The Viability of Policy Separation of Liberalized Value Added Services From Monopoly Infrastructure

Richard A. Kramer

Columbia Institute for Tele-Information
Graduate School of Business
809 Uris Hall
Columbia University
New York, New York 10027
(212) 854-4222

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Richard A Kramer
Northern Telecom Europe[1]

Abstract

The problem of policy separation of a liberalised upper layer of value-added services from a monopolised infrastructure layer rests on politically determined definitions of increasingly blurred boundaries. It is clear that liberalised VANs suppliers brings benefits to markets and to the PTOs with whom they compete. Infrastructure monopolies are more problematic, as they are clearly not sustainable in many network segments. Looking to the future, to achieve effective and viable separation, one of two course must be chosen. One is to reaffirm the infrastructure monopoly, divorced from the business of competing in VANs markets, to act as a unified bit carrier. Technology advances such as ATM, INs and desktop switching may help. Another choice is to rethink and strengthen interconnection policies, moving them in the direction of cooperative, rather than competitive efforts. This may in the end be too technologically complex, but for the present it is the incentives inherent in the system, and the information asymmetry between PTO and market entrant which must be addressed.

Definitions: What are public and private networks?

Definitions are contested ideological terrain, struggles over the defense of territory and markets. The necessary starting point for this discussion is to establish definitions of public and private networks, of value-added, and to say what constitutes infrastructure? How are these definitions changing?

This distinction between public and private networks has been shown to be largely artificial, in that it is highly complex and can be organised along any number of arbitrary indicies.[2] All networks are private, they must by definition be closed systems. There cannot be an uncompleted link in an operating network. The term "public" simply refers to the access granted to, or ownership of such a network. When discussing the policy separation of certain parts of an interoperating whole, the issue is simply of network access, which can work in the other direction as well.[3]

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1. The author is currently Manager, Market Analysis, at Northern Telecom Europe, NT House, St Cloud Way, Maidenhead, Berks SL6 8XB, United Kingdom. Tel +44 628 812 826. This paper should not be taken in any way to reflect the corporate policy of Northern Telecom Europe or any of its affiliated ventures. The views presented here, and any errors, are the sole responsibility of the author, and this paper is not for citation in its present form. I wish to thank John Harper and Robin Mansell for their helpful insights on this topic.

2. For a discussion of these definitional variables, see Rutkowski, 1991.

3. Public access to privately owned networks is another side of this coin, and one best left to other research papers in this series. Still this must be noted as a major stumbling block in EC debates over

As to infrastructure, the most common analogy drawn is that from transportation. This should be abandoned as well. It certainly quaint to think of files as large trucks and voice traffic as little cars, travelling in and out of traffic circles, but almost anything can be a road for the right sort of vehicle. Roads are technologically far simpler (though perhaps as labour intensive) to build than simple telephone networks. There is a much more limited range of environments which can function as telecommunications networks. The technical rules of the network road must be carefully monitored. This specificity creates a natural centralised role for a systems integrator, which bolsters arguments for monopoly infrastructure provision.

The working definition of infrastructure is central to the later question of separation. It could be said to only consist of the physical network components: the transmission conduit, the switches (which cannot operate only as infrastructure), the customer premises equipment. The level above this, the "value-added" layer if you will, begins with the addition of software to carry and switch traffic over the physical infrastructure. This view of a stripped down physical infrastructure means that POTS should be thought of as a value-added service Indeed, one needn't return to Kahn's logic on network externalities[4] to express the simple fact that the switching function adds value to telephone service.

The question of the site of added value has become more problematic as networks expand in size, reach and complexity. As Arlandis points out, determining added value will be the object of an "unending power play" in coming intelligent networks. International simple resale reflects the fact that value can be added to a service without changing the actual nature of the service in the least. There is no need for complex equations to show that most users cannot afford leased lines, but a reseller of those lines adds value to them by dividing them among a number of users. The service is the same - bandwidth between two points - but its value has been increased, measured crudely by the fact that the total revenues generated from resold capacity exceed the cost of facilities rental.

Taking a minimalist approach to this definitonal struggle may make logical sense, but it is not a useful starting point for this particular argument. The view of POTS as a value-added service is largely an anomoly of regulatory battles waged between IBM and AT&T in the 1970s. While the slippery slope argument (that it is impossible to functionally divide the switching of voice services from that of data service, and hence both represent value added to the communications process) can be convincing, the reality in a nation such as the UK is one of a shared, arguably instinctive understanding, of the boundary between basic voice services and value-added services, including packet and circuit switched networks. Moreover, this co-existence has come in a market where both AT&T (through Istel) and IBM are major players, and have respected the boundary. Therefore, the liberalized upper layer should not for now be considered to include basic voice services, though there are clearly numerous and increasingly necessary exceptions to that rule.[5] The point is that the interesting questions are not in voice but in the data market.

ONP; Europe's PTOs have argued that in allowing access to their networks, they should gain a reciprocal right of access to the network of any private provider. This would clearly be a crippling blow to new entrants, and provide the same sort of disincentives to innovate as are embedded in the tariffing policies under ONA.

4. "Anyone who doesn't have a phone, I don't want to talk to." I.e., the more people on the network, the greater its value, the value added to the network is in linking two callers. The connection of the second telephone customer allows the network operator to add value to the service provided to the first.

5. For example, ISDN systems which integrate data and voice complicate the liberalisation of the former in the environment where the latter is considered a reserved, or monopoly service. This particular problem has been a driving force for voice liberalisation in the EC, as data over voice and ISDN

Can we agree on something? Liberalised VANs supply.

Why should VANs be liberalised at all? There are several important reasons. The key factor here is that in many cases PTOs, as monopoly infrastructure providers which also participate in VANs markets, have incentives to invite competition (admittedly tightly managed, and at the margins) into the market. At the root of this contradiction is a worldwide need in both the telecommunications and computing sectors for major new products and for them to be marketed effectively to replace telephone service as the main engine of growth. "Technology has bred more ideas than the market can absorb... nowadays the industry could meet almost any presently conceivable need with technology already on the market or in the lab" (Harper, 1991: p. 19). VANs suppliers play a critical role in conceptualising these needed new products.

- VANs suppliers target niche markets which PTOs mostly overlook, and may be able to carry out certain functions more efficiently. For their part, PTOs and their suppliers excel largely at conceiving and implementing technologies which improve price/performance of existing core products (A D Little, 1991).
- VANs suppliers stimulate demand for network services in an era of otherwise slow growth, as the market for basic telephone service nears saturation. On a macroeconomic level it can be argued that competitive VANs supply provides entrepreneurial stimulus to economy.
- The scope of VANs competition can be limited by the price of leased lines or interconnection, so long as the infrastructure monopoly holds firm. And even if the market moves from monopoly to oligopoly, carriers have common incentives to keep leased line rates well above costs.

These arguments could be taken to a greater level of detail, but suffice to make a strong case for a liberalised upper layer. This case may be lost on PTOs, who take a less sanguine view as to the associated costs. Their arguments in favour of limited liberalisation start at a fundamental level, where the very presence of competitive VANs suppliers runs counter to the mindset of monopolistic PTOs.Customer specific networks are an imposition on the neat ideal of maximum economies of scale. They also can compete versus core PTO products at lower unit cost, they require special attention, and are disruptive to the operations-intensive PTO organisations.

Questions of sustainability

While the VANs market is far from perfectly competitive for the reasons mentioned in the preceding paragraph, there is substantial entry by rival suppliers. A monopoly over VANs does not appear sustainable.This question of sustainability should also be the entry point for a discussion of infrastructure monopoly. Stated another way, can fragmentation be prevented, even in the most rigidly controlled monopoly environments? Given the plethora of new technologies, perhaps not.[6] One cannot deny the benefits which comes from private networking, of experimenting simultaneously with many approaches, on perhaps a more rigourous cost-justification basis. Yet this should not divert attention away from the historical fact of, and reasons for infrastructure monopolies: cost, complexity and public service.

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6. While there is tremendous promise in today's new technologies I am tempted here to recall the similar "plethora of new technologies," the "alphabet soup" much heralded by the FCC and other Washington types throughout the mid-1980s in support of broadcast deregulation. How many of those services, besides CATV, have come to fruition? Even the most promising of technologies, such as DBS, have made little if any impact on the US market.

Before delving into those three areas, it must be understood that a network is a set of services, not a single service. Networks should also not be thought of as markets, but sets of submarkets, fully of highly differentiated commodities. The single output model does a disservice to the richness of network markets, not just due to the presence of competitive VANs suppliers, a relatively recent and limited phenomenon, but to the ongoing differentiated efforts of PTOs.[7] The PTOs are the only ones with a complete picture of the costs and issues of all of the disparate network submarkets.[8]

The driving force behind such models, be they of network fragmentation, network tipping, or segmentation, is that the median network service cannot accomodate all users. But this view of centrifugalism, of traffic specialisation, movement of networks away from a core service or centre, focusses primarily at the specialisation of providers, and not the concurrent specialisation of the infrastructure monopolist. It is both tempting and facile to paint a picture of all monopoly carriers as necessarily bureaucratic buffoons.[9]

In support of the carriers, there is a countervailing trend of specialisation within the public network. The functionality of today's CPE is migrating to the public switched network. (See Table 1). The liberalised upper layer is where the greatest profit margins and hence incentives for developing business are. This is one reason why the EC is backing off the hard and fast rule of cost-based or cost-related tariffs: it recognises that some Ramsey (value of service) pricing is needed to stimulate PTOs to fund the development of new applications for services like ISDN. Not only do they have an incentive to innovate to stave off competitors, but it is conveniently forgotten that most new entrants still rely heavily on PTO plant, leaving the PTOs to control the market direction (a point I shall return to).

Can't PTOs themselves be as dynamic as the entrepreneurial VANs suppliers? Well, perhaps it is unlikely, but PTOs still command far greater resources and a unique position from which to take what entrepreneurs invent and extend it to the wider market. This has already happened, as competition has galvanized PTOs, notably BT, which is a far more able competitor now than in 1984. Likewise the French, Dutch, German and Spanish carriers have show tremendous progress, as have the RBOCs in many areas.

It is also important to realize that the PTOs do not have to be the source of all creative ideas to move in a dynamic fashion. There are many forces external to the PTOs which are pushing them to be more innovative, in addition to the entrepreneurs who develop and market VANs services as previously discussed.

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7. One can easily argue that the PTOs could have done far better, but they deserve some credit for the position they have attained thus far, whether through skillful manipulation of the regulatory and political process or by fostering some measure of internal engineering excellence.

8. See for example a 1987 report by the General Accounting Office which claimed that the FCC had the resources to audit local telephone companies only once every 16 years. The problem is even worse in Europe, where BT is perhaps the only European PTO with a complete financial picture of its operations. Perhaps the strongest hope for the PTOs of LDCs is the fact that they are subject to intense financial scrutiny by investment bankers in the process of considering privatisation or the entry of a foreign supplier.

9. What ever one may think of France Télécom's choice of technologies, they have shown that monopolists can mobilize their resources to develop high-quality networks and services. For an extended and critical discussion of the wholly separate question of whether this strategy was a wise one, see Ergas, 1992, who argues that political imperatives often forced the technology deployment process in an inefficient direction.

- **Equipment suppliers**, to whom the PTOs represent by far the largest customers, are encouraging that dynamism. Suppliers need to sell new products and work through new cycles of switching and transmission equipment
- **Users**, whose increasingly sophisticated demands are finally receiving closer PTO attention. Their entrenched position means that they are in the best position to serve the needs of both large and small customers.
- **Regulators**, who by putting their eggs largely in the PTO basket (perhaps allowing one or two to be hatched by the local teleport) have made it clear that defense of the monopoly and its system of cross subsides (the raison d'etre for the regulators' existence) will remain a priority.
- **PTOs themselves**, who are in the midst of a dual cultural change which has profound implications for their future form -- they are facing up to both liberalisation of domestic markets and the necessary globalisation of operations.[10]

Capturing the Dynamism

There is certainly more the PTOs could do to foster innovation, but their market position is anything if not secure. The current moves of users and carriers towards new configurations and arrangements of public and private network services reflect the continued importance of infrastructure. Yet how does one capture the dynamism of the liberalised upper layer -- of the VANs providers, suppliers, users, etc. -- in a monopoly infrastructure?

The interesting move at present is of users back to public network based systems. They have gained experience with private networking and know what can be done cost effectively. Competition among suppliers to offer VPNs and bandwidth-on-demand services promise to further reduce the cost of public network solutions (especially as cuts are made in the highly variable cost of a key component, leased lines (i.e. access to infrastructure). Hence, the flexibility of public system (all too often absent from theories of network evolution) provides some clear paths out of the specialisation-generalisation conundrum.

In the midst of these dynamic changes, the economics of networks are becoming three dimensional, with tariffs calculated not just in distance and in time but also in bit rate. A world of pure bit carriage (discussed in a later section) has already begun with moves towards ATM, which allows the network to satisfy a greater number of user demands, as users can remotely reconfigure their networks. ATM allows users to customize their use of bandwidth without being constrained to the channel data rates of the network transmission scheme. Variable data rate and voice compression services can be more easily combined as ATM cells are simply inserted into the SONET packets. This is a process which is already beginning, as ATM LANs are being rolled out this years and next. In time, ATM deployment will cut the five layer exchange and transmission architecture to two layers. In five years time, all of London or NYC could be run from two or three ATM switches, superseding 400 exchanges of varying age.

The previous two sections established that a) there is a solid reason for liberalising the upper layer, despite PTO objections and b) there is still some hope for the PTOs. Now we turn to examine the experience of uniting the layers, before discussing potential solutions or probable future policies.

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10. This topic is the subject of a forthcoming study by Kramer and NiShuilleabhain.

Interconnection and Incentives

An important point is often lost in the debates over liberalising infrastructure monopolies is the lack of a solid conceptual argument for forcing a non-monopolistic firm to interconnect its competitors.[11] Why should RBOCs be required to serve their competitors as customers, if they are not acting to some degree as public trustees? What kind of service can those competitors expect to get? The short answer is that under ONA, those competitors have been given a choice of continuing with the status quo or paying far higher tariffs to develop more innovative offerings (Levine, 1991). Meanwhile, under ONP, the PTOs have only just begun to move offerings in any cost-related direction (assuming they develop the ability to determine this fact internally), and have largely controlled the implementation process through the ONP Committees and ETSI (Kramer, 1992).

The resistance to change, to forcing PTOs to provide economical interconnection for rivals will be understandably powerful and diffuse. It will come from many groups: stockholders, government regulators, unions and equipment manufacturers all have a critical vested interest in preventing competition and protecting PTOs. Taken together, they are a far more powerful interest group bloc than that which new entrants can muster. Users straddle the fence because they cannot afford to be entirely hostile to the PTOs, on whom they still rely, though as their options increase, so does their clout.

Creating a network of networks through interconnection sounds increasingly less plausible without admitting the role of a centralised entity to act as a platform. To begin with, the practical realities of creating a web of interoperable systems are immense, especially given the vested interests which are acting through the standards process. The nature of the present interconnection process is such that the opportunity for a cooperative resolution, needed to make a federated network system work is unlikely. Most experiments with interconnecting rival infrastructures have ended in abject failure. ONP is currently bogged down in a difficult effort to define interfaces and elements of network access.

There is an added danger that interconnection may lead to reduced competition by encouraging co-operative linkages rather than end-to-end rivalry (Meuller, 1988), but this view fits the logic of specialisation currently seen in liberalised VANs markets, but is perhaps less applicable to the costly duplication of plant. The PTOs are relatively happy to allow competitive supply of VANs so long as they control the terms of access to the network.

It is clear that so long as there are only partial or specialised network solutions in the marketplace, the separations process will rely on interconnect policies. This problem will persist even in a broadband scenario, as ATM for example does not address the needs of firms which have deployed VSAT networks. Since interconnection has been a tortuous process for many participants over the past decade, it needs to be reconceptualised as follows:

The process must cease to be an extension of PTO market power and become a more progressive, cooperative effort than one dominated by a single entity. This will only be possible if there is some relative leveling of market power, or industrial policy concerning access charges imposed from above.

The technical cost burden of engineering interconnection is partly to blame here, as is the natural fear of complex systems and arrangements. The lack of standardised interfaces for interconnection, and the growing quality problems of network providers also places the feasibility of a federated network system in serious doubt. There is a role for cautious intervention, but over time it has not fared much better than the market. This also supports the

11. This of course presumes that one is largely following the neoclassical economic view which privileges unfettered competition. The reality, especially in Europe, is that state intervention is a first principle, therefore violating the law of perfect competition. It is inevitable that government pick winners and losers in the marketplace.

argument for an infrastructure monopolist, acting only as a wholesaler of carriage, who would have an incentive to adopt the most open interoperable standards. The political struggle over interconnection has not been pressed upon the main operators, and presented as beneficial and in their interest,.This is partly due to capture of the regulators by the PTOs, and also reflects the PTOs aggregation of technical expertise about the network.

Lines in the Sand?

One of the criteria for separation of layers is whether the liberalized upper layer service stands alone without regards to the infrastructure it travels over? Are the services infrastructure independent or transparent? If they are not, then they must rely upon some set of criteria (contested terrain to be sure) of how the network is structured -- standards, interfaces, architectures -- to support their existence.

This position of defining criteria for network access (and accepting the need of providers to make use of networks other than their own) furthers the already tremendous market power of the infrastructure provider (of which European and North American observers are well aware). In the UK, openings available to would-be service providers other than BT depend inescapably upon BT's own decisions about what technology to incorporate in its plant, what capabilities arising from this technology it will make available and on what terms. Financing is another critical issue, and a reason for the emergence of a global oligopoly of PTOs which have the capital to fund long term network and service deployment projects and prevent the entry of rival VANs suppliers (Kramer, 1992). However, divorcing all services from the physical infrastructure would leave a stagnant and more politically vulnerable network. This is the crux of a nasty dilemma. Guaranteed an infrastructure monopoly, the provider would have no incentive to upgrade the network if it did not also compete for the value added portion. And as is well understood, the more it is allowed to provide, the less incentive it has to allow others to do the same.

One possible solution is to have performance targets which must be followed, but these are also risky. Any state plan detailing a schedule of infrastructure upgrades, which all providers would then make reference to would have to anticipate the market behaviour which has made ISDN such a dud and at the same time increased traffic through fax machines Such attempts at forecasting have a mixed history (Elton, 1992). This brings out the contradictions between complexity/uncertainty on one hand and the stability of the system on the other. There is no way to accurately forecast the future evolutionary path of the network, and yet there are numerous parties with a tremendous investment in maintaining its stability and linear growth.

Had there been a massive investment in broadband in the last five years, the results would have been disastrous. We would have a platform and no applications to run over it, and we would have, as we do today, users clamouring for lower tariffs and greater flexibility for their own specialised internal needs. Users in Europe are close to rioting, as they did in the US over a decade ago, but the object of their anger remains the PTOs, who they would like to nudge in a more efficient direction. When they do, and at the same time win the freedom to pursue other options, longterm infrastructure investment will become even more problematic, but no less important; users still want to rely upon the public access network, in most cases as a primary, not a secondary resource.

Many, if not most firms rely heavily on public networks alongside their own private systems. Up to half the leased lines in some private networks are for protection/backup. More efficient private networks would require fewer leased lines, and thus reduce PTO revenues, but using a public network based system also offers cost savings as it allows sharing of backup facilities. And in many cases, the status quo will be favoured over the vast uncertainties inherent in the capabilities of new and less well tested systems.

In some cases, capacity is provided by two or more public access carriers, though as seen in the US, smaller carriers are often simply reselling lines leased from the dominant provider. Mercury's success has come as much from second sourcing for BT customers, as from its undercutting BT tariffs. While BT cannot prevent the former, indeed may not want to, (it gives them a backup as well) it has attacked the latter just recently. Its 1992 rebalancing lowered international tariffs by £120mn and imposed large user discounts of £180mn, with the shortfall made up by increased rental and connection charges for residential consumers.

Private VANs providers cannot afford to pay more to the PTOs for enhanced functionality which they do not need, or that replicates what they themselves are trying to do (and profiting from). But it is a regulatory anomoly that they are happy to have such a service. New providers in the liberalised layer need to mix and match network functionalities, and may not want a separation which leaves them paying for every basic service element individually if a bundled yet less flexible service comes at a lower price. Rivals may prefer to share in the same economies of scope that the PTOs reap. The current problem stems form the PTOs control over the terms of carriage. Moreover, if flat growth in voice telephony is making PTOs search for new revenue streams, then they will be even less likely to relinquish the pursuit of VANs opportunities to private suppliers.

An added danger highlighted by forecasting problems is the lack of applications developed to date to take advantage of the existing infrastructure. Large investments in ISDN in France and Germany are now being supplemented by funding to help develop applications which make use of bandwidth. In the USA, the only broadband service which has interested the mass market is cable television and that has not produced any significant new services in the past decade. Most traditional telecoms service providers have been criticised for standing too far from the needs of the user. But herein lies another dilemma, that by not proceeding in advance of users, and adopting a demand-led strategy, PTOs may not be able to satisfy rapidly expanding and shifting user requirements.

Separation is a political issue

Before considering the economic or technical side of separation, the problem should be cast as a political issue. In Europe, for example, the emphasis of the RACE programme was shifted by political fiat towards funding applications experiments, rather than developing technologies and convincing PTOs of the merits of advanced communications networks. This shift recognises that the process of standards development, fostering interoperability and moving towards a common beneficial network architecture are all subservient to political forces. Only applications for which there is a proven demand are exceptions to these rules, and only such neutral services stand a chance of being deployed in a panEuropean fashion. RACE had to lead where others would follow. The RACE example underscores the fact that regulation cannot, and indeed, it is not its proper role to, anticipate demand for services. Proactive standards in advance of investments in technology development, such as GSM, may lead to later problems. Whether or not French videotex technology is the superior product in the market is irrelevant to the political debate over whether Europe should adopt the Teletel standard. Thus, the dividing line which is drawn will be always a fickle and capricious one, depending on the investment paths ahead of and constituencies behind each service.

This is so even in the much-heralded open competitive environment of the UK, where Sir Bryan's pronouncements from on high show that the market is far from being "deregulated." The class and branch license granted to Mercury in 1985, and the recent Duopoly Review decision, were the product of intense political negotiations, as have the access charge debates and recent reviews of BTs prices.

As discussed as the outset, separations hinges on the political nature of definitions, such as that of reserved or essential services, which is changing as new functionality is added to the network. For example, ISDN creates a problem in the integration of voice, a reserved service, and data, a liberalised service, on the same indistinguishable conduit. ONP is raising similar sticky exceptions. Both American and European PTOs are eager to expand the definition of reserved or universal service to encompass more than basic voice telephony, even as monopolies are under attack from CAPs or regulators such as the DGIV.

Is there a long-term logic in stopping at liberalizing the upper layers, and preventing the development of rival infrastructures? Several powerful arguments for preserving reserved services have been advanced:

- Public service goals must be protected, and the system of social subsidies rests upon monopoly provision and profits. Often those revenues are needed to fund network or basic service deployment. Any alteration of longstanding practices raises the issue of withdrawing "acquired advantages" from established players.
- Fragmentation of service provision saps the critical mass of revenues which might fund the development of advanced broadband infrastructures, as well as threatening the stability which such environments require to schedule long-range deployment.
- Existing investments (made largely from taxpayer pockets) must be amortised. New providers are not eager to assume the cost burdens of serving all users which may want access to their service. Mercury is currently not installing residential telephony lines outside of a few central business districts.
- Infrastructure providers such as the competitive access providers (CAPs) in the USA have not offered to rewire the nation. They are looking either to make use of existing facilities such as cable television networks, or to wire urban business corridors where concentration of users is greatest with MANs and WANs. The fact that there is some business opportunity there attests to the limits to the economies of scale and scope in multiproduct environments, but by the same token, those economies are critical to the world beyond midtown Manhattan, the Loop in Chicago or the City of London.

The fact of this last point reflects that the large majority of users have shown demand only for voice telephony and cable television. The synergies with other high end services are more important to consider. The local loop may offer little advantage in the international services arena for a firm like BT, when most users are concentrated in a small area such as the City of London, and likewise in the US, where most of the international calling market is concentrated in a few cities.

Eastern Europe provides an exceptional case where a solution might be hammered out first, given that it will not come anywhere without some pressing political crisis. Advanced services are being deployed with little reference to a largely obsolete and unreliable monopoly, providing a testbed to see whether a pure transmission infrastructure can be controlled by a number of relatively equal smaller specialised VANs suppliers, with a centralised firm offering basic voice services and selling bandwidth to service providers.

Network Economics, or the Cost of Competition

In the US debate, arguments from all sides begin with a ritual invocation of the mystical benefits of competition. In Europe, the gopsel has not been spread so effectively, despite proselytisers of every stripe (most commonly the Union Jack). The costs of competition come down to the simple economics of constructing alternate infrastructures. To start with, the debate must be placed within its proper context, with reference to the stages of network

deployment and technological advancement. The basic fact is that most nations cannot afford one viable infrastructure, and this includes many developed as well as developing world countries. And here, embarrassment of riches, we are talking about two, three or seven infrastructure alternatives. (Note that the US market is quite unique in the diffusion of non-PTO CATV networks. See Table 2). Have we overestimated the benefits of alternative infrastructures, especially where they can bring cost savings over tried and true technologies and architectures? Is this a money pit, similar to the new technologies which were touted in the 1970s and 1980s?

Financing New Capacity

A central question is whether the money is available to construct alternative infrastructures. The myth of a recession-proof telecommunications sector is gradually showing its face: users are demanding action on inflated tariffs, which are outrunning productivity gains, and the recession is limiting the amount spent on services, as well as fostering competitive services such as global VPNs, less dependent on national infrastructures.[12] The order books of PTOs are always one year behind the economic times. What regulators approved for 1991, before the Gulf War, before recession, before the slippage of the German and Japanese economies, are not necessarily going to be extended in linear fashion into a more turbulent and uncertain 1992 and beyond. This is recognized by the equipment industry, in the cautious tone of announcements of record profits by Northern Telecom and Siemens, and reports of internal cost pressures at Ericsson.

The sunk costs in plant imply that changes in technology and markets cannot easily replace the existing infrastructure. Competitive efforts in local loop provision are backed by a fraction of the investment which has already been made in the current network. Some believe that a massive writeoff of existing plant may come in the near term, but it cannot occur too rapidly without crippling the PTOs on world financial markets. There is a powerful incentive to protect infrastructure investments, and hence to resist the separation of layers, unless PTOs are assured a role in both competitive and monopoly layers, as is presently the case across Europe. This limits manufacturers ability to foster VANs by developing products for narrow markets.

The paradox of local service competition.

Another aspect to consider is whether the cash for financing new services will come from the services themselves. What new entrants have to offer is lower connection charges. Call charges will be similar to the existing network, due to interconnection tariffs.New operators cannot drop usage charges well below the existing operator because the vast majority of its traffic still terminates on the existing operator's lines, and hence incurs interconnection charges. The less people use the telephone, the more significant the rental charges appear to them, and the more likely they are to change to a new operators offering lower connection charges. Local loop competitors therefore face the danger of attracting the very people they least want as customers. (See Table 3) For users whose usage charges are high in relation to rentals, there is little incentive to switch, especially since heavy users are more likely to value the stability of the existing systems. Moreover, residential consumers are not ideal revenue generators: UK distribution circuits are used on average 10 minutes/day. This underscores the need to shift the focus on PTO investments from new services to the cost savings rational inherent in efficient network upgrades, as is discussed in greater detail below.

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12. What I mean by this is that VPN services can be run by deploying or leasing a small amount of network capacity, rather than incurring the overhead of the national PTO.

Must industrial policy be a dirty word?

Industrial policy is a necessity as well as a reality for many nations.[13] Market fragmentation has its downside for innovation in services, and coordination is especially important during developmental phases. It has been argued convincingly that the major successes of telecommunications technology have been accomplished by engineers in different companies and countries sharing knowledge and openly emulating one another in its application, not by working in artificially watertight compartments imposed by formal competition. The effect of competition has been to divert the attention of engineers to the effort-intensive problems of interconnection (Harper, 1991).

Improving toll networks was the main thrust of engineering efforts in past decades, which explains it as the first site of competition, as well as why its quality was not a problem as was that of local loop service.[14] Now the shift is to developments in the local service arena, which is also more labour intensive and promises greater cost savings. Before R&D monies, effort and attention -- compliments of the ratepayer -- are poured into the local loop, there must be a satisfactory answer to question whether competition there is viable.

The lessons of the UK market, where infrastructure competition was introduced a decade ago, are highly instructive, and outline the fundamental economic reality of infrastructure provision: with current technology, the local loop must be considered a natural monopoly in all but the densest or wealthiest of service areas. Barring any of the solutions as much delayed as discussed -- ISDN, IBNs, convergence, fiber-to-the-home, PCN, GSM, radio tails, DBS, cable telephony, and whatever else might be on the horizon -- there is little reasonable expectation for local loop competition in the near term. Cable telephony may make inroads in the UK market (which is several years ahead of any other nation in allowing it), but it must be remembered that most of the calls placed on cable telephony systems terminate on BT lines. The current percentage for Mercury, which has been building a local and national network for ten years, is over 50% termination on BT lines. As to the teleports and CAPs in the US, they are targeting only the high volume users which cost justify large investments, as did Mercury in the City. Thus, VANs services of the future which have mass market aspirations are likely to remain dependent upon lines leased from PTOs.

This does not prevent VANS suppliers and private network managers alike from taking on an adversarial stance towards the PTO. INs, ATM and IBNs can all be portrayed as a plot to deprive large users as uncomplicated leased lines, interconnection rights and the ability to configure network solutions independent of the PTO (though in reality they may provide the most cost effective networking solutions, as each requires economies of scale).

Another problem is that cross-elasticities of demand are often overlooked, as they tend to cloud the purist's vision of broadband networks. Since before the birth of the ISDN concept in the 1960s, it has been taken as an act of faith that integrating services over a single transmission medium was beneficial. Yet the virtues of chaos are too infrequently presented alongside the convergence scenario, and they are far more difficult to express. We still await the economic models which view the revenue of a new service in terms of the loss to an existing one. The assumption of a zero-sum game would shipwreck many a consultant's grand vision, such as last year's model predicting 10 million UK PCN subscribers by decade's end

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13. We should not forget that industrial policy and state intervention were part of the Founding Father's traditions. As Alexander Hamilton wrote in 1791: "capital is wayward and timid in lending itself to new undertakings, and the State ought to excite the confidence of capitalists, who are ever cautious and sagacious, by aiding them to overcome the obstacles that lie in the way of all experiments."

14. See for example, NYC in the late 1960s, or the UK in the mid-1980s, where local loop service quality became a major public issue. In France, one point of the infamous Asnieres 22 comedy routine was that reliable connections for international service were there for those who could afford them, as the comedian Ferdinand Reynaud joked that it was easier to call a suburb of Paris by routing the call via New York over AT&T Long Lines that it was to use the local PTT service.

Technology, Complexity and the Virtues of Centralisation

Complexity and stability are increasingly at odds in the modern network, which challenges the ability of engineers to hold together an increasingly untenable patchwork of technologies. Standardisation is as difficult to come by and just as politicised as ever, but more critical to maintaining a fragile interworking system with exponentially more points of risk.

Intelligent networks offer a decentralised solution to the complexity problem. The complexity of software for high-speed digital networks is leading to the development of software primitives, basic building blocks of the switching systems which will operate to support advanced intelligent network (AIN) platforms. This also places a critical firewall between the enabling platforms of basic software which reliably and efficiently run the network, and the user community to which networks are opened. The IN architecture can be seen as an attempt to protect the physical infrastructure from intrusion, by placing less secure software modules out away from the digital central office switch.

This is a natural evolution which should be welcomed and may allow for competition even as PTOs resist it. The software layer is where the value-added portion of services are located. PTOs have followed in this direction, offering software defined VPNs which are likely to increase in prominence. INs spring from the need for software development both in the network and for services which use the network as a platform, though intelligence in the network may complicate any simple separation scheme.

This school of thought anticipates competition in software based services, viewing the IN as an enabling platform which can be disaggregated down to the level of individual modular software components. This sort of platform does not mean that intelligent networks are a masochistic attempt by the telcos to invite competition. There are three drivers for INs: quality, cost-savings and competitive strategy.

INs are in the first instance an expression of the reality of simplifying network switching software, which currently runs a million lines of code (excluding billing and customer information systems) for every SS7 call. Rewriting these programmes every time a new feature or service is introduced is proving too onerous a burden for PTOs, whose primary need is to maintain service quality. Quality has emerged as a prime product differentiator of competitors to the PTO, who may only offer a more reliable variant of comparable service at higher cost, eroding the price competition basis of natural monopoly arguments.

The complexity of software leads to a no-risk environment, where experimentation with new services is discouraged, given that it takes five years to fully deploy a new service idea, and 25 years to redeploy the network. It also skews investment priorities towards services which directly lead to new capacity of connections, as opposed to rationalisation and improvement of internal facilities management. This brings up a second driver, which is the cost savings offered by INs, which can counteract the soaring data processing costs of US and European PTOs as well. The percentage of investment capital spent on DP by the RBOCs has skyrocketed to where it is half the switching equipment spend, and expected to be even with switching by the end of the decade.

Vulnerability, survivability, reliability, quality -- are these concepts anathema to modern telecommunications networks? Will our technical prowess outrun our ability to solve complex problems? Or are there new network architectures, solutions, technologies which can limit these risks? The breakdown of the cost-sharing coalition so eagerly celebrated by free-marketeers might be quickly reversed once the price of deploying a stand-alone quality system is realised. It is arguable that a prime asset of operators such as MFS, Teleport or WilTel is their manageable size. New services need close monitoring of profitability and technology, which is intrinsically difficult in large firms with many overheads such as the PTOs.

What segmentation advocates fail to bear in mind is that the network is not well designed to handle complexity, and users have little tolerance for it as well. The interesting issue here is the convergence of telecommunications firms' needs to develop software engineering capability and the interests of their users in more flexible software-defined systems. Software needs to be simplified to bring more fault-tolerant networks, which also fosters greater services development. The quality impetus is driving intelligent networking, but it also allows both PTOs and service providers alike to get past changing the switching software each time a new service is ordered or rolled out.

New applications also portend unforeseen usage patterns. France Télécom's Transpac network crashed in 1985 when Teletel services were introduced on a wide scale. The packet switching technology used by Teletel was designed for constant connections between mainframes, and the rapid shifting among services by users overloaded the software, causing network paralysis. Could there be a similar set of problems waiting with the development of GSM or PCNs, ATM and SONET, etc.? These are all services or technologies largely untested on a mass market scale, and their burden on the unified network will be considerable.

To add to the problem, many of the systems envisioned as future network architectures represent quantum leaps in complexity. GSM systems require a tremendous amount of data to be transmitted along the network alongside the actual voice signal. As seen across the USA , a single software error can ripple throughout the public access network and halt operations in seconds. Are multiple federations of networks prepared to handle massive increases in complexity, when the unified system is struggling under the tremendous burden of doing so?

As the number of plant owning competitors increases, the number of interfaces is bound to grow more than linearly, made more complex by the multiple conventional cellular and PCN networks. The problem becomes more difficult still if several networks are used in sequence for a single call. It is all too easy for a minor discontinuity in the dialogue path between control computers to arise, perhaps because some network in the middle uses a slightly different software from one of the end ones (Harper, 1991: p. 25). This is a problem which currently favours single sourced panEuropean networks.

Is PCN a Panacea?

GSM is an attempt to codify that advantage into a single network standard for mobile services, yet it is complicated and over-engineered. Likewise, the promise of PCNs should not be over-pledged, as it requires elaborate electronics in the handset, which again raises another barrier to entry in fostering widespread competition. Operators will have to space base stations at 400m, a scale not far removed from the higher density parts of the local exchange carriers conventional distribution plant, and would be extremely costly. A common distribution network used by all operators would also improve the somewhat suspect economics of PCN infrastructure.

One year ago highly regarded consultants predicted that five UK PCN services (assuming a migration to microcellular by Racal Vodafone and BT Cellnet) would not be enough. Today, two PCN licensees have merged and BT and Racal have not moved aggressively to upgrade to microcellular. This shows the critical reliance on common use of infrastructure: since coverage must be broader than a city centre or a few fixed locations, the costs of creating infrastructure were prohibitive for Mercury and Unitel to undertake alone. They may yet join Hutchison in sharing those costs in a parallel network architecture. Even the advocates of unlimited plant duplication based on the principle of open competition must note with irony that in the midst of devolution and fragmentation we have a return to the idea of the cost-sharing network. Such a role is also ascendent in the US, with the formation of Brooks Telecommunications to assume the role of network wholesaler.

In the start-up phase (until enough of the viable market is served; no one is envisioning universal microcellular) these networks will share a common reliance on BT's fixed network. Over half of Racal's calls terminate on BT lines, and Mercury is not currently installing residential lines.There is much greater hope for infrastructure competition from cable television franchisees, who are adding 30,000 lines a month. By contrast, with 10% growth in business lines, and a low 2.5% growth in residential services, BT added 90,000 new lines each month in 1990. Growth dipped sharply in 1991, but there is little reason to think that the recession will not also damage cable telephony firms. As one analysts' report remarked, the impact of competition from PCN or cable is not regarded as material on BT on a normal investment timescale. Cable and PCN will not provide a realistic substitute for fixed services. BZW (1991) predicts 2% residential, 5% business penetration for cable by the year 2000.This evidence along with the above discussion should invite a rethink of the experience of proliferating networks and infrastructure competition in the face of entrenched market power.

Time and again, efforts to introduce some measure of infrastructure competition, even one as limited as a second cellular provider (and the UK experience shows how reliant providers are on the fixed network operator) have ended in failure. GSM in Europe is at present nothing more than a series of access technologies to the fixed network. Mannesmann's D2 service is just starting up this June, in the midst of German recession, after two years of delays in negotiating tariffs for interconnection with the DBT network. Already in Sweden, the rival infrastructure provider Tele2 has faced a host of similar difficulties. Across Europe, the new cellular licenses will be granted in an environment where competition in fixed networks is not proposed, and the infrastructure monopoly is recognized. The selection of the DCS1800 standard for the new E1 license in Germany and in France (and the comments of the Direction de la Reglementation Generale that DCS1800 would be "an extension of GSM to the 1800MHz band") illustrates this mindset of "ring-fencing cellular" (Yankee Group Europe, 1992: p. 14).

Examining the prospects for competition from mobile services shows that the infrastructure may be more sustainable than often realised. PCN may command a substantial share of the mobile and handheld market, but does not represent a major challenge to the fixed network service. As for Telepoint, it has been a total failure to date. Its latest incarnation has come under the aegis of the monopoly PTO (BiBop, Kermit, etc.) which, if successful, will further strengthen the argument for creating a wall between POTS and new mobile competitors, and bolster the PTOs image as efficient problem-solvers where others have failed.

Another issue worth rethinking is whether today's infrastructure is already obsolete. Clearly not in the minds of PTOs, who are not prepared for a rapid depreciation of existing plant. They cannot afford to absorb such losses, especially as future returns become less certain. Is there a middle ground for finance -- increasingly squeezed by global recession -- and technology -- continuing its advance to where workstations may soon replace large CO switches? Again, this mean as that the impetus to deploy advanced functionality should come from preemptive cost-savings plans. There are glimmers of such discontinuous changes which may assist the task of separation more cheaply. It is now possible to program a PC to perform the same function as a PBX, to switch traffic. This would help fill a universe of separate layers, providing critical public access to control over the switching function of the infrastructure. So long as that control is embedded in a multimillion dollar switch, then control will be difficult to cede and separation will never be complete. Part of the functional problem is that there are no dumb services or primitive systems. Intelligence has always been diffused in the network, since the introduction of the second switch and the need to connect it to the first. Various parts of telecommunications networks, as they adopt and develop "intelligence." These

are not developments which policymakers can easily anticipate, and the linear quality of R&D and technology developments may prevent radical advances from being deployed.[15]

An optimistic scenario, based on faith in computing technology to improve exponentially might ask: If we have intelligent networks, why not intelligent services which simply travel over a pure bit carrier's network? VANs services could become increasingly infrastructure transparent, and therefore more global in scope. It is possible to envision the development of an intelligent VAS which senses the type of IN architecture on which it is being run and makes adjustments to its code accordingly. This is beyond the current capabilities of expert systems, but might be simplified by flexible workstation based switching software. INs, as mentioned, create a dilemma because they can both simplify and complicate the issue of separation: the more logical functions embedded in remote locations, the more control needs to be exercised over the network by a single entity, but also the more points for new entrants to provide that control. Even if INs bring greater devolution, there is still a natural role for a systems integrator. This brings us finally to the third driver for INs; as Bell South's Richard Snelling remarked in 1988, they are "a revenue protection investment strategy." And that entity cannot simply provide the pipes without having some expertise in plumbing. Indeed, there is a strong argument that involvement in provision of liberalised services in necessary to give a monopolist the incentive to upgrade and deploy advanced networks technologies.

Information Asymmetries

One issue which complicates not only the competitive provision of infrastructure, but also the viability of a separate liberalised upper layer is the persistent information asymmetry between the main network providers and new entrants.

In the US, the decomposition of the local access network under ONA seeks to stimulate competition in markets for local switching and transport. Unbundling is geared towards more efficient and widespread use of scarce network resources. But this is a view adversarial to the PTO. It says "relinquish what you have (and have invested huge sums of money in creating), to allow others to share in your profits." A more positive view of this process must include the carrier perspective, as they currently control the network resource. Without their cooperation, unbundling, ONP, and competitive VANs markets will be gained only through a long uphill battle, and the opportunities for carriers to thwart the process are many and well-known.

The information which PTOs might reveal on network development is highly sensitive commercial data which competitors and suppliers would dearly wish to know.[16] Indeed, it is critical for new entrants to know the type and cost of functionality available to them. Yet it is unfeasible to mandate access to such data. Carriers cannot be required to file plans of modernization and technology deployment for a certain time frame, and realistically be expected to follow them. And could a regulator penalize a PTO for changing strategy midstream, imposing a cost for adopting an unforeseen but beneficial new technology? This results in an information asymmetry which is critical to the long term preservation of market power.

The asymmetry is a product of a set of contradictory commercial incentives, on the part of both PTOs and new competitors. In this contest, it is the market power of the PTO, bolstered by the information they control, which raises barriers to entry for new providers. For example, the PTO strategy for network evolution must be made available early enough for competitors to plan accordingly, but the PTO control of such data ensures them an advantage in

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15. Part of the problem is that particular products develop internal constituencies and drain resources so that they may be pursued even if they do not in the end appear profitable. Again, this is a cultural issue addressed in Kramer and NiShuilleabhain, forth.

16. For an example from the US, see the discussion of the battles over the Customer Proprietary Network Information as described in Levine, 1991.

business planning. This lack of planning data is something the European users have long complained of (Berry, 1991). Private network deployment might be seriously altered if PTOs were more forthcoming to large users about budgets devoted to broadband services.

Under the current system, users have no check on PTOs to follow preset paths. PTOs which are certain of continued monopoly on value added services have only marginal incentive to develop strategies at all, and certainly none to reveal them to competitors. (This does not forestall them working in a proprietary manner with equipment suppliers, or service providers with whom they have alliances.) In many cases, they have an incentive, often from the political sector, to develop certain strategies in total disregard of market conditions (Ergas, 1992).

In the rare cases where they are not entirely supportive of the PTO, regulators face a similar asymmetry, and are often handicapped as mediators. With Oftel, for example, the information asymmetry may be small, but the administrative, rather than judicial system of policymaking does little to expand public knowledge. In the US, the asymmetry is lessened by data exposed in legal proceedings, but even the world's largest regulatory apparatus, the FCC, relies heavily upon the industry to supply critical data.

Is there hope for a progressive policy?

The larger question is, could (or would) the public network play a role as the public platform which stimulates a new applications software industry for VANs? Can the PC model, with a single operating system supporting a host of applications, be applied to the network? A lot depends on whether the PTOs are dragged kicking and screaming into this venture, or whether they see it as a strategic opportunity to further entrench themselves in the local loop transmission market by ceding some tightly managed competition in the value added sector. This also relies upon whether they see their infrastructure monopoly as sustainable.

What makes the difference here is not liberalisation of the VANs layer, which need not address the question of breaking the infrastructure monopoly (indeed, the argument here is that VANs providers may have much to gain from that monopoly, depending on the terms of separation and access). With proper access charges, a shared monopoly system could be maintained, and with intelligent networking and variable bit rates, it is growing easier.

The options or solutions seem to be defined by whichever horn of the dilemma you choose to be gored by. Now that we have outlined the many contradictory poles of this argument (see Table 4), the question is whether there are some regulatory or policy options which have been overlooked in achieving a viable separation. The core assumptions of separation are 1) there needs to be some measure of VANs liberalisation to unleash the benefits of a dynamic sector; 2) there is a logic to interconnection policy, though practical experience with it has not seen a progressive or cooperative effort, and 3) the network should be treated as a huge and complex enabling resource, many of whose functions are best run by one entity, over which providers need fair and secure influence

A walk through the main arguments presented thus far goes something like this: The infrastructure monopoly should not be defined even so broadly as to consist of all transmission paths (without any discussion of switching capacity). There is vigorous competition in toll networks in the USA and there is a clear demand for LAN interconnection, MANs and WANs. Should it then be confined to all local transmission paths? After all, there is the potential for competition in some areas, especially dense urban business districts, though the potential is weaker in most local plant. But duplication of plant is often inefficient, and new technologies unpredictable. What then is the best way to halt the pace of inefficient duplication? A market test would seem to be appropriate here, but that too has its shortcomings. New entrants need the protections of effective interconnection policies, to assuage the difficulties of start-up costs.

In addition to tacking interconnect issues, the information asymmetry and market power of PTOs which can limit entry must also be addressed.

The viability question therefore centres around curbing monopoly power, and creating a new and improved version of that platonic ideal, the level playing field. Two sets of solutions are presented here.The first set continues the network monopoly, the second embraces fragmentation and non-sustainability. The monopoly ideas are geared towards divorcing conduit providers from service providers, and best address the need for a fair and viable separation to have a fair provision of capacity. The second set are based upon reforming the interconnection process, and achieving fairness through threats of exit and competitive entry. The scenarios are presented in Table 5.

1. Retail/wholesale separation

This argument begins with the premise that there is already a boundary forming between network operations and the activities carried out first hand for customers. What is needed is a single networks operator which wholesales its distribution plant on a fair basis to retailers, and is involved in no services (though harper proposes that such a carrier could provide international business services). The wholesaler, freed from dealing with retail customers, can more readily embrace the principle of cost-savings and operational rationalisation than PTOs currently do.

The retail/wholesale dichotomy plays to the PTOs strength at designing and building advanced networks on a mass scale and weakness at marketing to customers/users. It would also have the advantage of getting them to focus more on technology R&D than customer satisfaction. All retailers would have a non-dominant stake in the wholesaler of distribution plant. The inclusion of all providers as shareholders in the network wholesaler addresses the need for profit sharing and joint incentives to deploy state of the art technology. Harper argues that the UK experience should cast doubt on the logic of proliferating networks. the above dichotomy would free competitors from making the heavy investment needed to replicate PTO plant (Harper, 1991: p. 22).

The common network envisioned here would consist of high tech plant running within 1/2Km of customers,and directly into the offices of firms with PBXs or LANs, This plant would be largely fault free, and run under centralised remote control in terms of adapting to customer needs and traffic. Suppliers are being given exacting targets to meet these reliability goals, which will help facilitate staff reductions. The workforce is concentrated in maintaining the periphery of the network. The separation of this plant from the retail functions of the network also reflects a boundary between low-labour intensity network deployment and maintenence (which will be largely through remote reconfigurations) and high labour intensity at the point of the customer interface.

2. Unified bit carrier scenario

Advances in voice compression and increasing service integration have opened up the scenario in which a common bit carrier would be able to satisfy most user's needs. Much like with the retail/wholesale separation, this UBC would only be allowed into the business of wholesaling distribution plant. It would not however be allowed into international or any value added services. This is the clearest path to an IBN if that is the stated policy goal. Arlandis (1992) has noted that this can also shift functionality to CPE through Open Architecture Receivers and the like, though cooperation is essential between actors to make such a system work.However, if all providers don't agree to sustain it, then it will inevitably face competition and the process of disintegration will begin anew.

What are the practical dimensions of relegating the PTOs to a role of pure bit carrier? Given the choice of providing high profit margin software based services, or maintaining a physical infrastructure, sure to be subject to stringent regulations and likely to be operated on common carriage principles, which PTO will choose the latter?[17] A physical infrastructure enterprise cannot easily be carved out without discussing the issue of who might be interested in running such a business. It would surely face stringent regulation, and have its tariffs closely monitored (especially as the service upon which all other providers would rely). Bit carriers, even one which can accommodate any service, offer only limited business opportunities. A good example of this is the recent difficulty C&W is having realizing a gain from the international capacity it invested in developing, because users are simply leasing bandwidth (using C&W as a UBC) and not purchasing C&W's higher profit value added services.The linearity of opportunities they do offer is dull, measured by selling more capacity to send bits. More bits may equal more money, but profit margins remain slim.

On the other hand, it offers a role for a carrier, run according to public service considerations, to stimulate the economy. Such a carrier in the EC and possible North America could get industrial policy support in the form of subsidies. A problem of the imposition of service integration, or pure bit carrier solution, from above it that it flies in the face of a dominant network evolution trend, towards open network architectures, systems, provision, etc. An integrated system implies a closed environment, mainly because pieces and parts of such systems cannot be leased out if the total costs are to be recouped. This latter argument is that of the US RBOCs, that greater entry into VANs markets is needed to cost-justify the deployment of a broadband networks.

The interim step towards either of these proposals would likely be some sort of separate subsidiaries with stand-alone accounting, but the history of that effort in the US should provide numerous less as to the necessary depth of the separation. Until there is a split of carrier from service provider, the viability of separation without anti-competitive behaviour flourishing is doubtful at best. Despite the American experience, separate subsidiaries may be the best hope for Europe's PTOs, which are certainly too entrenched to relinquish their role as service providers or accept the task of fair and efficient carriage for competitors.

3. Interconnection

This solution can begin by conceding the problem of MANs and WANs and resolving to allow full blown infrastructure competition. It also admits that service providers cannot be easily split off from carriers, especially where the unified structure has 150 years of institutional history and inertia in its favour. This shifts the onus onto those who are determining and managing interconnection policies. It may also invite wasteful duplication of resources, made all the more scarce by recession is key markets. But this is a market-oriented choice implicit in interconnection policy (and also reflects a major difference between ONA and ONP, elaborated in Kramer 1992). As discussed above, there needs to be a more effective system of protections, the sort which would only come from a cooperative effort. This policy option would also require considerable technical expertise and backing.

In Europe there is a unique opportunity to condition entry into new markets by rival suppliers upon offering a portion of their network capacity for anyone else to use, and getting a proportional access to PTO networks. This would require some upfront investment (a goal of

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17. Lets face it, even for the most bureaucratic of PTOs, discrimination is where the interesting business questions, as well as the fun, is. Belgium's RTT is eager to sell its Global VPN services, and may succeed in doing so as long as it keeps its tariffs for monopoly provided leased lines above the cost of VPNs. The best hope there might be is to get PTOs to voluntarily jettison their carriage business. Pacific Telesis had proposed hiving off their regulated infrastructure business to concentrate on where the growth is, in their unregulated business.

regulators) and also guarantee access to the new provider, overcoming PTO objections. New providers have argued that reciprocal access is too onerous a burden, but it could be applied to players with domestic monopolies (or de facto monopolies) elsewhere, accepting the clear trend of a oligopoly. This puts the greatest barriers in front of the large players, but gives them a guarantee that investments will no go wanting for access.For those which can afford it, entry will have a clearly stated upfront cost of interconnection. The small and flexible VANs providers have the edge in that they can piggyback on any carriers capacity so long as their service is differentiated enough not to threaten the revenues of carriers. A good example are the service consortia like SWIFT and SITA, though they enjoy institutional support. They might also form alliances with larger carriers to jointly gain entry.

4. Status Quo

The system we have is the most observable, and the easiest to criticise. It is therefore axiomatic that the status quo should in many ways reflect the worst of both worlds. De facto monopolies which can also participate in liberalised upper layer services are the villains of a well-know and unsavoury story. If infrastructure provision is only partly competitive, then the nature of interconnection tariffs will determine the scope for competition, and the story there is equally unsatisfactory. A choice must be made, either to support a UBC which provides and operates infrastructure on wholesale terms or to have unlimited duplication of plant with a reliance upon rejuvenated interconnection laws and access charges to open access to competitive providers.

10 Years On: A Preview of the New World Telecoms Order?

Whichever path is chosen, the nature of the process must change for separation to be viable. Instead of forcing a monopoly through legislation, or tinkering with the present system of interconnection, we need to devise a system (which may be inherently at odds with lassiez faire capitalism) so that all parties have a common incentive to support a single network resource, rather than just bemoan its shortcomings. This carrier will in turn have an incetive to serve as many parties as possible. Technology is making this possibility grow ever nearer. Users have shown a willingness to pay higher tariffs for similar services offered over competing networks. They would pay an even higher price (though they might not have to) to keep an efficient, flexible and open network platform afloat.

If we can make some decision between a monopoly carrier or interconnection regime, some features we can anticipate under viable separation include:

- Centralised deployment of ATM and continued if not increasingly aggressive upgrade of the local loops closer to the subscriber.
- Establishment of a unified bit carrier, funded through access charges, based the contributions of providers, who pay for carriage, and their rival networks who pay interconnection charges.
- A return to the public service mentality which nurtured engineering excellence within the monopolies, within an organisation run on competitive terms to serve all users of network capacity.
- Movement towards a broader oligopoly where the sharing of a few groupings of network resources is common, lending cooperative support for a near-monopoly infrastructure.
- The days of a monopoly infrastructure may be gone, but users and PTOs alike will recognize the value of having small segment of the market cordoned off for entrepreneurial providers and infrastructure providers.

Bibliography

Arlandis, Jacques, 1992, "Convergene Between Telecommunications, Computing and the Media: Visions for the Future." Montpellier: IDATE. Unpublished paper.

Barclays deZoete Wedde, 1991, Research Report on BT, London: BZW, September.

Berry, Jean François, 1991, (need to get precise title of article on capital budgeting and broadband) 1992 Single Market Communications Review

Elton, Martin, 1992, "Integrated Broadband Networks: Assessing the Demand for New Services," Unpublished Working Paper, New York: CITI.

Ergas, Henry, 1992, "France Telecom: Has the Model Worked?" Paper presented to the Royal Norwegian Council for Scientific and Industrial Research, 29 January.

General Accounting Office, 1987, Telephone Communications: Controlling Cross Subsidies Between Regulated and Uncompetitive Services, Oct. Washington: GPO.

Harper, John, 1991, A 21st Century Structure for UK Telecoms.: Competition Without Fragmentation, London: CommEd Publishers.

Kramer, Richard, 1992 (in press), Service Provider Strategies for Europe, Analysys Publications, Cambridge, UK.

Kramer, Richard and Aine NiShuilleabhain, forth. "PTO Strategies and the Emerging Global Oligopoly: An Examination of Market Structure, Finance and Corporate Culture," Paper to be presented to the 7th Annual Euro CPR, Copenhagen, October.

Levine, Henry, 1991, "R.I.P. ONA," Unpublished paper.

A. D. Little, 1991, Issues and Options for telecommunications in Europe, 1990-2010. Report prepared for the Commission of the European Communities.

Meuller, Milton, 1988, "Interconnection Policy and Network Economics," Paper presented at the 17th Telecommunications Policy Research Conference, Airlie, VA, Oct. 31.

Rutkowski, Tony, 1991, "A Taxonomy of Networks," Presented at the CITI Private Networks Workshop, 25 October.

Yankee Group Europe, 1992, "Ring-fencing Cellular," Level: 8, Vol 12, Issue 3, March.