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Private Networks and Public Objectives

In America — and increasingly abroad — electronic highways proliferate, as do the providers of electronic and video information. Electronic networks thus appear well on their way toward openness and freedom.

But are they really? Just because one set of restrictions disappears does not mean that new and perhaps unanticipated bottlenecks will not emerge instead. One such bottleneck is, paradoxically, the result of the exercise of a fundamental freedom: the freedom of association. I will argue that the cumulative impact of this freedom in the telecommunications field may well lead to restrictions in another: the exercise of free speech.

To understand why freedom of association may lead to reduced freedom of speech, we have to understand where the evolution of telecommunications is taking the network environment and the extent of this transformation. This will be the subject of the next several sections.

The Emergence of Private Networks

When discussing developments in telecommunications, one type of privatization receives much attention — the *ownership transfer* of a national network into private hands, for example, British Telecom in the United Kingdom, Telmex in Mexico, and Nippon Telegraph & Telephone in Japan. But there exists another quieter process with much greater long-term significance that may be called *use* privatization — the

rapid development of private and closed-user-group networks. These networks are private, but not necessarily in the sense of ownership. They may be fashioned from state-owned segments, as in the ministry-run networks in the People's Republic of China, or they may be used by the state, as in the case of the U.S. government's giant FTS-2000 system. But they are private in the sense of being separate from the public or general network, and they are not open to all in the way that the public network is. This type of privatization has evolved rapidly; as it grows it calls into question traditional telecommunications arrangements.

An analogy may clarify this shift: Ownership privatization corresponds to a transfer of shares in a state-run railroad to private shareholders; use privatization is comparable to admitting private automobiles and taxis as means of transportation. Arguably, changes in the ownership of the Long Island Railroad or Conrail had only a minor impact on a city like New York, while the evolution of the private automobile had an enormous impact on the cityscape, metropolitan growth patterns, job location, and ethnic stratification.

The trend toward private segmented networking, though largely outside the public view, has been rapid. Most observers still view private networks as essentially special arrangements at the margin of the regular system. But in the future, we may well observe a reversal of what "regular" means. For example, while in 1980 virtually 100 percent of U.S. network investments were made by public network carriers, in 1986 this figure had already dropped to 66 percent; the remainder was accounted for by large users and private networks.[1] Large organizations, such as Citicorp and Boeing, run network operations requiring many hundreds of employees. For Citicorp, telecommunications has become, after personnel and real estate, its third largest expense item.[2] The federal government contracted for its own private network, FTS-2000; valued at $25 billion, it was the largest federal civilian procurement.[3]

Perhaps even more significant than intra-organizational networks are the emerging group-networks. First to develop were clearing networks for financial institutions such as FEDWIRE (payment network), CHIPS (U.S. payment netting system, with counterparts CHAPS–UK and CHATS–Japan), and, internationally, the Society for Worldwide Interbank Financial Transactions (SWIFT), followed by horizontal and vertical networks for florists, travel agents, insurance companies, and advertising agencies. Next were industry networks linking entities in frequent business contact. General Motors, for example, created a vast system among its own far-flung operations and its suppliers, dealers, insurers, and financial intermediaries, internationally as well as domestically. Such networks provide relatively secure, cheap, and customized communications. They also tend to have service features which go beyond simple transmission, providing "added value" such as electronic data interchange or other software enabling transactions. Similar services are also offered by specialized value-added services networks or enhanced services providers.

The spread of private networks raises new issues — and old issues in new guises. Take as an example the private network of an institution such as Columbia University. Columbia's proprietary system — in place since September 1988 at a cost of $15 million, requiring the rewiring of the entire campus and employing a workforce of 46 — was instituted as a superior communications solution but has drawbacks for the actual users: It severely limits terminal equipment options (only four terminal models are available and compatible); it charges its users prices substantially above costs, with no obvious constraint and no information that can be used to evaluate the justification of charges; it provides only bundled service/equipment packages, with all deviations at a very high cost; it charges very high rates for the connection of modems, codecs, and fax equipment; it can legally refuse service to unpopular political groups as long as it does not discriminate on the basis of race, sex and

religion; it can monitor or limit electronic mail messages; and it blocks its employees and students from reaching certain numbers. For the users of the network (as opposed to its operator), there is practically no recourse to regulatory agencies. Thus, the institution may be better off, but its users may not be.

Across the country, and even the world, large institutions and groupings create similar private networks. As this system evolves, it is appropriate and necessary to look at it with increased attention and to analyze the public policy ramifications of its aggregate. In doing so, this paper will describe the telecommunications environment of the future — a federation of private networks linked through a modular public network — and the status of traditional public objectives in such a new system.

The Emergence of the Private Network System

Several factors have led to the emergence of private networks.

Office Technology Deployment

Private networks began as dedicated voice circuits leased from the telephone company for users who wanted to connect, on a permanent basis, several of their facilities, e.g., a downtown headquarters with a manufacturing plant across town. Soon, however, more complex arrangements evolved. Physical range increased and involved other domestic telephone companies and then international carriers. Organizations also used an internal switching capacity, first by manual switchboards and later by private automatic branch exchanges (PABXs), with functions similar to those of a telephone company switch. Users added increasingly "smart" electronic equipment and interconnected it, especially after the 1968 *Carterfone* decision permitted non-AT&T equipment to be used. It also led to the sharing of circuits by several users interconnecting through a PABX. Carriers, at first

resistant, later offered software-driven hybrid services, known as "virtual" private networks, contributing to a blurring of the distinction between the switched public network and non-switched (fixed) dedicated private networks.

Users increasingly gained control over the network segments closest to them; first, over equipment on their premises; second, over the wiring segments in offices and residential buildings. It was natural, as the next step, that several large American landlords began to provide a full array of telecommunications services within their building to commercial tenants, thus taking this segment out of the public network. These "shared-tenant services" shifted the switching from the public exchange to the landlord's private branch exchange (PBX), and moved transmission from the public networks to private lines. The shared services, by their economic logic, expanded to clusters of office buildings and central business districts, in effect creating alternative local telephone companies.

Firms also interlinked their computers, which became increasingly "distributed," via local area networks (LANs) which began as privately established high-volume links serving the data flows within an organization and among its equipment. In some organizations the internal flow over LANs reaches 60 percent. Here, too, expansion was inevitable; some LANs grew geographically into WANs (wide area networks), even spanning several continents.

In time these elements came together and created intra-firm local networks, with multiple interconnections with the public networks.

The Service Economy

Although technology provided the impetus for private networks, it would be incorrect to view change only as technology-driven. At least as important, and a driving force for

restructuring of networks has been the phenomenal growth of user demand for telecommunications, which in turn was based on the shift toward a *service-based* economy. The large users of telecommunications are corporate headquarters, banks, insurance firms, airlines, health delivery organizations, engineering and consulting firms, law offices, media organizations, and other providers of services. The shift toward such activity in highly developed countries was partly due to their loss of competitiveness in traditional mass-production *vis-à-vis* newly industrialized countries. It was also partly due to a large pool of educated people skilled in handling information. Information-based services, including headquarters activities, therefore emerge as a major comparative advantage of developed countries. These activities were reinforced by productivity increases in information transactions through computers and advanced office equipment.

In consequence, electronic information transmission (telecommunications) became of ever-increasing importance to the new services sector. It also became a major expense item. This made the purchase of communications capability at advantageous prices more important than in the past. Price, control, security, and reliability become variables requiring organized attention. This, in turn, led to the emergence of the new breed of private telecommunications managers whose function was to reduce costs for their firms and who, for the first time, established sophisticated telecommunications expertise outside the traditional telecommunications industry. These managers aggressively sought to establish low-cost transmission and customized equipment systems in the form of private networks of power and scope far beyond those of the past. In the spirit of Parkinson's law, they also created large departments. Some of these operations require hundreds of skilled technicians and managers. They began to carve out slices from the public network. It does not take a large number of private networks to have an impact: In the United States, for example, the largest three percent of users

typically account for 50 percent of all telephone revenues. These activities are spearheaded by private firms, but are not exclusive to them; non-profit institutions such as hospitals and universities, and public organizations such as state and local governments, are also actively pursuing similar cost-reduction strategies.

User Differentiation and Pluralism

By their very nature and tradition, the traditional monopoly carriers provided standardized and nationwide solutions, carefully planned and methodically executed. In the old days, sharing a standardized solution was more acceptable to users, because the consequential loss of choice was limited and was outweighed by the benefits of the economies of scale gained. As the significance of telecommunications grew, the costs of non-optimal standardized solutions began to outweigh the benefits of economies of scale, providing the incentive for non-public solutions. Furthermore, some users aggressively employed a differentiation of telecommunications services as a business strategy to provide an advantage in their customers' eyes, therefore seeking a customized rather than a general communications solution.

Another significant change occurred through the emergence of alternative transmission, starting with the Federal Communications Commission's (FCC) "Above 890" decision to permit intra-organizational microwave private lines.[4] Since then, numerous new facilities-based carriers offering transmission capacity have emerged, including international carriers such as Cable & Wireless, P-TAT, and PanAmSat; national carriers such as MCI and US Sprint; regional carriers such as RCI, Lexitel, and Allnet; specialized carriers offering microwave circuits (Eastern Microwave), satellite (Western Union), coaxial cable (Manhattan Cable), and fiber (Metro Fiber, FiberLAN, and Teleport); intra-building shared-tenant systems (STSs); and intra-organizational LANS. Thus, it has become increasingly possible and often desirable for

users or systems packagers to put together segments of capacity and to fashion ad hoc private networks based on the most economical and effective capacity offers.

To add to the increasing differentiation, telephony has gone a long way beyond providing simple switched voice connections. A large number of value-added services have been introduced, especially in data and text areas. Examples are voice mail, videotex and audiotex, and electronic message interchanges.

Conceptually, most advanced telecommunications services can be analyzed as four layers superimposed on each other: basic transmission, data packet transmission, generic services, and applications packages. Actual applications began with a mind-boggling complexity. Take for example a service we all use regularly, automated bank teller machines (ATMs). These services are often provided by a specialized private network operator serving a number of banks. This ATM network operates on private lines (basic transmission) leased from the basic network operator, typically the local exchange companies or long-distance carriers such as AT&T. These lines are used by data transmission companies such as Telenet, Tymnet, or the former AT&T Net 1000, which all add the packet switched capability used in interactive data transmission. Their services, in turn, are used by firms that enhance them further into generic value-added services such as on-line data access, electronic mail, voice mail, telemetry, and others. Such firms include MCI, GE, Tymnet, and AT&T Accunet. Different generic services are then bundled into application packages appropriate for various industries (finance, agriculture, hospitals) or functions (component part orders, international trade, credit card transactions, manufacturing designs).

While in many instances several of these layers can be integrated within the same company, they need not be. Thus, when a bank customer uses an ATM, the communications

involved may involve five or even more functionally different service providers on the same physical segment, as well as several firms for the different geographical segments. The underlying banking transaction, in turn, may trigger interbank electronic transfer networks of similar complexity, using in turn special network arrangements.

Networks are not simply technical systems, they are reflections of interrelations among various groups, organizations, and individuals. The number of groups in society that interlink by telecommunications is large, and their communications needs as collectives became specialized. This led to the emergence of private user clusters. Early examples were travel agents and airlines, automobile parts suppliers, and financial institutions, which established group networks that combine some economies of scale with customization.

Modeling the Evolution of Networks

Foremost among the reasons for the emergence of private networks is cost, that is, their lower price to users. But why should it be cheaper to have specialized networks? To analyze this issue, the following section is a theoretical exposition of networks and why they tend to fragment with growth.

Networks are an important concept in society and the economy. They abound in various fields and in different forms. They include physical facilities for electric utilities, communications, and transportation, as well as relational systems such as networks of "old boys," political supporters, and intelligence agents.

Telecommunications networks can be viewed as having qualities of both private goods and public goods. Pure private goods admit only one user while pure public goods admit everyone. What has been happening in recent years to telecommunications is largely a shift in the degree of its intermediate position in the direction of user associations.

A universal public network which connects everybody with anybody under a single organizational roof is technically and financially merely one arrangement out of many. One can view a network as a cost-sharing arrangement between several users. As the network grows in size, the average cost paid by each user first drops, then later rises as marginal locations are connected. The benefit of membership in the network, meanwhile, keeps growing, though at a declining rate. When first started, the network requires a certain number of subscribers to become self-sufficient — it must reach a size where benefits become greater than costs. Below that point, which may be called the "critical mass" point, the network needs some form of subsidy to cover its costs, from either government sources or its operator, as an investment in the future.

After this critical mass point, expansion of the network is self-sustaining, since newcomers add to the utility of the network without raising costs. However, at a certain "private optimum" point, newcomers are no longer welcomed, because costs begin to rise with each additional subscriber while incremental benefits stagnate. When this occurs, the network ceases to expand on its own.

For public networks, this private optimum point is not ideal; some potential users are bound to be left off the network. Therefore, universal service policies in most industrialized nations help to open the network membership to further growth, and thereby to include as many users as possible.

However, these universal service policies may result in some users receiving less from the network than desired. Indeed, there may be an "exit" point where the network has expanded to the extent that, given its cost, a user is better off not participating; the user would rather drop off and be without service than participate in supporting the network.[5] More likely, however, is for some users to drop off and start their own new "network association" if they can do so legally and economically. This is particularly the case if they can inter-

connect with the remaining network. They can thus maintain the benefits of the network's large size without its cost-sharing burden.

These trends lead to what may be called "the tragedy of the common network," borrowing from Garrett Hardin's classic environmental "Tragedy of the Commons," because it is not the failing of the traditional system, but rather its very success which undermines its continuity. As the above analysis outlines, the success of a communal network creates expansion, cost-shifting, and the forces for particularism. Because the combined volume of large users has risen so much, they can account for much of the cost savings of sharing just among themselves. They can form alternative network associations for large parts of their communications needs, first in-house, then with their closest suppliers, customers, or market partners.

These groupings of users need not be territorial. The tradition of interconnected national systems is likely to be transcended in many instances, and specialized transnational networks emerge. This becomes possible with the drop in cost of international circuits.

For satellite transmission, in particular, the marginal cost with respect to distance is close to zero. Communication flows can be routed in indirect ways in order to join new and more congenial network arrangements. Arbitrage becomes easily possible. This undermines attempts to administratively set rules for prices and service conditions.

In the future it is likely that specialized global networks will emerge for a variety of groups that communicate with each other intensely. Their relation to each other is functional rather than territorial, and they can create global clustering of economically interrelated activities much in the way that in the past related activities clustered physically near each other.

Examples for group networking are:

- advertising agencies, media firms, and printers;
- chemical manufacturers and environmental protection agencies; and
- insurance agencies, hospitals, record rooms, and police.

In some instances, these will have special performance features that distinguish them from the general "public" network. In the first example of the list, network bandwidth probably must be quite high to permit transfer of high-resolution graphics.

In other instances, additions of supporting software and data bases provide a more powerful communication, as in the second example. But in many instances, such as the third above, it is probably the price of inter-communications that drives the arrangement.

Many entities are likely to participate in several networks. Furthermore, the new and pluralist network system does not imply separate transmission links for each subnetwork at every point. It will often make sense to transport the traffic of several low-volume users part of the way on the general network until the point where there is enough aggregate traffic to branch off. The economics of sharing are not abolished. But they must prove to be superior as a matter of choice rather than being imposed by a legal requirement.

But why stop at networks for groups? If the trend is from national public networks covering the entire population to a pluralist system, why not expect still further disaggregation? This additional step means individualized networks, or *personal* networks, which may be called PNs, analogous to PCs. Before dismissing the notion of PNs as extravagant, let us remember that 20 years ago nobody expected personal

computers, and nobody expected computers to end up on everybody's lap, either.

What does a personal network mean? It means an individually tailored network arrangement that fits an individual's communications needs. It does not necessarily mean a separate physical system, except for inside wiring and maybe the last mile of circuits, some radio-mobile links, and terminal equipment. The rest consists of what are called virtual networks, provided by a whole range of service providers and carriers, not just one, and packaged together to provide easy access to an individual's primary communications needs: friends and family; work colleagues; frequent business contacts, both domestic and foreign; data sources; transaction programs; video publishers; telemetry services such as alarm companies; bulletin boards scanned; etc. Contact to and from these destinations would move with the individuals, whether they are at home, at the office, or moving about.

For all of these reasons, public networks have been subjected to centrifugal forces. Like a Greek drama unfolding, the unified, centralized system unravels because it reflects the realities of a passing era. Technology and economics are tearing at the traditional unity. The centralized system frequently still has politics on its side. It still encompasses several of the main organized constituencies in industrialized countries. But the new interests create their political constellations, too. Now, another grouping is emerging, the alliance of large users together with the most advanced part of the telecommunications equipment industry, which also includes the computer, components, and office equipment firms.

In sum, the use-privatization of the public network is perhaps the major network development in recent years, yet it is little noticed in its cumulative implications since much of it takes place outside the traditional focal points of policy

attention. Perhaps because of its technical complexity, this trend has not received the visibility and analysis it deserves and requires.

The Impact of the New Group Networks

The theoretical discussion in the previous section aimed at demonstrating the dynamic of disaggregation in networks. If one gives individuals the freedom of association, they will form new types of interlinkages which we call networks. What are some of the long-term implications?

Networks Will Become Transnational

As the cost of transmission continues to drop, the network associations will not be territorially organized. Territoriality was based on the need for a network architecture that primarily minimized cost by minimizing transmission distance. It led to the creation of the "German network," or the "French network." This technological and economic territoriality suited governments everywhere just fine, because they, too, were based on territoriality of jurisdiction, and could thus conveniently exercise control and even ownership over "their" networks. But things are changing. Now, networks are increasingly becoming pluralistic group affairs. Groups break off parts of their communications needs from the public network and aggregate them in their own associations. Banks, insurance agencies, airlines, automobile manufacturers, and many others communicate with each other on increasingly specialized networks. Advertising agencies, marketers, printers, and media do so similarly. Another group is automobile manufacturers and their suppliers, dealers, and financiers.

Territoriality becomes secondary. Many of these communities of interest transcend national frontiers. Their interests are continental and global, and so are their networks. When the computers of brokers and investment banks in New York

are interconnected by a continuous network and interact with those in Tokyo and London to trade and clear transactions, one cannot say anymore that there is a New York or Tokyo market. There is no physical locus for the market anymore. *The network becomes the market.* Transactions are not conducted at any particular physical point.

New Electronic Neighborhoods Will Emerge

A few years ago, it became fashionable to speak of communications creating the "global village." There was something inspiring in this image, communal and peaceful. But there is nothing village-like in the unfolding reality. Instead, groups with shared economic interests are extending national group pluralism through the opportunity to create global interconnection with each other into the international sphere. Indeed, communications make international pluralism easier because it is easier to reach critical mass for subnetworks if one aggregates across several countries.

The new group networks do not create a global village, they create instead the world as a series of electronic neighborhoods. In the past, neighborhoods had economic and social functions. In New York for example, there are Chinatown, the Garment District, Wall Street, Madison Avenue, and the Theater District. Elsewhere, there are regions with specialized production: Solingen and Sheffield for cutlery, Lyons for silk, Hollywood for films, Silicon Valley and Route 128 for microelectronics.[6] Production clusters create economies of aggregation that substitute for the economies of scale and scope of the giant multi-product firm. Physical proximity was a key. But now, group networks can serve many of the functions of physical proximity. They connect specialized producers, suppliers, buyers, experts, and markets. They create new ways of clustering, spread around the world.

Some of these electronic neighborhoods will be nicer than others. They will perform better, faster, and often even

cheaper. In developing countries, the networks of those transacting with the world are already becoming better than those of local people. In places like China and Egypt, a two-tier communications system has emerged.

Networks might also be stratified along socio-demographic dimensions. Already, some long-distance resellers in the United States offer bonuses to churches if they sign up their members. Such marketing efforts can lead over time to identification of some networks with particular ethnic, religious, or political groups. Similarly, some networks may be shunned by labor union members if they have a history of labor problems.

People or businesses could become identified with "their" network. A year ago, New York Telephone proposed splitting the 212 area code, with the Bronx and parts of Manhattan getting a new code. Many Manhattanites were upset to be lumped together with the Bronx and made themselves heard.[7] Governments might try to maintain systems of internal redistribution by resorting to taxation and allocation. A value-added tax on communications would be a sensible substitute for the present hidden system. But it will not be easy to define what will be taxed, or to measure it, or to prevent the taxed electronic flows simply to bypass the jurisdiction.

Networks Will Assume Political Power as Quasi-Jurisdictions

Historically, the nation-state was at tension with cross-border allegiances — whether proletarian international solidarity, rebellious youth culture, international financial capital, or ethnic minorities. The new network environment weakens national cohesion. It strengthens particularism and internationalizes it. It is difficult for a state to extend its powers beyond traditional frontiers, but it is easy for the new networks to do so.

Furthermore, these network associations possess and acquire powers of their own. They already may link powerful entities, and can bring their combined powers to bear. For example, the combined weight of the members of the SWIFT banking network got the powerful national Post Telegraph & Telephone monopolies to cave in on a number of crucial issues. And there is no reason to expect the power of network combinations to be directed only at communications issues. Once groups are in constant touch, they may as well get organized on other issues, too. *The communications network becomes the political network.*

They will coordinate in the economic sphere. When it comes to the role of information, the line between competition and cartel coordination has always been a fine one. In the 1920s, various American industries established so-called fair-price bureaus that gave each member of the industry a convenient look at what its competitors were charging. This practice was outlawed in a series of anti-trust cases. Imagine if one leaves instead information exchange to a series of artificial intelligence programs communicating internationally. One has a real problem of conceptualizing, detecting, and preventing international cartels. One person's collusion is another person's programmed trading. *The network becomes the cartel.*

The network associations are also likely to become quasi-jurisdictions themselves. They have to mediate the conflicting interests of their members. They have to establish cost shares, sometimes creating their own de facto taxing mechanism as well as redistribution. They have to determine major investments, to set standards, to decide who to admit and who to expel. As a network becomes more important and complex, control over its management becomes fought over. Elections may take place. Constitutions, bylaws, and regulations are passed. Arbitration mechanisms are set up. Financial assessment of members takes place. *Networks become political entities.*

Thus, we may be witnessing the creation of new and often extraterritorial forms of new quasi-jurisdictions that are not clearly subordinated to others. In response, governments might create forms of domestic and international regulatory mechanisms for specified sets of problems, possibly based on global networks themselves that continuously collect and exchange information, track activities, and coordinate enforcement.[8]

Networks Will Exercise Power Toward Their Members and Restrict Free Speech

Perhaps the major long-term issue is whether a network group can dominate its own members, or be restrictive in its permission of others to join. The power of the network becomes most obvious when it is operated by a dominant entity. For example:

- As mentioned before, a network can be quite restrictive if its actual users are relatively captive, e.g., employees, students, patients, dependent suppliers. It can limit terminal equipment and options, charge monopolistic prices, and legally refuse to serve political activist groups.

- The major U.S. videotex service, Prodigy, prevents its user groups discussing politics on the system as well as the Prodigy system itself. When Prodigy, which provides extensive messaging service, announced that it would raise the rates for such messages, a group of subscribers posted notices in a "public area" of the system encouraging other subscribers to protest. When Prodigy removed these messages, the protesters turned to the private message feature, and sought help from advertisers. Thereupon, Prodigy cancelled the subscriptions of the protesters.[9] The controversy over Prodigy suggests the increasing potential for blocking the right of free speech as technology allows new, private networks to develop.

- In 1987 a debate raged at Stanford University over a joke file on the University's computer system. Because it contained jokes offensive to some groups, the university was pressed to impose restrictions on content.

- Employers frequently block the ability of their employees to reach certain numbers. While this is based on protections against running up telephone bills generated by dial-it services, the principle could be extended to excluding messages of a type undesirable to employers, such as those of labor unions.

- In so-called intelligent buildings, landlords provide communications to occupants. These "shared-tenant services" are largely under the control of the building owners, whose interconnection decisions determine which networks tenants can reach.

- Electronic mail, which carries personal messages over computer networks linked by telephone lines, suggests a number of issues. For example: Do employers who own the electronic mail system have property rights to messages sent and received by their employees? Do employees have such rights to material sent on their employer's system? May employers read messages sent by their employees over systems owned by the employer? (In one instance, a mayor read the private electronic messages that city council members had sent to one another.) What rights of privacy extend to the information the system automatically generates about employees sending messages, e.g., records of who is communicating with whom, at what time, and for how long? Can the system owner exclude certain types of communication?

- Speech restrictions have already begun to appear on public networks as well: Telephone companies that have traditionally operated as common carriers, i.e., not discriminating among users based on the content of

> their messages, have recently sought to screen messages carried over their conduit based on maintaining their "business reputation."[10] Some telephone companies, both local and long distance, have chosen not to provide billing and collection services for certain "900" services, thereby raising the cost of doing business to providers that offer controversial speech. US Sprint has a staff of 22 enforcing its dozens of guidelines for "900" services. Sprint rejects 40 percent of all applications for this service based on its policies governing advertising, content, and other areas. (It does not permit calls to children under 13, services involving giveaways, or any service that the company, in its sole discretion, believes does not "provide value [in] proportion to its price.") AT&T previews the programs of service applicants, for example, of dial-a-joke programs. Ethnic or off-color jokes need not apply. Governments, in response to some abuse, have weighed in with a heavy hand, for example setting maximum prices that can be charged by such information providers and setting bars to lawful "adult" messages. With the similar logic of "business reputation," telephone companies could conceivably deny transmission service to private networks of controversial groups or any whose purpose they disapprove of.

Petty monopolies can thus emerge, largely unencumbered by the protections built into the public network, at least in the past, by law, custom, and regulation. The primary option is exit, which may mean giving up a job and departing to another institution organization with different policies.

Are there freedom of speech rights for users in group networks (in network terminology, "common carriage obligations")? The scope of these rights is undefined. In the absence of state action Constitutional First Amendment rights do not appear to exist. Statutes apply only if there is evidence of discrimination. Regulatory impositions of such obligations are possible, but are limited by the rights of groups to

substantially define their membership and the rules under which they operate, especially where a major purpose of the groups is communication, and thus the exercise of a fundamental right itself, i.e., of speech. In such circumstances group activities have protection from restrictive regulation. In other contexts, the exercise of speech rights is stymied by access problems, especially to the workplace or to the shopping malls that today take the role of public gathering spaces. By analogy, the access to networks might be foreclosed, and with it its free speech potential.

Many of these new communities of interest transcend national frontiers. Global, integrated private networks create their own First Amendment issues. How will nationality be determined in "cyberspace," where electronic interactions occur without physical location? To what legal system or tradition will users be able to seek guidance or appeal? Under such conditions, the First Amendment may become little more than a "local ordinance," and in conflict with speech principles of other countries.

Even where network groups are organized democratically, they may well be restrictive. A major function of liberties, after all, is to protect minorities from unsympathetic majorities. In the public sphere, guarantees of free speech against governments are part of constitutions. In the network environment, the granting of access and non-discriminatory content-neutrality is required of the general "public" networks by law or common carriage regulation. But common carriage does not necessarily apply to group networks. Groups may institute restrictions on the exercise of speech over their network, and assert that their status is alike to publishers, with no rights of users. They can exclude certain subjects from being discussed, or certain speakers from having access to the network. This could become particularly an issue when telecommunications networks gain the ability to transmit video programs. It is true that individuals could form alternative networks if they are being restricted. Thus, market

forces could help, but not if some of the networks control some segments of a chain of communications, or where the ability of any link in such a chain to institute content-based tests would impose transaction costs on the entire system. It is for similar reasons that society has adopted the use of legal tender and of commercial paper to permit low-cost transactions. Common carriage has a similar rationale.

One solution would be to impose common carriage on every network. But even if that were legally and constitutionally permissible, it will not be desirable or possible to extend the common carriage model all the way into the last small group network or into a broadcast-like one-way network.

Common Carriage Rights-of-Way

One possible solution is the creation of bridge mechanisms. What is needed is to establish a set of principles to guide interconnection in a mixed private-public network system. Such principles would allow private network arrangements to connect to the public networks, as they do now, but would require a *reciprocal* arrangement: common carriage "rights-of-way." Such rights-of-way would function like public roads and highways that pass private property, or easements that allow public passage through private land. They would permit the unimpeded transmission of information across the network federation and enable end-to-end connectivity, although not necessarily on the entire bandwidth of a transmission, since this would be unfair to a network that started out with a different status. Some rights-of-way would be quite wide superhighways, while others could be narrow but otherwise unobstructed lanes. They would provide a portion of their capacity for common carriage use. Such a system would allow for many forms of private networks, which the owners control. But as such networks enjoy the benefits of interconnecting freely with the public networks, they need also offer some capacity for the reverse flows as a reciprocal right.

A model (albeit flawed) of how this might be constructed can be taken from leased access channels on cable systems. Cable systems are essentially private networks, and the network operator has almost total discretion in controlling access "downstream" to subscribers. However, since 1984, federal cable legislation has mandated that a portion of the channel capacity be made available to "persons unaffiliated with operator" in a manner that approximates common carriage (i.e., the cable operator establishes the rates and is for the most part barred from considering the content of the programming).[11] As such, a portion of the network capacity is set aside for "upstream" access for the use of program providers who are not otherwise "members" of the network or controlled by the network owners.

One drawback to the cable model has been that leased access channels are like islands — there is no easy connectivity among them or to providers of information. In the federated network of the future, rights-of-way could traverse the entire system, from carrier to carrier, allowing the public network to cross private networks in order to reach end-users efficiently as well as allowing private networks to use the public network. Such an arrangement would strike a balance between the conflicting legal status of the public and private networks, and between traditional telecommunications and mass media.

We have all heard about the merging of electronic communications. But this has been essentially a technologist's vision, with policy trailing far behind. Common carriage rights-of-way provide a tool of integration for the increasingly centrifugal network environment.

Conclusion

Group formation always had a double-edged aspect. On the one hand, it was an extension of individual rights. De Tocqueville noted that the "right of association . . . almost is

unalienable in its nature as the rights of personal liberty." On the other hand, freedom of association led to situations inimical to individual as well as to a more general public interest. While many are agreed with the significance of pluralism,[12] others note the negatives.[13]

The exercise of freedom of association may lead to group formations that are restrictive of speech. Hence, the evolving pluralistic structure of telecommunications may bear the seeds for a new type of bottleneck to the free flow of information that did not exist on the traditional public network and its common carriage. It is a challenge to communications policy to keep the network system open from end to end, and to provide integrative tools for its diversity which do not result in fragmentation. Here is an inventory of the policy challenges posed by the growth of private networks:

Consumer Protection

User Sovereignty. A major question is whether a network group can dominate its own members or be restrictive in its permission of others to join. As more consumers are connected to private networks, their access to the benefits of service and equipment competition can be thwarted. How can consumers ensure that they will be able to use their choice of equipment over networks outfitted only for proprietary devices? If their local networks do not permit them to receive the desired service or functionality, what rights do they have to obtain access to a rival system, or simply to the public network?

Privacy. As private networks evolve, they incorporate many advanced features, which will contribute to and draw from personal data bases. As a result, a new generation of privacy issues is arising, which present laws and regulations do not appear to cover adequately and competitive forces may not help to solve.

Impact on Public Network Providers

Cost and Upgrade Impacts to Public Networks. The public network provides value to users of alternative networks in ways that are not obvious. For example, it is available as a backup if faults develop in a private network or if capacity is reached; hence private networks can adopt a less costly standard for reliability. It also provides standardized protocols and so forth. Clearly, the development of private networks will have an impact on public network costs (as distinguished from revenues). Is it possible that there could be a subsidy from the public network to private ones (i.e., from residential or other small users to large business users), reversing the historical flow?

Revenue Impacts on Public Networks. As users leave the public network, traffic is negatively affected. Price competition among networks may result in still lower revenues. It may require new internal pricing rules for services. As a result, investments and upgrades to the public network may suffer. This may serve to diminish service quality on the network and affect the competitiveness of the network.

Financial Interconnection. The major issues are (a) the optimal extent of unbundling, and (b) access pricing from one module to another. A related issue is the ability of other networks to interconnect physically on the premises of the public network. This is the highly controversial issue of collocation.

The Stability of the New System: Is a Network of Networks Sustainable? Public (open access) and private (closed access) networks co-exist and create an interdependence of users and networks. The stability and sustainability of this co-existence and the potential dominance of centralism, co-existence, or fragmentation needs further analysis.

Technical Issues

Standards and Technical Fragmentation. As the number of nonpublic networks increases, so does the technical complexity and diversity of networks, as users supplement or replace public transmission and software-defined offerings with customized additions. Given the technical nature of private networks, how will multiple standards be most effectively interconnected? What impact will this fragmentation have on innovation in the equipment industries of the United States and abroad? How will technical standards affect network performance and cost for users and suppliers? Under what conditions will technology and services emerge which are superior to those of a centralized system? When will they be inferior?

Standards are often used as tools of competitive strategy. What should be the role of government and of regulatory bodies — national and international — in the standardization process? Will a decentralized network system converge toward standards through market forces? What will be the role of private systems integrators in this process?

Interfaces and Principles for Modularizing the Network. In an interconnected network system based on hardware and software interfaces, it is critical to develop network concepts and principles organizing hardware and software functions in a way that makes interconnection feasible. This requires conceptualizing a network system based on unbundling and modularity. How is this related to ONA and ONP constructs? What is the optimal content of network unbundling?

Models of Interconnection. Mechanisms by which networks interconnect physically, virtually, and electronically, and evolving access arrangements, must be examined.

The Interconnectivity of Software (including software collocation) and Network Management Functions. The key to con-

structing hybrid networks — part private leased lines, part virtual private network (VPN), part public carrier — lies in software compatibility and interactive network management functions. These issues and their impact upon the open systems movement, both theoretically and practically, must be studied.

Service Quality in the Network of Networks. With the shift toward incentive forms of regulation, the importance of analyzing service quality in telecommunications has grown. In a network of networks, degrees of quality offered by various components become interdependent.

Capacity Planning in a Decentralized Environment. With the decentralization of networks and their interconnection, independent suboptimizing decisions on investment and capacity might not result in overall efficiency. What "invisible hand" mechanisms may exist in a federated network environment, and what are the possible remedies if they do not?

Emergency Planning. Because of changes in competitive market forces, network providers are not likely to build as much redundancy into their networks as in the past. As a result, emergency preparedness may suffer. Similarly, in the case of service breakdown in a private network, excess demand may be put on a public network. One solution may be to grant mutual access between all or a majority of networks in times of emergency, similar to the Emergency Broadcasting System for broadcasters. Which access priorities should underpin such a system? How should networks vital to national and international emergency preparedness be hierarchically structured?

Common Carriage and Access

Mixed Public-Private Systems. The status of common carriage will need to be analyzed for its applicability to the changing nature of networks. We are experiencing head-on collisions

between the separate principles which have dominated the telephone, cable television, and broadcast industries. Additionally, many networks are now offering both private and common carrier-type services. The developments require the coordination of a mixed private-public network system. Such a system would permit private network arrangements but would also protect, or create, common carriage "rights-of-way." This issue is of immense importance to the future status of network operations.

Access to Private Networks, Closed User Groups, and Public Networks. How to provide access among networks, such as from a shared tenant services telecommunications network to the public network, is far from established. Closed user groups will vary in size and sophistication, yet will need access to larger networks and the public network on equitable terms. On the other hand, they will not grant access to all who wish to use them. The altered network environment creates a new generation of access issues. What are the possible conditions and terms for access to the wide range of users? What are the important policy and legal issues pertaining to rights of access? Can a network group dominate its own members, or be restrictive in granting permission to others to join? What are the long-term implications of user and network control over access? Similarly, according to which criteria should closed user groups be allowed access to larger and/or public systems? Perhaps the major question is whether a network group can dominate its own members or be restrictive in permitting others to join.

Often, conflicts arise among users of private networks. Although initially users of an alternative network will share some commonality of interest, this may change over time and conflicting interests may come to dominate. This could occur as a result of such causes as, for example, a change in the ownership of one of the users, the eventual arrival of diseconomies of scale, or divergence in needs and corporate strategies. The stability of the new coalitions needs to be

studied, and constitutional and anti-trust aspects of new network associations thought through.

Pricing and Tariff Policies

Access Charges for Private Network Users Interconnecting with Public Systems. How should access charges regarding the use of one network (or elements thereof) by another network be set for optimal results?

Alternative Mechanisms to Subsidize Universal Service Provisions. Private networks spur the migration from public networks, which destabilizes the funding for traditional mechanisms designed to encourage universal service. Policy makers must examine options for alternative subsidy funding and assess the feasibility of various tax mechanisms, how they might be levied in practice, their likely incidence, and how they would best be allocated.

Technology Policy

The Impact of Private Network Developments on National Competitiveness. How will innovation in equipment, service provision, and user applications affect the international competitiveness of the United States, as well as the performance of other countries? How significant is telecommunications network usage as a source of general revenues?

The Feasibility of Partial Regulation of Network Building Blocks. Different providers and users will own or control certain network components, both hardware and software. With connection among the various public and private networks, the facilities of numerous providers will be used. Some portions of such systems are today (and probably will remain) subject to regulatory oversight, while others will not.

Government Support for Private Networks. The importance of certain types of networks to national social and economic

goals is likely to grow. Governments may therefore provide incentives and financing to encourage their development. What are the theoretical, policy, and practical issues associated with government support for creating specialized private networks?

Global Private Networking and the Ability to Fashion National and International Policy. Decentralization of networks and their transnational aspects challenge government and regulatory control and the coordinating and market-allocating role of international telecommunications organizations. How might domestic regulation and international arrangements be affected? How might they evolve? Is a globally decentralized system viable?

Redefining the Concept of Infrastructure. Because of the centrality of information and its transport to the economy, the emergence of the network system — shaped by business demand, carrier strategy, public policy concerns, and international forces — has important consequences. What constitutes infrastructure in such an environment, and the extent to which the government will or can extend its authority over that infrastructure, will be crucial policy issues in such a network environment.

Notes

1. Crandall, Robert W., *Fragmentation of the Telephone Network: Implications for the Policymaker*. Washington, DC: Brookings Institution, 1988.
2. Ken Phillips, communication.
3. The author served on the Selection Advisory Committee for the FTS-2000 procurement.
4. *Allocation of Frequencies in the Bands above 890 Megacycles*, 27 FCC 359 (1959).
5. See, for example, E. Noam, "A Theory for the Instability of Public Telecommunications Systems," in Cristiano Antonelli, ed., *The Economics of Information Networks*. Elsevier, forthcoming; G. Heal, "The Economics of Networks," unpublished paper, Columbia Business School, October, 1990; G. Chichilnisky, "Networks and Coalition Formation: Externalities and Increasing Returns," unpublished paper, Columbia University, Department of Economics, July 1990; and K. Hayashi, "The Economies of Networking: Implications for Telecommunications Liberalization," unpublished paper, IIC Conference proceedings, Washington, DC, September 1988.

6. Piore, Michael, and Charles Sabel, *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books, 1984.
7. The alternative proposal was to assign all *new* lines to the new code, which would have created the possibility, for the first time anywhere, for "his-and-her" area codes in the same residence.
8. The optimal size of jurisdictions was always dependent on communications. French departments were based on the distance that a horseback rider could cover in a day. Transportation and communications technology changes the optimal size. It's hard to imagine a voluntary European integration without telecommunications.
9. Professor Henry Niman, per Marc Rotenberg, communication.
10. Some regulatory commissions, most notably New York's (but not the FCC) resisted; but at least one major court decision, in a muddled opinion (*Carlin Communications Corp. v. Mountain States Tel. & Telegraph*, 827 F.2d 1291 [9th Cir. 1987]), seemed to permit restriction.
11. *The Cable Communications Policy Act of 1984*, 47 U.S.C. §532.
12. See, for example, Dahl, Robert A., *Who Governs? Democracy and Power in an American City*. New Haven, CT: Yale University Press, 1961; C. Lasky, *Foundations of Sovereignty*. 1921; Charles E. Lindblom, *The Intelligence of Democracy: Decision Making through Mutual Adjustment*. New York: Free Press, 1965; David B. Truman, *The Governmental Process: Political Interests and Public Opinions*. New York: Knopf, 1951.
13. Nisbet, Robert A., *The Quest for Community: A Study in the Ethics of Order and Freedom*. New York: Oxford University Press, 1953; Theodore J. Lowi, *The End of Liberalism: The Second Republic of the U.S.*, 2nd ed. New York: Norton, 1979; Henry S. Kariel, *The Decline of American Pluralism*. Stanford, CA: Stanford University Press, 1961.

From the Aspen File

The Aspen Institute has long been involved incommunications issues as they effect business and society. Two important publications have recently been released that look at modern telecommunications—from the regulators point of view, and that of the consumer.

Aspen Institute Report Suggests Group Consensus Possible on Major Telecommunications Infrastructure Issues

The Aspen Institute Communications and Society Program recently released a report which asserts that compromise and consensus are quite possible in an area of regulation which has been very contentious to date. In a report of a four day conference held in August in Aspen, Colorado, Northwestern University communications professor Robert Entman concludes that there are several areas of consensus among divergent players in the telecommunications policy area. These include:

- Continuing deregulation of inter-LATA (local access and transport area) markets;
- Replacing internal cross subsidies, where subsidies are deemed necessary, with targeted subsidies drawn from broad sources;
- Modifying federal preemption standards to clarify the regulation process; and
- Requiring equal access interconnection for local exchange competitors, including unbundling to the extent that it is economically efficient.

The Report is an interpretation of the positions and contentions of the diverse participants at the Aspen Conference. Attendees included two commissioners of the Federal Communications Commission, two congressional staffers, two state public utilities commissioners, and a cross-section of representatives from academia, competing telecommunications businesses, users, civil liberties organizations, and consumer representatives. The report makes clear, however, that the statements are not specifically subscribed to by any individual participant. This disclaimer, said Charles M. Firestone, Program Director and moderator of the conference, was necessary to allow participants to contribute freely to the discussions, debate the issues, and to be more flexible in their positions.

The report describes and analyzes the polar positions asserted by parties on many of the remaining issues related to investment in