VANS

Four Levels

Level One - basic network services and managed data network services (MDNS) - provides the platform.

Level Two involves horizontal VANS (messaging, transactional, and online services) intended to develop and sustain demand for primary-level facilities.

Level Three is the domain of customised solutions, where systems integrating disparate components (relating to horizontal and/or vertical capabilities) are designed on a project basis.

Level Four - today the most complex - involves developing standardised industry solutions, designed to maximally exploit existing and committed future-network capabilities, and marketable as commodities to ensure appropriate economies of scale and scope.

The last requirement is crucial, as it distinguishes Level Four VANS providers from those who excel on the project rather than industry level, as well as from competitors who perform optimally as full-service providers within industries, but whose focus on developing vertical applications linking companies *within* and *across* industry chains is not complete. (Among the IVANs, only GE Information Services defines its core business in these terms.)

The Developmental Trajectory

Level Four VANS providers, in contrast, are entirely oriented toward developing industry-standard products. Here EDI (central to quick-response retail systems, stockless inventory programs and just-in-time manufacturing) becomes just one component within a universe of modular capabilities.

Some of these - currently under development -involve information transfer according to standardised computer protocols. Other modules incorporate messaging systems covering every aspect of trading partner relationships; online systems circulating industry-wide production data among producers, marketers, transporters, buyers, operators, and regulators - both domestic and international; and/or network management and radio communication capabilities. (The use of GSM tracking for fleet management in EUCOM's EURO-LOG is one leading example.) Such modular systems-integration tools are designed to become industry standards.

VI. DEVELOPMENTS IN EUROPEAN DATA NETWORKING

Here we analyse the different strategies currently pursued by IVANs and domestic players to expand presence in the European data networking market.

The IVANs include TO players with significant financial resources (AT&T, BT), TOs with less access to investment capital (Sprint, Infonet), and computing sector providers (GEIS, IBM IN).

On the domestic front we focus upon France Telecom and Deutsche Telecom, and their subsidiaries Transpac (owned by FT's COGECOM) and the joint venture EUCOM.

We leave aside for the moment a third group of emerging players seen in Figure 1 -- MCI, C&W, Unisource -- all three of which have yet to define European strategies. To date their market ambitions remain unclear.

IVAN Strategies and Market Prospects

The IVANs will comfortably generate revenues on VANS levels I-III (basic and managed data networks, horizontal VANs and customised solutions) in the five-year timeframe, although the third is more the province of players originating in the computing sector (GEIS and IBM IN) than in voice networks. However expansion into level IV (industry-standard applications/ ISAs) will depend upon establishing relationships with network providers in every national market. [18]

Wealthy TO Players: AT&T, BT

As the European TOs themselves move aggressively to build market share in horizontal network services, the major IVANs must broaden hitherto-targeted VANS customer bases. In the longer term each must deliberately establish a presence at the highest and most profitable level, which involves the mass marketing of industry-specific applications in major commercial sectors.

Established IT firms have significant experience in this area, although more on a project rather than industry-wide basis. They are nevertheless skilled in applications development and in weaving together disparate IT products. Because this translates into lower costs and other forms of comparative advantage, acquisition of systems integrators seems the obvious route for wealthier IVANs.

AT&T Istel's Continental expansion plans hinge upon recent software/IT specialist acquisitions, and correlatively an aggressive targeting of multinationals' MDNS and facilities management businesses.[19] Meantime, BT has characteristically announced its intention of becoming one of the top five systems integrators worldwide during 1993-97.

Weaker Global TO s: Infonet, Sprint

Infonet's almost exclusive focus to date on transnational services is a liability, particularly as competitors - notably AT&T Istel, BT, IBM, and Sprint - are following the consortium's lead by including support for multiple protocols, dedicated virtual circuits and bandwidth-on-demand, and LAN interconnect services. Attack (albeit friendly) is the best defence, and so the company is seeking alliances and joint-venture partners for business development in national markets. The goal is to expand Infonet's customer base through domestic presence, and also consolidate group identity.[20]

Sprint's evolving relationship with Unisource and its recently-announced Alcatel Data Networks collaboration come at a crucial time. However, in both cases the company's European partners retain the upper hand: whether Sprint manages to aggressively exploit both relationships towards its own ends may finally determine the company's significance in European VANS over the ten-year timeframe.

Computing-Sector Providers: GEIS, IBM IN

In the past GEIS has excelled as a full-service provider for multinational clients with limited inter-enterprise applications transfer. Today the company focuses on building industry-standard solutions upon its base of `electronic commerce services' (i.e. basic VANS applications such as messaging, e-mail, online systems, and transactional - including EDI - services), and interlinked by modular software tools. The business strategy spans three levels - implementing intracompany systems across industry-specific enterprises and subsequently across industries - and targets five commercial sectors.[21]

GEIS' shift to developing off-the-shelf software products - intended to generate scale and scope economies - has important long-term consequences. Because significant levels both of domestic network penetration and also market education are required before IT permeates medium- and small-sized European businesses (although here, too, an avant-garde exists), cooperation with European TOs must inevitably increase.

Seeking to leverage different strengths, IBM is moving toward open, broadband SNA because it anticipates users embracing video-based multimedia applications in a multivendor setting.[22] The IBM IN has also targeted three growth areas: network outsourcing, customised-network design, and industry-solutions. This company has neither GEIS' experience nor EUCOM's unique advantages. Yet market penetration in key industry sectors will become critical: because the first two targeted areas are those in which all providers now variously compete, and because IBM IN's formerly distinctive strengths are today less important differentiators.

Thus in the case of both global computing sector players, medium-term growth in Europe implies closer business development with the European TOs, who control (with rare exceptions) access to all but the largest users. Cooperation will be necessary to ensure not simply an expanded customer base for service innovation, but also to guarantee network externalities for potential trading-partner clients within targeted industries.

Regional (PanEuropean) VANS Providers: EUCOM, Transpac

The strategically-interdependent companies Transpac and EUCOM share the potential to drive IT implementation at the small-business level throughout much of northern Europe - and certainly in both French and German domestic markets. This coalition of interests is unique within the European region but also globally, both in terms of market size and potential impact upon a range of core industries.[23]

Almost entirely oriented toward developing industry-standard solutions, EUCOM begins at the most complex VANS level. The company is intended to play a pivotal role in strategically exploiting massive infrastructural investments to date by joint-venture partners France Telecom and Deutsche Telekom. The holding-company's mandate is to develop a range of higher-level products and services, which are intended to boost not simply usage of generic VANS capabilities (e-mail, EDI, online services and so forth) separately marketed by the parent companies, but also of their domestic ISDN, X.25, and GSM networks. (As in the US, low European demand for ISDN per se is counterbalanced by significant demand for ISDN applications.) It is the commitment of EUCOM parent companies to ISDN which underpins such start-up projects as Media Nova Informatik, EUROTOP and Monitor Journal. Other ISDN network drivers will doubtless emerge.

However failing widespread ISDN and GSM implementation through 1995, Transpac - joined later by Deutsche Telekom's Datex-P - will emerge as EUCOM's most important beneficiary.[24] (Today there are over six million Minitel terminals in use throughout France; more advanced network locomotives are needed.)

Other aspiring regional players are transforming themselves into holding-companies building international portfolios. Few (apart from BT) will have the financial strength to do so independently. Most will pursue shared commitments and cooperative business development after the EUCOM model. (In fact Unisource was created directly in response to the Franco-German alliance, just as the outsourcing venture Eunetcom represents a co-ordinated response to BT's Syncordia.)

Haves and Nots: Who Plays in the European Market?

Here core/periphery relationships play a significant role. One class of TOs seeks to leverage (in general, recently-acquired) experience in global services, developing investment opportunities for monopoly profits. Another has pursued international ventures, mostly involving domestic service provision even as home markets beckon with unfinished business. (Telefónica is a prime example, but there are others.[25]) A third group forms alliances to meet demands of large customers for services which for lack of capital and/or expertise they cannot provide.

Among the haves, only three European operators (BT, FT, and Deutsche Telekom) enjoy the resources and expertise in home markets to establish viable pan-European or global networks. These larger TOs trade on the stability of protected home markets and steady revenues from a captive subscriber base including high-end military and government users, who generate significant traffic volumes, contribute to the development of leading-edge applications and coordinate access to R&D funding and facilities.

This last is critical to the TOs' resource base. France Télécom, for example, benefits from extensive state-funded R&D and education programmes. Deutsche Telekom is hampered by restrictive German laws preventing foreign subsidiaries, but has nevertheless secured a lucrative growth market to the East. As in the case of AT&T with Bell Labs after divestiture, BT has abandoned much of its domestic R&D efforts - with the notable exception of software engineering. Instead the company invested heavily in subsidiaries and technology platforms, including Tymnet and Syncordia, with further acquisitions anticipated.

These TOs can also fund the software development needed in developing advanced networks.[26] This focus is critical to customers and profits as well as internally, as the cost of billing systems and databases (especially for network management systems requiring high reliability) spirals upwards.[27]

The remaining TOs lack the size (Belgacom, PTT Telecom Nederland, teleDenmark, Telecom Eireann), organisational and technical know-how (Telefónica, SIP/STET/Italcable), and/or finance capital to compete on a global scale. Some, such as CTT and OTE, lack all three. On the border between haves and have-nots, the Spaniards and Italians lack the capital to fully resolve domestic problems, let alone properly address international demands. The Swedish and Dutch PTTs, on the other hand have adopted an aggressively cooperative approach.[28] Future Member States such as Switzerland, Sweden and Austria are equally constrained by size, though both have shown technical proficiency and traditional strength in export markets.

VII. CUSTOMER FOCUS

Initially focussed on a narrow segment of high-volume users (corporate or state-sector) customer service has in the U.S. filtered down to the level of single-line residential subscribers. Corporate customers in particular benefit from a high level of technology deployment, as seen in the range of alternatives to traditional networks. (For example, over 90% of the worldwide installed base of VSATs are in the U.S., and North American firms are the heaviest users of switched high speed (1.5 and 45 Mbps) transmission paths).

What does a customer focus entail? For one, it requires improved infrastructure. Most TOs must manage the demand for service so as to limit traffic increases. Recent tariff rebalancing - keeping access low to build penetration and leaving usage high - reflects this constraint.[29] There is for an established demand for panEuropean managed network services. How have the TOs responded?

Building the Euro-Mall

One-stop-shopping service arrangements have been largely unsuccessful: TO ambitions have suffered through internal squabbles over network management, foreign exchange burdens, and contractual liabilities for providing uniform service quality or rates amidst a patchwork quilt of bilateral accounting and interconnection agreements. Users, meantime complained of problems with single-point billing and service charges.

A generic problem arose from the limited conception of one stop shopping: seen largely as providing a single point for purchasing diverse options rather than fully managed networks.[30] (An analogy is the single travel agent who books carriage on any network; with Aeroflot or OTE, you're in for a bumpy ride). Providers have also been hampered by uneven network coverage, the lack of a single carrier identity and national prohibitions on resale and service unbundling.

There are also historical barriers. Patterns of industrialisation resulted in corporate networks which evolved in country-specific forms. France's centralised packet-switched network platform offered a cost-effective solution for serving industries concentrated around the Ile de France region (France has relatively few multi-site firms); German firms' network development reflected the country's federal structure and industrial decentralisation. It is not surprising that DT today adamantly refuses resale and third-party use of digital circuits: its network expanded by generating demand for costly leased lines, with few alternatives.[31]

Despite such problems, multinationals continue to demand one-stop shopping services which would eliminate the transaction costs and uncertainties of dealing with different carriers. They appear prepared to pay a considerable premium for managed services, although limits exist. (Early user Amadeus found its arrangements too costly, underscoring the fact that one-stop shopping providers are hardly as motivated as corporate telecoms departments to keep costs down.) Meantime, regulators have found themselves opposing users. The DGIV declared that common ordering procedures developed by TOs was an abuse of dominant position. The Hermes project was also attacked as anti-competitive for bundling service elements; the DGIV opposed uniform prices which ignored local conditions.

Such objections may be relaxed considerably where more than one operator offers panEuropean data networks (regulators will then concede that interworking and interconnection demand close coordination). These problems illustrate rather well the complexity of the European market. Services must be pursued in advance of regulatory approval, which consistently lags behind technical innovation. New entrants and users must harmonise interfaces and suffer through regulatory delays. Demand forecasts offer little comfort, although TOs and new entrants are beginning (as we have seen) to work together in addressing emerging submarkets.

From Whence Comes the Mythical Europerator?
European carriers have shown a desire to work together in certain submarkets, responding to numerous EC documents (including the Maastricht treaty) which call for pan-European telecommunications networks. The TOs do not want the EC to advocate competition as a solution for this network, and know they can improve productivity by increasing usage of existing network capacity. GEN, which involves the installation of digital cross connects to allow faster access to large users (keeping traffic channelled over private networks), represents a major advance.[32] There remain questions of the terms under which smaller players will access the GEN network: will they use the Leased Line Directive to force access to panEuropean 2Mbps links?)

GEN has yet to materialise, and other projects are similarly stalled. It is impossible to say whether these efforts to establish pan-European networks have failed because of insufficient demand or because of the considerable regulatory and technical obstacles. These elements are changing; users have become increasingly vocal in identifying specific technical needs, demanding tariff reductions, and forging closer links with suppliers. They have formed organisations to present a unified stance to vendors and carriers, although doubt remain as to whether such groups are effective at communicating user needs or simply another marketing forum.[33]

VIII. WELCOME BARBARIANS

Capital still retains a determining influence over the evolution of telecommunications and other industry sectors. Throughout the 1980s financial concerns grew in visibility and drove the restructuring of firms and entire sectors.[34] Telecommunications - painted as a recession-proof growth industry, rather than as mystical preserve of advanced technologies - was not immune. Until the mid-1980s, technology had been the focus of PTT attention. As its profit potential was subsequently noticed, new CEOs were imported from the finance sector.[35] They redefined operations, published profit and loss figures, and adopted cost-consciousness, thus obscuring some of their prestigious engineering cultures.

Financial pressures on TOs in fact mounted sharply late in the 1980s. TOs had traditionally been required to subsidise national equipment firms through inflated procurement contracts as well as government budgets. However network costs did not necessarily fall with digital network deployment, and large-scale infrastructure projects required more capital than governments could provide. As competitors gradually emerged, greater attention was paid to tariffs[36] and customers threatened bypass. It was a far cry from the sleepy bureaucracies dominating telephony first 100 years. These pressures resulted in finance reforms in nearly every EC Member State (Figure 2).

Figure 2: A shift towards finance culture

Belgium	1985	Debt crisis due to public investment restrictions on RTT.
Denmark	1990	Creation of TeleDenmark consolidates TO resources.
France	1984	Caisse Nationale des Télécommunications est. to fund FT.
Germany	1992	Partial DBT flotation proposed for 1996.
Greece	1992	OTE flotation proposed.
Ireland	1984	Irish Telecommunications Investments est. to raise capital for Telecom Eireann.
Italy	1985-6	Quiet flotation of SIP and STET shares.
Netherlands	1989	Corporatisation of Royal PTT Nederland to circumvent public borrowing restrictions, privatisation planned.
Portugal	1990	Proposed privatisation of TLP, CTT; creation of holding company (Telecom Portugal) to facilitate share sale.
Spain	1985	Telefonica privatisation: most widely-held Spanish stock.
UK	1984	Privatisation of BT; £4bn in public debt forgiven to boost share vaues.

The deepest of these reforms involved partial privatisation (BT, Telefonica, STET and SIP). Similar schemes are now proposed across the EC, save Luxembourg. Yet privatisation tests the mettle of reformers. The Dutch, Portuguese, Greeks and Irish all postponed privatisation plans once debates on the issue became mired in partisan politics. The French began to discuss partial privatisation only in 1992 (to alleviate France Télécom's heavy debt burden[37]). Deutsche Telekom recently expressed hope that floatation would raise some DM20bn, but the government precluded sale before 1996.

Increasing financial influence will impede liberalisation in some markets. Long term monopolies may be needed to make Eastern European telecommunications investments attractive. Renewal of Telefónica's 30-year monopoly (which underpinned its "Year of the Investment Drive") sent its stock soaring last winter.[38]

Inadequate financing also places the less-favoured EC regions in a double bind: lacking networks of sufficient quality to support advanced business applications, they are unable to generate the capital to finance infrastructure development. This sort of feedback loop suggests that disparities among European nations will escalate in the next 5-7 years, and the LFRs are likely to be ever more resistant to reform.

Political decisions backed by the power of industrial constituencies reinforce recursive trends: Italy found capital to fund networks in the North, but left the South without comparable services. At the EC level, participation through STAR and RACE programmes is dwarfed by regional needs. Lacking strength with which to forge alliances (save defensive ones) the LFRs fail to attract the industrial customer base which has bolstered TOs revenue streams in larger Member States. There too, the option of supply-side infrastructure investment is complicated by lack of switching capacity, quality variations which preclude national services and consequently a less sophisticated user community. Without cash flow, operators must look to subsidies as a guarantee of long-term survival.

While this recent emphasis on capital persists (in large part due to decline in states' ability to fund infrastructure investments), traditional motivations remain. International ventures, for example, are often the product of cultural rather than business decisions;[39] as economists like to point out, business cultures often ignore economic logic.[40]

IX. POLITICAL LINKS

There remain a class of questions framed beyond economic or managerial debates. Governments command the attention of TOs. Seasons change, but European protectionism remains chronically fashionable. In areas such as procurement (where global competition appears largely to have outrun political obstruction), the EC can still invoke its role as protector of European industry. The idée fixe of Fortress Europe - itself consisting of 12 smaller fortresses - unmistakably persists, where industrial policies promoting national champions and steady TO contributions to government budgets cement entry barriers.

The political lobby has grown in strength as pro-competition factions (led by DGIV and the UK) wane in influence. The French present themselves as progressive technocrats in regulatory matters [41] whilst the Germans seek to balance federalism and centralised capital flows with institutional power (e.g. Deutsche Telekom). Neither today seems eager to end tacit cooperation amongst its network of national firms with transEuropean investments.

In the meantime, the Services Review debate is stalled on numerous fronts.[42] TOs may invoke complex legislative arguments, international trade law, or demand political protection for foreign competitors. There are also natural technical barriers to overcome: delays or problems with attachments, uneven network standards, lack of excess switching capacity, etc. After years of supporting national champion suppliers with proprietary standards and interfaces, Europe's TOs cannot overnight reconfigure their networks or institute open architectures.

Such on-going regulatory squabbles serve to delay changes for those least prepared to capitalise on them. The ultimate fear (of politicians and TOs alike) springs from the loss of control: as regulatory efforts are consistently outflanked by market developments. There is, for example, an obvious disjunction between the slow progress of interconnection policy and the explosive market growth (both in Europe and globally) for internetworking products and services.

X. CONCLUSIONS

European telecommunications will increasingly be defined (subject to market access and regulation) by cooperation in the vertical markets and competition in horizontal sectors. The rise of the latter may be the thin edge of a wedge which undermines the historical correspondent relationships among TOs. At the same time, the need for a harmonised approach to international services provision may give birth to an ET (Europa Telecom) and/or a panEuropean forum charged with managing network interconnection and service integration.

Incumbent market participants are launching various cooperative initiatives to protect against creamskimming of high margin businesses. Call-back schemes, leaky PBXs and services bypass highlight the extent to which market and technological developments have outflanked regulatory barriers. Today, TOs cannot count on regulators to protect them, and practically every European regulatory body appears vexed by the problem of fostering competitive service provision.

As regulatory and market structures are transformed, Europe's TOs face unprecedented challenges in management, marketing and corporate culture. These 'soft' areas are a vital source of competitive advantage in an increasingly services-oriented industry. Private (especially virtual) network growth will continue in many markets, particularly as equipment suppliers in low-margin businesses are forced to cut prices (and enter services provision themselves[43]).

New service providers (players able to secure regulatory backing and more swiftly address market opportunities) will continue to emerge: there are clear roles here for IT and DP firms, suppliers, and industry-specific alliances like SITA and SWIFT. Such groups need not own transmission facilities.

Intelligent networking will accelerate this trend leading to the emergence of independent service providers, who will pay usage charges for network infrastructure but generate revenues beyond those carriage costs. Rather than being an overlay network, the IN will become the public network itself: the solution into which overlay networks will dissolve. The emerging era of network-less service providers will drastically accelerate nascent changes of structure and identity in the traditional players.

1. Three features characterise the industry in which many competing firms produce close substitutes. First the firms provide products and services between which customers slightly differentiate -- hence the potential for cultivating brand loyalty which underpins each provider's small amount of monopoly power. Second, new providers enter to exploit profitable sectors (hence the wave of carriers which have emerged during 1989-1993). Third -- as in the case both of perfectly competitive and monopolistic firms -- producers in monopolistic competition seek to maximise profits.

2. Contrary to current rhetoric, Europeans maintain a leading position. In some segments the EC trade balance is negative, but this is due to loss of market share in terminal equipment rather than in switching or transmission. Growth areas such as gateway switches are dominated by Ericsson, with Alcatel, Siemens and Italtel playing strong supporting roles. See Pyramid Research, 1992, "International Gateway Markets," ***Telecommunications Development Report,*** June Vol. 7, No. 6.

3. A good example is Stratacom, which won a significant,though small share of the market with its frame relay products and multiplexers based on a proprietary standard.

4. TOs and equipment manufacturers alike have protected themselves by adopting "evergreen" policies, where network upgrades consist of simple line card replacements. Thus, TOs are not forced to alter existing network architectures until technology choices are apparent.

5. Jens-Arnbak has suggested that the entrepreneurial, adaptive (often self-consuming) culture of firms in the IT and DP sectors makes them better suited to meet emerging needs than the TOs accustomed to gradual change and limited competition.

6. A huge percentage of entrepreneurial startups in the US computer field were begun by cast-offs from IBM, HP, DEC, Burroughs, and so on. A similar wealth of expertise in the European computer industry is watching its livelihood dwindle: engineers and marketers shed by Bull, IBM, Nixdorf and Philips are turning to telecommunications as a natural complement to past activities.

7. Telecom Electric, the network provider of the UK electricity utilities, hired ex-C&W Managing Director Gordon Owen (architect of C&W's Global Digital Highway) and David Dey, former CEO of ICL who was involved in developing ICL's ISDN products. Dr Sydney O'Hara went from BT to C&W to help develop a coherent network evolution strategy.

8. BT identifies this as a main source of its mid-1980s quality problems.

9. Malecki, Edward, 1986, "Technological Imperatives and Modern Corporate Strategy," in Scott. A.J. and M. Storper, ***Work, Territory, Capital,*** New York: Routledge.

10. Scholars have little access to corporate decisionmaking at this level. But the real reason for the lacuna is that most traditional telecommunications entities have barely begun to think strategically.

11. Stand-alone cost-accounting may stifle demand but would in turn provide opportunities for competitors. A requirement of fully-distributed costing (as is the case on the macro level with international settlements) would restrain competition to the narrow boundary between marginal and stand alone costs. Of course, other factors are at work--demand elasticities, market conditions, price senstitivity, links between innovation and price competition, etc.

12. There is mounting evidence that the patience and resources allowing new entrants to invest for the long term may be more limited then initially projected. See (for example) recent announcements that the Hutchison Whampoa Group is re-examining its capital committment to UK mobile communications. At the same time the carrier accelerated efforts to resell services on the Cellnet and Vodafone networks). This sentiment has been echoed broadly by members of the UK investment banking community, which has been hard pressed to find new investors for cable telephony or mobile communications ventures. Second carriers everywhere have been slow off the mark. Sweden's Tele2 has accomplished little market penetration (since 1989) despite its liberal environment. Hermes has now floundered for three years. Optus in Australia seeks to provide a universal

service via conventionak trunk and mobile networks by 1997, based upon favourable terms of interconnection with AOTC. The New Zealand experiment appears a mess. Mercury seems torn, Hamlet-like, between chasing or ignoring residential consumers. (Despite recent statements that the company would adopt the former approach, it does not today install plant serving fewer than 16 lines.)

13. This argument surfaced initially in Jurgen Müller's 1988 INSEAD study, referenced in the Cecchini report (Cecchini, Paolo, 1989, ***The Costs of Non-Europe***, Wildwood House) and has been voiced theatrically in speeches by Commission staff.

14. Without debating the level of regulation needed to sustain market competition, we can agree that some areas of regulatory intervention are common to all: service quality and universality, spectrum allocation, non discriminatory terms of access and tariffs for residential-not necessarily business-users, ensuring service equity, and (last but never least) promoting national competitiveness.

15. Kramer, Richard, 1992, "Division and Difference: EC Authority and the Illusion of Competition Policy,"***Communications et Strategies***, Vol. 5, No. 7.

16. Privatisation will not necessarily address this issue since most PTOs will still be involved in transferring large sums to the state (via taxes and custom services). State and TO remain inseparable even under privatisation - BT employees must sign the Official Secrets Act because of the classified work BT undertakes for the government.

17. For views on such links, see Mansell, Robin and Michael Jenkins, 1992, "Networks and Policy: Interfaces, Theories and Research, " ***Communications et Strategies***, No. 5, 1er Trimestre; and Van Waarden, Frans, 1992, "The Historical Institutionalisation of Typical National Patterns in Policy Networks Between State and Industry," ***European Journal of Political Research***, 21: 131-162.

18. Those markets dominated by former monopoly TOs independently targeting level IV (e.g. France Telecom via Tanspac and EUCOM) undergoing cartelization. In other regimes liberalizing all but transmission networks (Finland and Denmark are the first examples), prevailing conditions in general appear less conducive to collusion, predation, and entry deterrence among incumbents. It will clearly be easier for the IVANs to build domestic market share - which hinges upon ISA-level activity - under these circumstances.

19. During 1991-92 the company purchased the French software and information services company Dataid; Germany's IT services company CAB (Computeranwendungs- Beratungs); and the UK software houses Belmin Systems, Daton Systems, WP Associates, Chorus Software, and Computer Systems Development (CSD) - subsequently renamed AT&T Impcom ISTEL Systems.

20. Some entrepreneurial subsidiaries, for example, are charged with essentially local mandates. Thus we see an increasing number of joint-ventures and partnering arrangements - which are variously intended to eliminate entry barriers, provide domestic customer access, allow exploitation of local expertise in marketing or software development, and so forth. Others (e.g. potential future cooperation between BT and EDS) are intended to play a pivotal role in international business development. For example, downward migration of technologies and service applications from mature to less-developed markets may be an important component of strategic planning.

21. These are retail, automotive, trade and transportation, banking/financial services, and - more recently - pharmaceuticals. EUCOM has targeted three of the same sectors.

22. Thus, for example, the company's 1992 agreement with PictureTel Corp. to jointly market desktop videoconferencing.

23. It would be hard to overestimate the flexibility concerning extended R&D as well as strategic market development conferred (on the one hand) by the near-monopoly status of EUCOM's parent-companies France Telecom and Deutsche Telekom, and (on the other) by their established cooperative tradition. The last remains fraught with complexities, but potent nonetheless: upon this hinges the entire EC Single Market project.

24. This company, a subsidiary of France Telecom Group's holding company COGECOM, has a domestic network of 550 switches and employs a workforce of 1075. Today Transpac's goal is to establish an integrated European packet-switched network of near-universal coverage The company has entered seven foreign markets to date (the UK, Germany, Luxembourg, Italy, the Netherlands, Switzerland, and Scandinavia) through partnering arrangements.

25. France Télécom's network is not advanced as are its public relations efforts and its high percentage of digital switching is hampered by limited fibre trunk networks. Much of the French network for data- perhaps as much as 80% - runs at speeds of 9.6 Kbps or less.

26. France Télécom recently acquired 19% of the Sema group, a leading French systems integrator, and DT has a similar alliance with one of the largest German IT firms debis Systemhaus.

27. For discussion of the increasing significance of data processing to the TOs see A.D. Little, 1991, ***Issues and Options: Telecommunications in Europe from 1991-2010***, DGXIII, Commission of the European Communities, and Williams, Howard and John Taylor, 1992, "Network Management Service Provision, and Changing Industrial Structure," Presented to the 9th ITS Conference, Sophia Antipolis.

28. Unisource is first and foremost an alliance geared towards limiting the inroads of UK carriers into the relatively open Scandinavian markets: the three partners have bundled existing services under a single multinational umbrella with relatively minor financial committment to date. Significantly they have merged their data networks. Ultimately the Dutch and Swedish TOs may combine operations entirely.

29. It is at present unclear whether network investment could be recouped by traffic increases if costs of service provision were radically reduced. The larger question is whether PTOs have stifled (deliberately, for they had no option of stimulating) demand, the development of a "telephone culture" critical to modern economies. One prominent US economist has argued that freephone is the single greatest marketing innovation in telephony of the past 50 years.

30. As one European CIO put it: "I want one bill to pay and one person to shout at on the telephone."

31. This lack of choice also explains why relatively modest satellite liberalisation of slow speed data in 1991 was hailed as a major step by users.

32. The British and Germans apparently suspect that GEN is another French-led industrial policy project which will involve the installation of Alcatel digital cross-connect switches (and bolster the postition of France Telecom's European service offerings, through Transpac, Eucom and Eunetcom). These dynamics are explored in depth by NíShúilleabháin, Aine, 1993, ***European Telecom Services Markets***, New York: McGraw Hill/Northern Business Information.

33. We refer to efforts such as the formation of the Telecommunications Council of Multinationals (TelCOM) which meets with TOs.

34. See, for example, two prominent French books which celebrated corporate leaders and their role in high finance--Alain Minc's ***L'Argent Fou*** and Jean-Jacques Servan-Schreiber's ***Le Metier du Patron***, not to mention the many English language publications promoting the importance of finance.

35. For example, Solana, Harris , Hepher, Valasquez, and Kok.

36. Witness the extensive debates over international tariffs and accounting rates in 1990-1 coinciding with the growth of competitive alternatives for international services.

37. And its competitive disadvantge with BT, which pays only 7.5% in tax and 3% of revenues in debt service. In contrast, France Telecom pays approximately 11% of revenues to the state to service its $20bn debt (and another 15% in taxes).

38.. Share prices were later depressed by a costly pension fund settlement.

39. There is no need to trot out the lengthy debate over the logic of capital accumulation (an obvious entry point for critical scholars). Capital scarcity explains the reticence of operators to undertake large scale B-ISDN investments (in the face of which RACE subsidies pale).

40. One banker commented that a driving force behind Telefonica's acquisition of a stake in Puerto Rican Telephone Co. was that the Chairman was already scheduled to arrive and

shake hands with the Puerto Rican president. The bankers were instructed to "make the numbers work."

41. The links between Minitel, French telecommunications policy and Gaullism (high tech Colbertisme), and the political forces marshalled in support of the Minitel programme are explored in Kramer, Richard, 1992, "The Politics of Information: The French Minitel Videotex System," ***Information and Behavior***, Vol. 4, pp. 457-492.

42. Anyone doubting this should remember that there is a significant (potentially very boring) ethnography to be written about the Washington DC offices of CATV, RBOC, and industry lobbyists engaged in ongoing struggles over pending legislation during the past decade. The attention paid to minute details stands in jarring contrast with the actual impact of legislation on market developments.

43. Alcatel has indicated strategic intent in this area.

Vertical & Horizontal Integration of Global Service Providers, by Service Domain and Subsidiary

Service Provider	VOICE Local	Long Distance	DATA International	Nodes/ Local Ops.	Facilities	Net.Services MDNS	Horizontal VANS	Outsourcing/Cust Solns./Sys. Integ.	Ind.ustry Std Applications	Other
AT&T	McCaw Cellular	64% US	Software Defined Net. Pacific Partners	AT&T Worldwide Alliance	39000 mi fiber Tridom	AT&T Istel HANS JENS	AT&T EasyLink	AT&T Istel		PBX, Chip Manuf. NCR, Bell Labs Safari Systems
BT	90%+ UK 41% Cellular		BT Worldwide Networks Div.	>5000 nodes 17 cities	Global Data Network : 43 natl mkts	BT North America BT Tymnet Worldwide Managed Links		Syncordia Corp.		BT Labs Equipment Distribution
C&W	Mercury/MPC HK Telecom Optus, Tele2 , CWC (US) Jamaica, & other Carib. islands		Global VPN (UK,US, HK) IDC (16%)	50 cos.	Global Digital Highway AsiaSat	HK Telecom CSL Fairway Networks (Jap) Gloabl Mgd Data Svc Sovan Teleport (CIS)		Asiadata		
France Télécom	95%+ France Radiocom 2000 Tel. Argentina TelMex Poland cellular		Colisée (IVPN)	550 domestic Transpac nodes, & UK mid'93	>120,000 mi fib. France Cables et Radio Telecom 1 X.25 nets-7 cos.	Transpac Numeris Transpac Net Svcs UK Interpac Lux., Italia, Scandinav. INFO AG, COMCO Intelmatique, Infonet (16.7%)		Sema (19%) CapGemeni 10% Systemia Telesystèmes Eunetcom	EUCOM	
GEIS	N/A	N/A	N/A	750 cities 35 cos.	Mark*NET MARK III/3000	C+C Intl (Jap) NEC Corp Info Svcs (Jap) Data Mgmt Intl (S. Korea) INS (UK)		GEIS in N. America - 4 cos. Europe -15 cos. Asia - 4 cos.	ISI-Dentsu (Japan)	
IBM IN/ Advantis	N/A	N/A	planned '94	700 cities 68 cos.	2Mbps multi- protocol/SNA network	IBM Japan, Australia, Canada Advantis (US), NI&C (Jap) Samsung Data Svcs (Korea) Managed Network Service		Enterprise Net. Svcs Advantis (JV w/ Sears)	Electronic Marketplace	
Infonet	N/A	N/A	N/A	30 cos. Operations in 45	X.25 with mux. INFOLAN backbone	Infonet Net Svcs Deutschland Tel. Finland, Bell Canada HKT CSL/LP, DACOM/LP Infonet Net Svcs (Malaysia) Globe Cable & Radio (Phil.) China DP Centre (Tai) Comms Auth Thailand*		DEC* Andersen Consulting* VPDN EDNS		11 partners: DT(16%), FT (16%), MCI (25%) PTT NL, Belgcom., Swedish Tel., Telefonica, AOTC, Sing. Tel. KDD, Swiss PTT
MCI	PCS Consortium MCI Todd Corp. NZ, MCI AAP (Aus) Guam Tel.	18% US	Overseas Telecom Inc. Global Advantage	MCI Global Data Net 100 cos.	20,000 mi fiber, Microwave & Satellite	MCI Global Priv Net Svcs Global Comms/Financial. Svcs Global Vnet VPD Service	MCI Mail Online Svcs Infonet (25%)	COMMAX (with BT, KDD, korea Tel.)		
Sprint	Sprint Local Comms Svc Centel	LD 9%US Sprint Nets. UK	Sprint Intl Global VPN	128 access centers, 56 cos.	Sprint Net: >20,000 dial ports, 3000 ded. hosts	Sprint Networks USSR Alcatel Data Networks Sprint Japan, Intec (Jap) PosDATA, Sprint Korea Sing.apore Tel Intl/LP DEC*		Unisource		Plessey Telenet (49%) >250 priv data networks installed >3000 VPNs
Unisource	PTT Telecom (NL) Swiss PTT Telecom Swedish Telecom		Unisource Holding (incl. Sprint)	Ded. Nodes: Fr. Ger. It. Sp. merged 3 data nets.	PanEuro net under construction	Unisource Business Net Uni. Sat Svc. Unistream & others		Unisource Business Networks		Evolving collab. w.Sprint, potential Asian Partners

Name of services (other than subsidiaries) are underlines.

Notes: /LP = local partner
* = Strategic Alliance