UIC John Marshall Journal of Information Technology & Privacy Law

Volume 6
Issue 2 *Computer/Law Journal - Fall 1985*

Article 4

Fall 1985

The "New" Local Communications: Office Networks and Private Cable, 6 Computer L.J. 247 (1985)

Eli M. Noam

THE "NEW" LOCAL COMMUNICATIONS OFFICE NETWORKS AND PRIVATE CABLE

by ELI M. NOAM*

TABLE OF CONTENTS

* Associate Professor and Director, Research Program in Telecommunications and Information Policy, Graduate School of Business, Columbia University. A.B. 1970; A.M. 1972; Ph.D. 1975; J.D. 1975. The author wishes to thank George Lefcoe for the initial impetus; Henry Levine, Albert Kramer, and Lowell Ravesloot for comments; and, Roberta Tasley, Valere Gagnon, Tim Seawright, Patricia Dorff, Jonathan Kadis, and Mark Ginzberg for helping it happen.

New forms of private local networks are emerging in the business and residential spheres. They are smaller than the earlier generation of global private networks of multinational corporations, but in the long run, their effect may be just as important. Two types of communication links have emerged in the office setting. One of these links, *local area networks* (LANs), are used mostly for the transfer of high speed data and voice and the connection of information equipment. The other type, *shared tenant services* (STS), connects the communication networks of small users to achieve the economies of scale and flexibility that had previously been available only to large firms.

These two types of building-based office networks overlap and interconnect. While STS are squeezing the local telephone companies from the user end, LANs are keeping traffic from entering public networks. These networks are causing capital equipment, such as PBX switches, to be shifted towards users. In the past, a telephone network had a fairly smart center and "dumb" branches. Now, the user end is becoming more technically sophisticated, while private unswitched lines are reducing the role of the center. These developments are also shifting the scope of regulation by moving the functions of regulated exchange carriers upstream into the unregulated customer equipment (CPE) region.

For LANs and STS, one driving force is to achieve economies of scale. It is important to realize that the economic logic behind the bundling of networks does not stop at the building line. Thus, clusters of STS will emerge in central business districts and overcome regulatory barriers. In effect, they will become quasi-local exchange providers. Similarly, LANs may grow into "wide" area networks (WANs). These developments are probably unavoidable, given two decades of experience in trying to block competitive entry into the communications market through regulation.

Other developments are beginning to take place, though slower, in the residential market where STS can start in large apartment buildings and dormitories. More significantly, "private" cable systems (SMATVs) are emerging as building-based, video-transmission networks to compete with "public" cable television. They too have the potential to provide shared tenant services to apartment house dwellers and entire neighborhoods and to compete with local telephone companies.

These emerging private networks will further complicate an already complex communications environment. To anticipate these trends, it is necessary, then, to understand these networks in their technical, economic, and regulatory aspects, and to see the parallelism in their development.

I. OFFICE COMMUNICATION NETWORKS

A. SMART BUILDINGS

"Smart" office buildings provide communication networks and other communication services to its tenants. This "intelligence" is becoming a selling point for office space in a glutted market, propelling real estate developers and landlords into the role of communication providers. Some smart buildings have electronic controls for heating, cooling, lighting, fire detection, and security. Most importantly, however, a smart building provides communication services to its tenants, which may include shared PBX switching, various communications links to the outside, and local area networks to link computers, word processors, and other equipment. Smart buildings can have terrestrial or satellite microwave links, facsimile equipment, shared computer and data processing centers, and word processing facilities. There can also be discounted long-distance telephone services, electronic mail, message services, videoconferencing, data storage, and telex service.

B. PRIVATE BRANCH EXCHANGES

The key element in any building-based telecommunications system is a private branch exchange or PBX. The PBX makes it possible to concentrate communications traffic from multiple on-premises users into a few intensely-used communication links. A PBX can have as many as 20,000 telephones connected to it. PBXs are in effect small software-driven computers possessing a wide variety of features, such as voice messaging, call-forwarding, conferencing, and speed-dialing. Some recent digital PBXs are also able to handle high speed data transmissions, switch computer terminals to various computers, and link separate local area networks with each other. Also, some PBXs have been equipped to allow computers using different communication standards to interface with each other.

Programmed PBXs can select the least cost route (LCR) for a long distance call—given the time of day, destination, and traffic density. To reach those long distance carriers, shared service PBXs can bypass the public switched networks of telephone companies by using private lines or other links. This has been described as the "reselling" of local transmission service.

One economic feature of PBXs is their "leakiness." Incoming long-distance calls can be routed into a building's PBX through a leased line and then into the local network like a regular local call. Local telephone companies, which currently receive a share of the long-distance toll charges, lose much revenue, since under this system, the long-distance nature of the call is undetectable.

Simple and small PBXs can be installed for as few as twenty telephones. These systems can cost as little as $300 per station, but they do not offer many features. Economies of scale can be significant. One PBX cost estimate by TeleStrategies concludes that the total per-line capital cost, including message center, billing processor, and least cost routing, to be $2,000 for a 100-line PBX, $1,000 at 500 lines, and $900 for 1500 lines. Beyond 2,000 lines, costs drop slowly.

C. Shared Tenant Services

Shared tenant communications services (STS) are not familiar to most business tenants. A Touche Ross survey of business tenants showed that in late 1984, seventy-six percent of the respondents had not heard about the STS concept.[1]

Shared tenant services, however, provide several kinds of economies of scale. In addition to reducing the per-line PBX cost, volume discounts can be achieved through the bundling of telephone services. AT&T's trans-continental WATS service costs $21.50 per hour use below fifteen hours a month, and $14.18 per hour above eighty hours—almost a thirty-three percent reduction in price. A similar reduction in price exists for MCI users as well.

Another major advantage of STS is that it makes it economically feasible for small users to *bypass* the public switched networks of the local telephone company and link up, through one of several routes, with other points, especially with long distance carriers.

Another reason for the emergence of STS is to recreate a one-stop telephone service. The AT&T divestiture has accelerated the trend away from a fully integrated system. Local telephone service, long-distance telephone service, and telephone equipment are being provided by different suppliers. This increased complexity generates incentives to bundle services in integrated, building-based communication packages.

The advantages of shared use are usually less important to large

---

1. Black, *The Issues*, COM. AGE, Nov. 1984, at 19.

users of communication systems who have already achieved economies of scale. Some experts set the limit up to which shared usage makes sense at 100,000 square feet per tenant. (The estimated number of telephones per 1,000 square feet is between four and five.) Other experts believe that a 150,000-square foot building is the minimum for economical shared telecommunications. Even that size building may not be able to offer more than a shared PBX.[2] Hence, shared services are most feasible in large buildings with small- or medium-sized tenants, especially if the tenants are heavy long-distance telephone users.

To increase efficiency, smaller buildings could "piggy-back" with larger buildings that are nearby. An example of this is InterFirst Plaza in Dallas, which shares its microwave links with surrounding buildings.

Residential usage of shared tenant services is also possible, even though such usage is far less common than in an office setting. One California developer is providing every residential unit with two voice and two data lines, connecting them with a central switch. The tenants are software programmers who prefer working at home. Residential and office usage may also be combined. For example, universities can resell long-distance service to students in their dormitories after business hours when leased lines are not in office use.

D. PROBLEMS OF SHARED TENANT SERVICES

Typically, the wiring in existing buildings is owned by local telephone companies, which charge for its usage. Even where the existing wiring could be adapted to a new communications configuration, it would have to be purchased from the local telephone companies. These companies have no incentive to reduce their rate base or to make the bypassing of their services easier by providing convenient terms of purchase.

In many instances, a rewiring becomes necessary. This involves laying heavy riser cables through congested ducts, often through asbestos-laden ceilings. It is often necessary to drill new risers through existing concrete floors. Low-cost rewiring may involve the unacceptable disruption of telephone service to the existing tenants. Rewiring may also require a change of telephone numbers, which established businesses may find inconvenient. On the other hand, the less bulky fiber optic cables may make retrofitting significantly easier.

There are significant capital costs in STS. A 1000-station PBX may cost approximately one million dollars, yet can become obsolete rather quickly. The trend in computer technology has been towards smaller and decentralized equipment. In the future, inexpensive tenant-prem-

2. *See* Bolick & Conroy, *Shared Telecommunications*, BETTER BUILDINGS, Sept.-Oct. 1984, at 20, 24.

ise PBXs may have all of the features that large shared-used PBXs have today. In addition, many present suppliers are not likely to be around when problems arise later, thus increasing the risk to present buyers.

Some of the cost advantage of bundling tenants' communications demands depends on the available communication rates. For example, if the cost of WATS fails to become less expensive per unit as volume increases, a major advantage for shared services will disappear. This could well happen when long-distance companies develop over-capacity and begin engaging in price wars that drive prices down for low-volume WATS too.

Tenants' demand for STS should not be overestimated. Many tenants have no need for high speed data transmission, local area networks, or video conferencing. In addition, some tenants' existing equipment may not be compatible with the new telecommunications system of the building; some tenants may be reluctant to depend on the landlord for the security, privacy, and confidentiality of communications. For a system to be economically successful, a sixty-five to seventy percent tenant utilization rate may be necessary, or landlords and the remaining system users will be paying higher costs than they expected.

There are also a number of potential regulatory issues. Tenants who find it hard to move may be dependent on the landlord's communications prices. Furthermore, the components of telephone charges can be complex and obscure, so that tenants might be at the mercy of a landlord's software. These problems would be limited if the public telephone company were given easy access to the tenants to provide an alternative supply of service.

Since tenant-landlord disputes on communications issues will unavoidably arise, it is likely that some regulatory safeguards will be imposed on landlords who provide STS services. For example, a "quasi-common carrier" status has already emerged, so that tenants cannot be precluded from using, for a fee, the landlord's wiring to access communication carriers that are not part of the landlord's package. Though many of these problems could be resolved contractually, tenants with long-term leases may not benefit from emerging communications options if the landlord controls access to these through his PBX and a least-cost routine that is not advantageous to the tenant in price or quality.

In addition, tenants may be affected by the landlord's choice of the mix and quantity of the outside lines. If there are not enough outside links, the tenants will have difficulties in making outside calls or in having incoming calls come through. This is crucial for many businesses. There is also a public interest in these questions. Attempts to get through to a busy PBX from the outside impose a burden on the public network and its switches. The public network, however, does not receive any revenues from unsuccessful attempts.

Questions of liability pose additional problems. If a landlord's PBX is inoperable for several days, a tenant may suffer severe financial losses. Telephone companies by law are free from consequential damages in such cases; but, their quality standards are also regulated. In order to avoid liability, then, an operator of an STS would need to seek protections either through statute or contract. Such protections would probably have to contain quality standards.

Landlords typically hand over STS and its technical, legal, and maintenance problems to specialized STS providers. These firms select, install, and maintain the landlord's PBX; negotiate with the telephone company; run the message center; and service the telephone equipment in the building. Relations between landlords and the service providers, however, introduce new problems. Unreliable service providers could create many difficulties between the landlord and his tenants.

Another problem exists in determining how the landlord's share of the revenues are to be calculated. There is a vast difference between a percentage of gross revenues and net revenues. Accordiong to one STS attorney, "you can count on ten pages of fine print to define net."[3] On the other hand, participation in gross revenues creates incentives for landlords to install every feature in a system without concern for the cost of the service provided.

E. COSTS AND REVENUES

According to one estimate, the extra cost of a "smart" building of 750,000 square feet is between two and four million dollars.[4] Part of the extra cost is a result of the additional staff requirements inherent in a smart building. A message center, for example, usually requires one operator for every 200 stations.

At Olympia & York, United Business Communications pays for the vertical installation of wiring, while customers pay for the horizontal installation—about $160 for an analog and $255 for a digital connection. Monthly charges per line run between ten dollars for an analog connection to twenty dollars for a digital connection. Fees charged for the telephone sets run between ten and thirty dollars a month. Fees for port maintenance run between five and ten dollars a month. For the convenience of one-stop communications shopping, United Business Communications believes that tenants are likely to pay a premium price.

3. *See* H. Levine, Special Smart Building Issue, in A Building Automation/Office Automation Packet 19 (1984) (prepared by Whisler-Patri).

4. Dawson & Fineburg, *Building Intelligent Offices*, VENTURE, Oct. 1984, at 90.

After all, maintenance, installation, and operation of the tenant's own network may still be more expensive, particularly if one includes expenses such as electricity, space rental, air conditioning, and manpower. According to UBC, the costs for a 500-line PBX for the switch room alone may be $80,000 a year, and the cost for electricity another $30,000 a year. This would be nearly twenty-two dollars per line each month for those expenses alone.[5] A similar estimate of the cost of installing shared tenant services is five dollars per square foot. Through some financing arrangements, however, that cost can be reduced to about sixty-five cents per square foot.[6]

A typical assumption is that one telephone line is necessary for each 200 square feet of office space. Thus, a 300,000 square foot building requires a 1500-line PBX. One analysis of the profit potential for shared services finds that a 1500-line system requires about one million dollars in equipment costs and $80,000 in installation costs. Annual operating expenses add about $800,000, plus $500,000 in line charges. Per square foot, there is an after-tax profit of about sixty cents a year. In year five, the return on sales is nine percent. In year seven, the return on investment is twenty-one percent.[7]

F. LOCAL AREA NETWORKS

Local area networks (LANs) are communication links that permit computers to communicate with other nearby electronic equipment. For example, LANs can link mainframe computers, personal computers (PCs), word processors, cathode ray tubes (CRTs), printers, disk drives, and data banks with each other. LANs thus enable equipment to be shared and their functions to be integrated, thus reducing the cost of operations. A network for personal computers is a common example of a LAN. It can also provide a PC user with much greater computing power by linking the user to the large data bases of mainframes.

The definition of LANs varies with users and suppliers. It has been best described as a data network that does not use a common carrier transmission facility.[8] At present, LANs are mainly outside of the PBX and thus not directly connected to the other communication links of users like shared tenants communications networks. PBXs, however, are now developing the capacity to handle the data speed of LANs and to link them to each other and to outside communication facilities. LANs are becoming a method of gathering and aggregating internal

---

5. *UBC OlympiaNet, Shared Tenants Communication Schemes*, INFORMATION SYS. NEWS, Nov. 26, 1984, at 58.
6. Sustar, *Shared Tenants Services*, TELECONNECT, Nov. 1984, at 106.
7. Communication from TeleStrategies to author (June 1985).
8. *See* Murphy, *A LAN Primer*, COM. AGE, June 1984, at 27, 27-29.

communications flow and concentrating them for outside transmission through a PBX and its local links. There may be as many as 15,000 LANs installed in 1985. For a basic system, a typical broad-band LAN system may cost about $300,000, two-thirds of which goes for labor expenses and the remainder for hardware.

LANs may carry, in some instances, sixty percent of an organization's communications flow. LANs are not only proliferating but are also being integrated through PBXs with bypass options. LANs are also expanding geographically and into wide area networks (WANs) outside the public network. In "Project Universe," the LANs of six British research institutions were linked by the European Space Agency's Orbital Test Satellite.

LANs operate on the principle of data streams that are coded for particular destinations that pass all of its participants. There are three major forms of LAN architectures. These are a star (with a PBX in its center), a ring (to which equipment is connected through nodes), and a tree (also known as a "bus"). The tree is the most common form today and is the one used in Xerox's Ethernet. IBM's system will operate on the ring principle.

Coaxial cable and optical fibers are the most popular transmission media. Though fiber is probably technologically superior, at the present, coaxial cable is more prevalent. Transmission rates of LANs range from 1000 Kbps to as high as fifty Mbps. Ethernet's rate is ten Mbps.[9]

When LANs are "internetworked," they may require an adjustment of current protocol. This interconnection problem is part of a more general one: as communication links overcome the insularity of various parts of the communications equipment in an office setting, compatibility becomes even more important. Thus, the emergence of LANs can be a force for standards and compatibility.

There are two methods of controlling access to the network. Both central and decentralized controls exist. Examples of when control is decentralized in the individual equipment nodes are CMSA/CD (carrier-sense multiple access with collision detection) and "token passing." Token passing access permits the assignment of *priorities* to different messages. This is important if voice communications are to be carried on a LAN integrated with data traffic. While data can be divided into segments without major problems, voice communications, however, would become unintelligible. Thus, the prioritizing of voice communications will permit uninterrupted voice conversations.

Presently, the tree-type networks are the most reliable, but their performance is limited. Although the failure of any one piece of equipment does not shut down the entire system, repeaters are necessary ap-

9. Way, *Managing a LAN*, TELECOMMUNICATIONS, Jan. 1984, at 79, 79-80.

proximately every 500 meters, and their reliability is critical for the system. Ring LANs also require repeaters. A major convenience of the ring architecture is the ability to centralize all wiring into a center, such as a communications closet, within which the actual ring is formed. This makes it easy to add new stations to the ring and to locate the source of a problem. It is also possible to form a set of sub-rings that can be interconnected. Such a centralized ring is already close to the star architecture and could be upgraded by the introduction of an appropriate PBX at the wiring center. The introduction of a PBX into a LAN permits the linkage of several LANs and the interconnection of medium- or low-speed regular office wiring. A PBX can also provide control features, such as accounting and recording, which makes it possible to bill for the use of LANs similar to the way telephone use is billed. These features (which can separate billings for different users and usages) are easily adaptable to a shared tenant services arrangement. Such a system also increases the security of information, since one tenant's data need not pass through the other tenants' terminals. Tree architecture LANs, such as Ethernet, can also be provided with a management and accounting unit, though it would be more complicated.

G. Alternative Forms of Local Transmission

A driving force behind the interest in shared communication services is the potential for using such communication links as an alternative to those of the local telephone company. This is usually referred to as "bypass." The Federal Communications Commission (FCC) defines bypass as "the transmission of long distance messages that do not use the facilities of local telephone companies available to the general public, but that could use such facilities."[10] Thus, the use of private lines that are leased from the local telephone company and are not switched is included. Though those lines still provide the telephone companies with some revenue, that revenue is considerably less than that which the company could realize from the same traffic on its public switched network.

A bypass using leased lines is referred to by the FCC as a "service bypass." This is to be distinguished from the "facility bypass" using transmission paths that do not belong to the telephone company. The FCC believes that service bypass will be the most prevalent form of bypass in the next few years.[11] One important reason for bypass is that users may need links which will allow them to transmit data in ways that the telephone company is not able to do on short notice.

10. Federal Communications Commission, Common Carrier Bureau, Bypass of the Public Switched Networks 31 (1984).

11. *Id.*

There are by now a good number of alternative forms of local distribution available. Several of these are supplied by the telephone companies themselves. A comparison of these local transmission links and their prices in Manhattan are provided in Table 1.

1. *Basic Switched Voice Grade Circuit*

The basic switched voice grade circuit can sustain transmission rates of 1,200 bits per second (bps) and can be upgraded with special equipment to 9,600 bps. Because switched voice grade circuits are costly and slow, their use in volume data transmission is primarily for backup and short distances. Line costs in Manhattan are $25.61 (including access charge) plus eight cents for the first five minutes and one cent for each additional minute.

2. *Direct Analog Data Communication Lines*

Direct analog data communications lines are private, unswitched lines leased from the telephone company and capable of rates up to 9.6 Kbps. This is enough for several interactive terminals but not for many other data processing uses. Direct analog lines require four wires. For a 9.6 Kbps circuit, New York Telephone charges $111.60 for one mile, $236.40 for five miles, and $486 for ten miles.[12]

3. *Digital Data System Service*

Digital data system service permits medium speed Dataphone usage between computers or terminals, with transmission rates between 2.4 and fifty-six Kbps. The cost of the service reflects distance and transmission rate. New York Telephone charges $135.75 for 2.4 Kbps and $373 for fifty-six Kbps for a five-mile distance.

4. *"T" Service Lines*

"T" service carriers, another type of line, permit high-speed data transmission for copper-wire computer use. "T" carriers consist of twenty-four time-division multiplexed channels of sixty-four Kbps and permit a speed of up to 1.544 megabits a second—known as the DS-1 or T1 rate. T1 signals carried over copper wires require at least twenty-four gauge, which is a larger diameter than most telephone wires in Manhattan. In some instances, it is possible to carry T1 on ordinary lines. It is often difficult to get T1 service in many areas. Repeaters are necessary every 6,000 feet. T1 channels are also used to combine the signal streams of several slower-speed users. The T1 rates charged by New York Telephone are $720.22 for one mile, $2645.26 for five miles,

12. J. Kadis, The Information City (1984) (unpublished report).

and $5051.56 for ten miles. Improvements in the basic T1 system have increased transmission rates to 6.132 megabits a second and are referred to as T2.

5. *Optical Fiber Lines*

Fiber optical systems operate by transforming electric signals into rapid pulses of light and then transmitting them through very pure strands of glass. The advantages of this type of transmission include freedom from electromagnetic interference and the reduced need for repeaters. In comparison, copper-wire T1 circuits require frequent repeaters. Fiber technology, however, may permit a spacing of repeaters every thirty miles for the same T1 rate. In experiments, distances of seventy-five miles have been achieved. Fiber cables also provide a high degree of security, since interception is very difficult. Also, since the glass strands are considerably thinner than copper wire or coaxial cable per equivalent transmission capacity, a more efficient use of duct space is possible. At present, a one-inch diameter fiber cable with 144 strands can carry as much as three copper cables with a four-inch diameter.[13] Transmission capacities between ninety and 135 megabits a second are now operating. Soon, 432 Mbps will be operational. (A digital video television signal requires about ninety Mbps.) In experiments, transmission rates of 1.5 billion bits a second have been achieved. At present, commercially available fiber optic links can support T2-type transmissions.

There are a number of disadvantages to optical fibers. They are currently less convenient to install in buildings than traditional cable as a result of the difficulties in bending, splicing, and tapping. In addition, terminal equipment is expensive. It is, therefore, uneconomical to use fiber for low-speed traffic. Thus, fiber is used mainly for concentrated bulk transmission by telephone companies and in high-speed local area networks linking computers. For example, New York Telephone's Ring Around Manhattan (RAM) connects its twelve major switching centers in Manhattan. Fiber use in local loop communications is developing quite rapidly. New York Telephone and Southern Bell have started to provide fiber circuits. Illinois Bell's Novalink will provide business users with cables of seventy-two fiber strands for the equivalent of 144,000 voice circuits.[14] Transmission speeds can reach up to 44.736 Mbps.

13. *Fiber Optics: The Big Move in Communications, and Beyond*, BUS. WK., May 21, 1984, at 168.

14. Gartner Group, Strategies in Telecommunication Services 2 (October 17, 1984).

6. *Coaxial Institutional Cable*

Coaxial institutional cable (I-NET) has long been used for high capacity voice and data transmission and for cable television. Its bandwidth has been increasing continuously and has reached 550 MHz for cable television. It can now carry up to seventy video channels. In the 1990's, it will probably carry up to ninety video channels. Because of its shielding, coaxial cable is relatively immune to electrical interference, and it can be installed by semiskilled workers. The typical cost for laying coaxial cable is between $10,000 and $15,000 a mile above ground, but it can be as high as $300,000 a mile underground.[15]

Because of their long-standing involvement with coaxial cable technology, some cable television companies have offered data transmission services to large business users in their franchise operation areas. In 1974, Manhattan Cable was the first to offer data transmission services. Its system operates over "dedicated" trunks and, for the most part, is physically separate from its television transmission. The company's headquarters functions just like a telephone company's central office, except that it does not function as a switch. Depending on the customer's equipment, various transmission speeds are available, ranging between 1.2 Kbps and 1.544 Mbps—the T1 rate. Most usage, however, is at 5.6 Kbps. The total traffic volume is relatively moderate.

Manhattan Cable's rates range from $160 a month for 2.4 Kbps to $1750 for 1.544 Mbps. The T1 rates are not sensitive to distance, thus underpricing New York Telephone's rates for distances greater than four miles.

Because of the emergence of cable television as an ever-present second system of communication wires, cable is capable of broadening its communications offerings and functioning as a communication carrier, with the competition increasing between telephone and cable companies over a wide range of services.[16]

In a speech to the National Cable Television Association, William McGowan, the chairman of MCI, offered cable operators the opportunity to carry MCI's traffic the "last mile." MCI has since linked up with cable companies in a number of cities, including Omaha, Atlanta, and Ft. Lauderdale. MCI's "Cablephone" can operate on interactive or two-way cable systems and permits access to its long-distance node by using a touch-tone telephone set over the cable. A six MHz video channel is used to provide 240 voice circuits to serve as many as 2,400 users per

15. Rothbard, *Underground Building Woes Push Costs Higher*, CABLE AGE, Aug. 29, 1983, at 15.

16. *See* Noam, *Towards An Integrated Communications Market*, 34 FED. COM. L.J. 209 (1982). *See also* Baer, *Telephone and Cable Companies: Partners or Rivals in Video Distribution?* in VIDEO MEDIA COMPETITION 187 (E. Noam ed. 1985).

channel. MCI's introductory rate for this service is ten dollars a month.[17]

Cox Cable, one of the major cable multiple system operators (MSOs), is one company that entered into agreements with MCI. When Cox Cable began to offer "Indax" and "Commline" service in Omaha, Nebraska, the local Bell Company complained to the Nebraska Public Utilities Commission. The Commission asserted jurisdiction over the dispute and ruled that Cox Cable is a "communications service for hire" subject to regulation. This led to proceedings before the FCC and the federal courts, which then led to federal pre-emption. The Cable Communications Policy Act which was passed in late 1984 essentially prevents the states from regulating services other than conventional voice telephones. This law and the current regulatory position of the FCC will likely lead to unregulated data transmission by cable companies.

7. *Point-to-Point Microwave Transmission*

Point-to-point microwave transmission was made operational during World War II. It requires an unobstructed line-of-sight transmission path and may be affected by interference both from meteorological factors such as rain, and from other users of the same frequency. The technology for the lower ends of microwave is more mature, cheaper, and requires less power than for higher frequencies, but carries less information. In communication intensive areas such as Manhattan, the more desirable lower frequencies are virtually filled up. Microwave receivers and transmitters are installed on rooftops by users, building owners, or STS providers. They are also installed and operated by regional microwave common carriers.

Point-to-point microwave is best suited for heavy users who link up with a limited number of destinations.[18] One such example is shared tenant services, which links up with long distance carriers.

An average microwave transmission channel in the six MHz frequency range can support the equivalent of four T1 1.544 Mbps channels, or 640 channels of 9.6 kilobits a second data traffic. At higher frequencies this can increase to eighteen T1 circuits per channel. Private digital microwave systems on the market have hundreds of channels and a capacity of 21.5 megabits a second or more.[19] Microwave equipment and installation to support four T1 channels costs about $30,000, while the capital costs for each additional T1 circuit are about $1,000. The FCC has recently deregulated microwave transmission, thus pre-empting state regulations.

17. Gartner Group, Strategies in Telecommunications Services 6 (Aug. 1984).
18. *Id.* at 4.
19. Mathay, *A New Path to Bypass*, TELECOMMUNICATIONS, Nov. 1984, at 92.

8. *Digital Termination Service*

Digital termination service (DTS) is a new point-to-*multi*point microwave transmission system which permits relatively small users from a number of locations to use microwave transmission. DTS was originally developed by Xerox for its since-abandoned XTEN national office communications network. It was opened for licensing in 1981 by the FCC as the local end of an end-to-end national all-digital microwave system. DTS connects users of data-type services (2.4 Kbps to 1.8 Mbps). It is not well-suited for voice transmission, since only about seventy-five voice circuits can be used simultaneously. Users can share channels, thus making dedicated channels unnecessary. DTS consists of central "nodes" which transmit and receive microwaves from all directions. These nodes interconnect with each other and with long-distance carriers by point-to-point microwave. The nodes have switching capability and have a range of about six miles.

The first DTS service was provided by Local Area Communications (LOCATE) in Manhattan. MCI has sought FCC licensing in forty-two cities to give DTS local distribution capability. SBS, Tymnet, and ISACOMM are similarly involved. ISACOMM, a subsidiary of United Telecommunications, is a participant in Olympia & York's shared tenants services and has applied for forty DTS licenses and plans to integrate DTS into its tenant service. The allocated frequency for DTS permits about 10,000 duplex channels per metropolitan area, though this could increase. Although most DTS service is currently point-to-point rather than switched, this may change in the future.

9. *Multipoint Distribution Systems*

Multipoint distribution systems (MDS) use multidirectional microwave for a one-way transmission of video and data. They were approved by the FCC in 1962 as a common carrier for low-power communications and have a range of fifteen to thirty miles. A transmitter costs about one million dollars, while reception equipment costs about $200. MDS is used mainly for pay-TV transmissions, though this was not anticipated when the service began. Thus, lease rates for data reflect the opportunity cost for the video transmission which in turn depends on the economic state of cable television. An MDS channel can be leased in Manhattan for $5,000 per month. Stock quotations are an example of one-way data transmission. FM-subcarriers are similarly used for such purposes.

10. *Satellite Links*

Although a satellite is not a local distribution medium in the normal sense (though it certainly could be used as such via a 46,000-mile hop), it integrates the local and long-distance part into one transmission if undertaken from the user's premises. Satellite links connect a user directly to a communications satellite via a parabolic "dish" antenna. One of the satellite's advantages is that it can be used to reach many recipients simultaneously. Connections are through earth and space facilities provided by a satellite carrier or reseller such as Satellite Business Systems (SBS), USSI, or American Satellite. Prices are lower for long term leases or when pre-emption by another user is permitted.

Users or user groups may also lease or buy a transponder from a satellite carrier such as RCA or Western Union. A transponder can sell for three million dollars, depending on its orbital slot and its frequency band. The maximum transmission capacity is sixty-four Mbps, which is divided into T1 channels. In the past, users had to buy or lease a full transponder. It is now possible to acquire fractional transponders. This ability is provided by American Satellite and United States Satellite Systems, Inc. (USSI), by either slicing the transponder bandwidth or through time division multiple access.[20]

Where communications demand is great, a company may also launch its own satellite. Because of the costs, regulatory problems, and traffic volume required, no company has yet undertaken such a venture. This option should become more viable in the future, however, with the reductions in launch costs due to the competition between NASA and the European Ariane consortium and to the decreasing costs of satellite facilities.

11. *Cellular Radio*

Cellular radio was developed by AT&T and provides superior use of frequency for radio communications. Cellular radio is being introduced in major U.S. markets under an arrangement which allows two licensed operators in each location. One license is to be provided by the local telephone company or its holding company. The other license is to be given to one of the numerous applicants—many of whom are from the RCC (Radio Common Carrier) or paging industries. Cellular radio is a technological improvement, but it is relatively expensive and cannot sustain transmission rates above regular voice grade. The prices of cellular radio, however, are dropping. Monthly subscription costs in New York range from fifteen to sixty-nine dollars. Usage charges range from a peak of forty to seventy-five cents a minute to non-peak charges of twenty-five to thirty-five cents a minute. The cost of the equipment and installation range between $1300 and $2200. Data must be transmitted from a stationary position and is currently limited to a rate of 300

20. Rosewell, Miller & Seh, *Corporate Private Networks*, TELECOMMUNICATIONS, May 1984, at 73, 73-74.

bps in New York. Cellular radio's main applications are likely to be mobile communications. Thus, a civil engineer in the field could be connected directly to his company's data base and computer capabilities by cellular radio.

12. *Infrared Transmission*

The use of modulated light sources, such as infrared or laser-generated light, provides a low-cost transmission system. The light signals are subject to interference from other sources of light and heat (including the sun). The primary use of this system is for very short transmission paths. Unlike the use of microwaves (which require a frequency assignment by the FCC) and of cables (where the crossing of public rights of way requires a local franchise), infrared transmission needs no license and is not regulated. T1-capacity (1.544 Mbps) transmission equipment costs $14,000 and has a range of under a mile.[21]

13. *Miscellaneous Systems*

A number of other forms of local data communications are available. These include: FM-subcarriers (for one-way data transmission), specialized mobile radio (SMR), radio packet communications (RAPAC), cable packet communications (CAPAC), land mobile radio, citizens band radio, and satellite mobile communications.

H. COST COMPARISONS

Table 1 summarizes the above information for leased forms of local service in Manhattan. The prices are normalized per one Kbps for comparison purposes. As can be seen, microwave ($0.20-0.65), fiber line ($0.30-1.70), coaxial cable line ($1.15) and T1 grade telephone company copper carriers ($1.70) are the least expensive providers.

For the user, the best choice of communication links depends on a number of technical, economic, environmental, and regulatory variables. These include data volume, availability of duct space, microwave paths and frequencies, lines of sight, southern exposure, order-lag of leased lines, the number of origination and destination points, and desired security and reliability. The user's choice will also depend on his willingness to own and maintain communications equipment and a network, to be served by a multi-service communication carrier, or to deal with multiple communication providers for separate services. Thus, in Manhattan, optical fiber links (either private or New York Telephone's)

21. Personal Communication with Light Communications, Inc., Norwalk, Conn. (Feb. 1984).

Table 1

Price Comparison of Local Transmission Links (Manhattan; leased lines or channels; 5 miles unless noted)

Transmission Medium	Price per Month (leased)	Transmission Rate (kilobits per second)	Price (per 1 kilobit per second transmission)
Switched Voice Grade Circuit	117.16[a] (69.16)[b]	1.2	97.60 (57.60)
Direct Analog Data Communications	236.40[c]	9.6	24.60
Digital Data Service	373.00[c]	56	6.70
T-1 Service Line (Copper)	2645.26[c]	1,544	1.70
Optical Fiber Line	2644[i]	1,544	1.70
	13,500	44,736	.30
Coaxial Cable	1750[m]	1,544	1.15
Point-to-Point Microwave	1200[k]	6,132	.20
	1000	1,544	.65
Digital Termination Service (DTS)	600[l]	56	10.71
Multipoint Distribution System (MDS)	5,000[j]	3,088	1.62
Satellite Transponder	110,000[d]	64,000 (max of 1,544 Kbps)	1.70
Cellular Radio	2,000[e]	.3[f]	6667
Infrared	400[g,h]	1,544	.25

a. Assumes $21.16 basic business rate access charge, plus usage charge for 8 hours/day usage, 20 days/week.
b. Assumes usage of 4 hours/day, 20 days/week.
c. New York Telephone.
d. Prices range from $66,667 to $150,000, depending on length of lease and preemption protection. Source: RCA Globecom.
e. $15-69 basic service depending on type of service; usage depends on on-peak/off-peak. Assumes 4 hours peak/day; 20 days/week ($1920 usage). Equipment installed $1300-2200. Assumes 5 years life. Source: NYNEX.
f. Voice rate 1.2 kbps.
g. Owned equipment $14,000; 5 year life; maintenance $1,000/yr. Source: Light Communications, Inc.
h. Range 3/4 miles.
i. "Novalink," provided by Illinois Bell in Chicago business district. Source: Illinois Bell Technical Reference Manual 1984.
j. Class Y service (24 hours/day), one-way transmission only. Source: Contemporary Communications.
k. Contemporary Communications. (The first number is T2 transmission. The second number is T1 transmission.). Eastern Microwave's rate is $900 equipment, $22/mile video coverage at 6 Mbps.
l. On basis of 30% use of node ports (100 ports). Contemporary Communications.
m. Manhattan Cable.

may be the best system for high volume data traffic between two locations since microwave frequencies may not be available. In other locations, circumstances could dictate the opposite result.

I. REGULATORY ISSUES

The development of bypassing has accelerated competition for the local distribution of telecommunications that had mainly been supplied by the local telephone companies. Typically, the largest three percent of customers account for fifty percent of revenues. Telephone companies are susceptible to major revenue losses if their biggest customers leave the system. The fixed cost of maintaining the network will then have to be redistributed over the remaining subscribers. This will result in rate increases and provide additional incentives to bypass or drop off the network altogether. The federal regulatory response to this problem—end user access charges—has been discussed at length by many observers and will not be analyzed here.

Initially, AT&T was cautious in pursuing the bypass option. This was a result of the restrictions of the divestiture decree and political reasons. Because local telephone companies were the primary customers of AT&T equipment, AT&T was in no position to antagonize them.

AT&T, however, had a great deal of incentive to pursue the bypass option. The main incentive was the high local access charges that AT&T had to pay to the local telephone companies. In 1984, AT&T paid $17.4 billion in access charges. On a per-call basis, this was more than what AT&T's long-distance competitors had to pay. Approximately two-thirds of AT&T's long-distance costs were the costs associated with access to the local networks.[22]

Local carriers received about one-third of their revenues from payments made by long-distance carriers. New York Telephone charges AT&T more than eight cents a minute per connection, while its cost is far lower. Even minor changes in the regulatory policies on access charges would have a profound effect on AT&T and the local companies.

Local telephone companies, too, can bypass their own switches. They are already doing this by leasing private lines that permit customers to leave the public switched network. In addition, New York Telephone has provided the communication system for Exxon's bypass that links its Manhattan headquarters to its offices in New Jersey. Ohio Bell took a twenty percent equity position in the Columbus Teleport. Bell Atlantic is constructing DTS systems in Norfolk, Virginia. Ameritech is participating in a joint venture to service smart buildings that

22. Personal communication with Edward Goldstein, Vice-President, AT&T (Apr. 1984).

may utilize microwave bypass connections.[23]

Another example of a telephone company bypassing itself is Pacific Bell's proposal to construct a cable television network in Palo Alto, California. This would partially integrate the cable's transmission role with that of a carrier of data and other communications by linking large users with each other and Pacific Bell's network.[24]

The result of local telephone company bypassing is that large customers could obtain cheaper services than residential customers—a possible reversal from the traditional redistribution from business customers to residential subscribers. This change would bring about strong political and regulatory pressures.

Regulators find themselves in a dilemma. As they restrict telephone companies from providing bypass services, they may be accelerating the departure of large users from the system. In response to this, a number of states have permitted local telephone companies to use differential pricing. The California Public Utilities Commission, however, has taken the opposite approach by banning intrastate carrier bypass.[25]

Because STS provide a powerful mechanism to make bypassing affordable for small- and medium-sized users, several local telephone companies have been hostile towards STS, even though others have jumped on the bandwagon. Those hostile to STS are concerned about revenue losses, duplication, fragmentation, difficulties during emergencies, "stranding" of surplus facilities, planning problems, and negative technical externalities on the public network. Southwestern Bell, one of the seven regionals, has filed restrictive tariffs in several states. In Arkansas, it severely restricts shared or common use of CPE and interconnection rights and requires a partitioning of common PBXs. In Oklahoma, the company imposes similar restrictions, including a requirement that certain calls exit the PBX into the public network and then reenter into the PBX. Southern Bell is another regional holding company fighting STS. Its South Carolina tariff gives the company discretion to deny interconnection where local resale occurs. In Arizona, Mountain Bell structured a tariff that reduces the economic incentive to share.

On January 7, 1985, the Arkansas PSC granted an interim order that affirmed the local telephone company as the sole provider of local exchange service. The order refers to STS as the "resale of local transmission service" requiring a certificate of public convenience and necessity. To obtain a certificate, a showing must be made that the STS is

23. *The Push to 'Bypass' Local Telephone Companies*, BUS. WK., Aug. 27, 1984, at 90, 92 [hereinafter cited as *Push*].

24. Baer, *supra* note 16, at 187-88.

25. *Push, supra* note 23, at 92.

"privately beneficial and not publicly detrimental," or that the local telephone company "is not providing reasonably adequate telephone service."[26] Similar developments have also occurred in Oklahoma.[27] Texas, on the other hand, has permitted STS, declaring:

> Defining these services as local exchanges, telephone service would, for all practical purposes, impose certification and rate regulation on these shared services. Regulation of this type could well retard the development of these services, to the possible detriment of Texas telephone users.[28]

In Arkansas, in contrast, it was declared:

> In essence, what the resale proponents propose is to create "islands" within telephone company certificated areas, and to allow the reseller to provide unregulated telephone service to those located within that island. . . . We are unable at this time to see how certificated telephone companies in this state could furnish, provide, and maintain adequate and efficient telephone service when at any given moment they could be told they are no longer to provide service to a particular island.[29]

Thus, the spectrum of the policy choice lies somewhere between the restrictions of Arkansas and the permissiveness of Texas. The FCC's position is likely to be closer to that of Texas. It is hard to see how an Arkansas-type of restriction would survive a court challenge, especially after the line of decisions upholding shared CPE use.

Other states are dealing with the question of STS differently. Florida requires approval of bypass. New York asserts its jurisdiction over STS. A Colorado law restricts anyone except the local telephone company from providing local telecommunication services. California, like New York, is reconsidering its policy.[30]

In the past, business communication systems have contributed towards the maintenance of residential services. This transfer was undertaken largely *within* the old Bell system. There is no reason why such a transfer arrangement could not also encompass communication systems outside of the Bell system by going beyond the local companies to reach bypass communication facilities. Until now, these facilities were not included as a contributor to the maintenance of universal service.

In the future, one should anticipate the possibility that a tax or surcharge will be imposed on bypass communications for the subsidy of universal service. Though money could come out of the general reve-

26. *In re* Southwestern Bell Tel. Co., No. 84-213-U (Ark. PSC Jan. 7, 1985).

27. *See* Note, *Smart Buildings and Shared Tenant Services: A Preliminary Analysis*, 37 FED. COM. L.J. 521, 529 (1985).

28. *In re* Southwestern Bell Tel. Co., No. 5827 (Tex. PUC Nov. 21, 1984).

29. *In re* Southwestern Bell Tel. Co., *supra* note 26.

30. Levine, *Smart Buildings Come of Age: Multi-tenant Telecommunications Services*, LEASING PROF., Oct. 1984, at 1, 1-6.

nue, this does not seem politically feasible. Such a surcharge would make some bypass and shared tenant services unattractive. To be economically efficient, any levy should be neutral among the various local communications, and it should not be used to hinder bypassing. Recently, Florida passed legislation to levy a tax on equipment used for bypassing. There is already a small FCC charge on leaky PBXs.

Few large users are likely to favor a bypass charge. The alternative, however, may even be worse from their perspective. Given the high political sensitivity of residential rates, it is possible that regulatory restrictions on the various forms of bypass and STS could eventually be instituted. Such restrictive regulations are likely to be more expensive than a contribution to universal service.

II. THE RESIDENTIAL MARKET AND PRIVATE CABLE

A. PRIVATE CABLE AND OFFICE COMMUNICATIONS NETWORKS

Small-scale, building-based communication networks are also emerging in the market for the distribution of video programs. These networks are generally known as satellite master antenna systems (SMATVs), an extension of conventional master TV antennas (MATVs) that distribute over-the-air broadcasting programs to tenants. An SMATV adds an antenna for the satellite reception of special channels, such as pay-TV, and sells these services to residents, similar to cable television operators. More recently, the term "private cable" has emerged. This is a more descriptive term. The "S" in SMATV is of secondary significance, since any form of "importing" programs (for example, by microwave transmission) is sufficient. Of primary significance is the emergence of unregulated cable television systems that operate under the control of property owners. This private cable television is in contrast to the regulated, franchised "public" cable television that is analogous to the public telephone network.

Both cable television and SMATV use virtually the same technology over coaxial cable with multiple channels of programs that are received from satellite and broadcast stations. A rivalry exists over the control (and profits) of the wire that delivers video programming into the home and not over the technology. In this sense, private cable becomes the residential and mass media equivalent of a building-based business communication system. There are also other similarities. A private cable system resembles a "bus" LAN in that it has a tree-and-branch architecture, high capacity, and a coaxial mode to link display terminals (television sets) to a large number of information flows (television programs). With proper adaptation, this cable system can be used for two-way communications and interactive services. It is also technically possible to have communications between the different terminals by providing some switching capability through a star architecture or through cable packet switching. The future use of a private cable system for telephone distribution and shared tenant use in a residential setting may be possible if the appropriate PBX and architecture are installed.

Although there is not much current demand for non-video, high-speed communication capabilities in residential markets, the penetration of the personal computer may change this over time. Similarly, local area networks in a business setting can be adapted for video transmission, though this currently has greater commercial value for video conferencing applications than for television entertainment programs. There is, however, a substantial conceptual overlap of landlord-supplied video and business communication systems, even though the applications are distinct and use differentiated, though convergent, technologies.

One example where video communication distribution capabilities merge with business communication systems is in the hotel industry. Thus, Hi-Net serves hundreds of Holiday Inns, linking them in a video conferencing network for business meetings. Pay-TV programs are also brought in for Holiday Inn hotel rooms.[31]

The regulatory issues between video and business communication systems are also similar. Landlord-supplied private cable television is being opposed on the grounds of "cream skimming," threats to universal service, unequal regulation in comparison to the dominant carrier, loss of economies of scale, and technological fragmentation. The falling cost of the technology has encouraged the entry of entrepreneurial private cable, leading to substantial deregulation by the FCC, contrary to the positions of state and local authorities. The conflict is far less bitter, however, than over private telephone systems. Cable operators still have many growth opportunities, including private cable. Their service is also not considered to be a public necessity. Thus, the conflict over private cable has been low-key in comparison with private telephone networks.

B. The Emergence of Private Cable

Private cable emerged in the late 1970's when the cable franchising process became bogged down in controversies in many large cities, leaving a substantial portion of the nation's urban population without cable TV. Since private cable systems do not require a franchise, they emerged to fill the pent-up demand for premium programming. The development of private cable accelerated in 1979, when the FCC deregu-

31. *SMATV*, SAT MAG., Nov. 1, 1983, at 7, 11.

lated TV receive-only satellite antennas (TVROs). This led to an increased demand for antennas and a rapid drop in prices, thus improving the economic feasibility of the service.

Some SMATV systems originate from a shady past. Signals of pay-TV suppliers like HBO were easily received and distributed without necessarily leading to payments to HBO. One study estimated that of the 500,000 SMATV users in late 1982, as many as 150,000 were "pirating" from pay-TV suppliers.[32] In some instances, cable companies entered the field in order to preempt competitors before an area was wired for cable. After obtaining a general franchise, the cable companies integrated the SMATV islands into their general distribution network. In other instances, however, property owners and condominium associations themselves became involved in private cable operations or contracted with entrepreneurial SMATV operating firms. According to the National Satellite Cable Association, the SMATV trade association, approximately 2,000 SMATV systems were listed with about 600,000 subscribers by 1984. Most private cable systems serve apartment complexes of 300 to 1000 units. The Co-Op City project in New York, however, has 15,000 units, while the Rochdale project in Queens has 6,000 units.

C. ECONOMICS AND TECHNOLOGY

The profitability of private cable systems depends on the size of the apartment complex and on the penetration rate. Unless penetration is very high (sixty percent, as compared to the more typical thirty to fifty percent), a 200-unit complex, private cable system will rarely be profitable.[33] Usually, at least 300 units are required for a system to break even. It is possible, however, to aggregate several smaller apartment buildings by connecting the TVRO antenna through small microwave links. When these links connect buildings which are not under common ownership, the FCC would define it as a "cable system," and then apply its cable regulations.

In 1984, a large dish antenna aimed at the principal pay-TV satellite SATCOM III-R cost about $17,000, plus $4,000 for installation. Smaller antennas are considerably cheaper. Subscriber equipment for non-addressable decoders and installation costs approximately eighty dollars per subscriber. Wiring costs between $150 and $200 in a low-rise building and between $300 and $400 in a high-rise building. Repeaters may also be necessary in large complexes.[34] Thus, in a 1,000-unit complex

32. Henry, *The Economics of Pay TV Media*, in VIDEO MEDIA COMPETITION 19 (E. Noam ed. 1985).

33. NATIONAL ASS'N OF BROADCASTERS, COM/TECH REPORT 2 (1984).

34. Henry, *supra* note 32, at 21.

with fifty percent penetration, the total capital investment costs are approximately $215,000, excluding billing equipment and other similar administrative overhead. This comes to about $430 per subscriber. Where the existing master antenna TV (MATV) wiring is available, the costs will be considerably reduced if the wiring is of adequate capacity.

There are two basic wiring architectures for SMATV. In a *homerun* configuration, the SMATV head end is connected to each apartment in a star-like pattern. This permits the easy activation and termination of services to residents and the differentiation of their service tiers. A *loop-through* architecture routes a wire through the building, allowing individual residents to tap into the system. This configuration does not easily permit the differentiated sale of channel options.[35]

Given significant overhead expenses, there are clear advantages to sizes in SMATV. These economies of scale normally cannot be achieved through simple horizontal expansion, since such expansion involves the crossing of public rights-of-way and requires a regulated franchise status. Therefore, some private cable systems have grown by becoming, in effect, archipelagos of scattered private cable islands in a metropolitan or multi-state region. The separate private cable systems still receive their own programs directly from various broadcasting sources; however, administrative overhead and controls may be centralized. For example, the SMATV operator Private Satellite Television controls the addressable tuners of its Atlanta subscribers from its Charlotte, North Carolina, computer, and then bills them from there.

D. Programming

SMATV systems provide satellite transmitted programming and can also retransmit programs received through other media, such as UHF and VHF broadcasters, subscription television (STV), multi-point microwave distribution system (MDS), or low-powered television stations operators (LPTV). Furthermore, SMATVs are able to receive satellite programs from the still-developing direct broadcast satellites (DBS), which provide a much more powerful signal than regular satellites. Private cable systems, then, can function not only as the retailers for pay-TV program networks such as HBO, but also as alternative retailers for media such as DBS, MDS, or STV.

The channel capacity of an SMATV system is, in principle, the same as that of cable TV. Seventy-channel, single coaxial cable systems are feasible under present technology. A number of systems provide fifty-four channels, though most private cable systems have signifi-

35. H. Howard & S. Carrol, SMATV: Strategic Opportunities in Private Cable 14 (1982).

cantly fewer. This is a result of the cable company's desire to reduce costs and of the absence of local franchise contracts. A private cable system needs to carry only the most popular over-the-air broadcasters, such as the three commercial networks, and omit low-budget UHF stations, which in the past had to be carried by franchised cable systems by law. Furthermore, cable operators are not required to provide so-called "PEG" channels (public access, educational, and governmental channels). Because a private cable system has only a limited number of subscribers who may well be more homogenous than the city population, the operator can tailor the program offerings and omit channels for which there is little interest. For example, in a senior citizen's building, the rock music channel MTV could be dropped. Through program choice, a homogenization of tenants could be promoted in some instances, which raises social and legal concerns.

A major limitation of private cable systems is their restricted access to premium programming. Major program channels felt pressured by their major cable system clients not to supply competing private cable operators. Program suppliers such as ESPN, the USA Network, and HBO have announced in the past that they would not distribute to SMATV operators.

When Warner Amex reduced the distribution of its premium service (The Movie Channel) to private cable operators, suits filed in Arizona alleged an antitrust violation and conspiracy. The parties eventually settled, and in 1984, Showtime/The Movie Channel announced that their programs would henceforth be available to private cable system.

E. Private and Public Cable and Their Competitors

The proliferation of transmission technologies causes the viability of private cable (and cable television in general) were to be questioned, if broadcasting technologies, such as DBS, MDS, and others, were able to provide similarly attractive programming at a lower price. An analysis of the other video media, however, does not support such conclusions.

The required investment for direct broadcast satellites is substantial. A high-powered satellite system carrying between six and eight transponders nationwide costs about $500 million, though this can be reduced by a different and more modest deployment of satellites. Medium-powered satellites are considerably less expensive. On the other hand, the antenna dish for the high-powered DBS is sixty to sixty-five percent smaller than an antenna for a medium-powered DBS. DBS also has high *marginal* costs per subscriber,[36] a result of the need for subscriber equipment, dish antennae, amplifiers, descramblers, installation, and maintenance. Monthly DBS subscriber charges are likely to be higher for five or six channels than the cable subscriber charges for thirty-five to fifty-four cable channels. In large parts of the country, however, cable is uneconomical due to low population density, thus possibly making DBS an effective vehicle for transmission. Once DBS comes into existence, it can then reach private cable systems and be distributed to tenants.

While DBS has received much attention, the more down-to-earth microwave technology of multi-channel MDS may prove to be surprisingly strong. MDS operators may enter and exit the market cheaply and quickly, thus being able to establish themselves early with four to eight channel systems that permit local flexibility. The marginal costs for each subscriber are substantially lower than for DBS but higher than for cable. In addition, self-installation of antennas is possible. These advantages are likely to make MDS a very strong competitor for the supplying of pay-TV to homes, though MDS is not as strong when in direct competition with cable. In contrast, the penetration of STV is declining. The costs of STV are high, and the break-even point is often not achieved.

F. THE REGULATION OF PRIVATE CABLE

Two regulatory issues are of particular significance to private cable systems. The first deals with regulatory obligations; the second deals with competitors' rights of access to an apartment building complex.

The cable industry has complained about the advantage to private cable from their being unregulated. Similarly, regulators have questioned whether the obligations imposed on cable TV operators by federal, state, and local authorities should also be applied to SMATV operators.

As with local telephone service, the intertwined issues of public service obligation, "cream skimming," unequal competition, and economies of scale are present. Cable operators are required to fulfill a variety of obligations, including the provision of services to the entire franchise area that encompasses the economically less attractive parts. Furthermore, the basic cable subscription rates in the past have been subject to some local or state regulation. In addition, cable operators must allocate some of their channels to programs that are not financially lucrative, such as small UHF stations, as well as public access, government, and education channels. Cable operators may also have to

36. Henry, *supra* note 33, at 19.

supply studio facilities for little or no charge to comply with the terms of their franchise contracts.

These regulations are to prevent the emergence of an "information underclass" unable to receive or afford the various media available to the majority of the population. Furthermore, some of the regulations are aimed at reducing the "gatekeeper" powers of cable TV operators by reducing their control over some of the system's channels. SMATV operators do not function under similar restrictions. A typical municipal franchise contract, as well as the 1984 Cable Act, permits the franchising authority to collect five percent of the gross revenues from the cable operator.[37] Private cable operators do not have to make such payments (though they do have to pay landlords). According to William Finneran, chairman of the New York State Commission on Cable TV, "the proliferation of private cable will emasculate franchised cable operators' ability to wire nonattractive areas."[38]

For these reasons, SMATV operations are troublesome to municipalities, regulators, and cable companies—parties that typically do not see eye-to-eye. A good example is New York City, where it took a lot of persuasion and sweetening of the franchise contract terms to get even one company to agree to wire the Bronx. Before any construction began, however, Satellite TV of New York Associates, together with the operators of Co-Op City, River Bay Corporation, started their own SMATV operation in the 15,000-unit middle-income complex. Fearing that this development could prevent any regular cable construction in the Bronx, the New York State Commission on Cable Television issued a cease and desist order to prevent the construction. This resulted in a challenge to the state commission's regulatory authority.

Meanwhile, the New Jersey Cable Commission imposed regulations on SMATV which were challenged by Earth Satellite Communication (ESCOM), a New Jersey SMATV company. A New Jersey Superior Court upheld the state's right to regulate SMATV by equating SMATV to franchised cable television.[39] ESCOM then successfully petitioned the FCC to issue a declaratory ruling pre-empting state and local regulation of SMATV, since they conflicted with the FCC's exclusive jurisdiction over interstate common carriers. This ruling was appealed to the U.S. Court of Appeals by the New York Commission.

In November 1983, the FCC responded by declaring that states were pre-empted from regulating SMATV systems.[40] The decision was

37. *See* 47 U.S.C. § 542(b) (Supp. II 1985).

38. Gladstone, *NY SMATV Systems Gets Go-Ahead*, CABLEVISION, Mar. 5, 1984, at 49.

39. Suburban Cablevision v. Earth Satellite Communications, Inc., No. C-1554-83E (N.J. Super. Ct. Ch. Div. May 20, 1983).

40. *In re* Earth Satellite Communications, Inc., 55 RAD. REG. 2D (P&F) 1427 (1983).

appealed to the U.S. Court of Appeals for the District of Columbia by the NYSCCT. In November 1984, the Court of Appeals upheld the FCC pre-emption over state and local regulation.[41] The construction halt on the Co-Op City project was overturned by a federal district court in February 1984, basing the decision on the FCC's pre-emption ruling. Currently, the project is in operation.

G. Regulating Public Cable Access

The second significant private cable legal issue involves the access rights of competitors like cable television. Given the relative high penetration rate necessary for private cable systems to break even, direct competition from "public" cable television operators may make SMATV uneconomical. Cable television systems enjoy certain economies of scale.[42] Thus, cable systems may still be the lowest cost providers despite the regulatory burden. For example, cable systems spend between twenty-two and twenty-eight percent of their revenues on programming. By comparison, SMATV operators typically spend thirty-five percent of their revenues on programming. Labor costs are also higher. For SMATVs, between twenty-five and thirty-five percent of revenues is spent on salaries, while only thirteen to twenty-eight percent of revenues are spent on salaries for cable.[43]

Thus, the ability to keep cable operators from entry may be critical if private cable is to survive. Yet, cable operators could argue that since they are under an obligation to serve all customers who desire their service, even in unattractive circumstances, they should not be precluded from serving customers under attractive circumstances.

Conflicts over cable's access rights to apartment houses persist. A local franchise grants a cable operator the right of access to public rights-of-way, but the right to enter private property is not included, unless state law creates such access rights. To protect the tenants' ability to receive cable television, several states have passed statutes granting cable companies the right of access, even if a landlord objects. Florida places the right with the tenant. A tenant cannot be denied access from a franchised cable television operator.[44] The law also prohibits the landlord from requiring a tenant or cable operator to pay the landlord to receive cable service, except for installation charges and service fees. Similar laws are in effect in Kansas, New Jersey, and

41. New York State Comm'n on Cable Television v. FCC, 749 F.2d 804 (D.C. Cir. 1984).

42. *See* Noam, *Economies of Scale in Cable Television*, in VIDEO MEDIA COMPETITION 93 (E. Noam ed. 1985).

43. Dawson, *Muscle Flexing: SMATV Style*, CABLEVISION, Feb. 7, 1983, at 51, 52.

44. FLA. STAT. ANN. § 718.1232 (West 1985).

Virginia.[45]

New York's approach is somewhat different, granting the operator of cable television the right to install cable television facilities. Reasonable compensation must be paid to the landlord subject to limitations imposed by the State Cable Commission. Massachusetts, Connecticut, and Minnesota take similar approaches. New York landlords may require the cable company or the tenants to shoulder the installation and repair costs and to maintain safety conditions.

One New York landlord denied access to a cable company despite the law. The litigation that ensued ultimately reached the U.S. Supreme Court in *Loretto v. Teleprompter Manhattan CATV Corp.*[46] The Court agreed in principle with Loretto's argument that granting access rights to her real property was a taking, even though the intrusion was only minor. The Court also held that proper compensation would overcome any frustration of her property rights. The New York State Commission on Cable Television then determined that one dollar per year per building was just compensation. Thus, Mrs. Loretto had won her constitutional point, but compensation of one dollar per year made it a pyrrhic victory.

The determination of the amount of compensation to landlords may depend on the adverse effect that the cable television's access has on property values; to the contrary, they may well have risen. For example, property values in San Diego varied according to whether houses were served by cable systems which were exempt from the then existing freeze on distant signal importation.[47] Since there was no decline in property values, regulators decided that only a nominal compensation was necessary. This economic logic, however, is seriously flawed. The true measure of economic loss to landlords should not be the reduction of property value, but the value of the foregone earnings that the landlords would have realized by setting up a private cable distribution. This earning potential should be reflected in a higher present value. It is this increase in present value that is the subject of a taking. The value of a cable company-served apartment building must be compared to an SMATV-served apartment building rather than to a building that is not wired for cable.

In the U.S. House of Representative's version of the 1984 federal cable legislation, cable operators were provided with the right of access to multiple unit dwellings after considerable debate about the constitu-

45. *See* M. Price & D. Brenner, Cable Television and Other Non-broadcast Video Technology 504 (to be published in 1986).

46. 458 U.S. 419 (1982).

47. M. Price & D. Brenner, *supra* note 45, at 47.

tionality of the provision.[48] This right, however, would not have existed when the building owner provided the tenants with the ability to obtain an "equivalent" diversity of information sources and services from cable operators. Thus, an SMATV system of reasonably comparable channel capacity and diversity of programming would presumably have been free from a cable operator's right of rival entry. This access provision, however, was deleted by the House-Senate conference during the hectic final days of the congressional session.

Absent any federal resolution of the taking question, state law would govern. Many states, however, have not passed statutes resolving the problem. It is likely that where the franchising authorities have been delegated adequate legal authority by the state, they may also provide access rights to cable operators in a franchise agreement or local ordinance.

The other side of the access issue is that a landlord's protected private cable may provide inferior and more expensive video services. This would leave tenants with the option of either voting with their program guide or departing in search of better video services. There is also the question of whether exclusive landlord-private cable arrangements violate anti-trust laws. In *Satellite Television & Associated Resources, Inc. v. Continental Cablevision of Virginia, Inc.*,[49] Continental, a cable company, had obtained an agreement with a landlord to wire an apartment building in return for exclusive access to tenants. This arrangement denied STAR, an SMATV operator, access to the tenants. The court found, however, that this arrangement was not a restraint of trade but instead was actually fostering competition, since it involved a landlord choosing between two potential entrants.[50] This holding cannot necessarily be relied upon in reverse situations, such as where an owner-affiliated SMATV is granted exclusive rights, or where the exclusive right is based not on a choice between two options, but rather on a desire to protect an established private cable provider.

Since landlords benefit from participating in private cable, they have an incentive to deny access to cable television, unless cable operators provide adequate compensation. If cable access, however, is granted as a matter of right, the compensation to the landlord may be set so low that entry may be encouraged to the point that the economic viability of private cable will be jeopardized. Yet, providing private cable operators protection from cable television may lead them into being complacent in providing cable services. How can this dilemma be resolved? Both of the above-mentioned approaches (keeping cable and

48. H.R. 4103, 98th Cong., 2d Sess., § 2 (1984).

49. 714 F.2d 351 (4th Cir. 1983).

50. *Id.* at 357.

SMATV apart and the *Loretto*-type of virtually free access) are extremes on a spectrum that permits intermediate solutions. A local cable television operator must be granted the opportunity to reach willing customers, even where private cable exists. Such rivalry will likely lead not only to better program and price offerings to viewers but also to technical innovations.[51] But, landlords should be compensated; otherwise, landlords will find ways to obstruct the cable operator's access.

One possible solution would be to let the cable operator have the right to some transmission capacity on landlord-provided internal wiring, including the right to upgrade this capacity when it is no longer adequate. This would allow cable operators to interconnect into a building's private cable system and reach potential subscribers directly. This arrangement would be part of the cable operators' package of rights and obligations for universal service. This approach is similar in concept to the right of access that a telephone company has in landlord-wired buildings. There, too, the landlord's right to provide his own communications system is balanced against the tenants' rights to choose alternative services and to participate in a larger public network. In the video mass media field, such a balancing approach would be premature; however, as cable-transmitted video becomes the primary form of mass media, and as the conflicts between local cable companies and landlord-affiliated private cable increase, this shared approach, based on access rights and compensation, seems to be a sensible arrangement. Other suppliers' programs could also be linked to such a private cable system on the basis of leased capacity.

H. Private Cable Regulatory Outlook

The above discussion shows that private cable is a viable video distribution medium whose main characteristics are landlord control, lack of regulation, and separation from the "public" franchised cable TV system. These systems have the potential to become, in effect, retail transmission pipes for a variety of other distribution media, such as DBS, MDS, and public cable itself. This scenario is characterized by partial collaboration and partial rivalry. One of the major public policy issues emerging is the regulatory imbalance between the growing role of private cable in relation to franchised cable television. Despite the trend towards deregulating cable television, it is nevertheless subject to a variety of obligations, such as must-carry rules, PEG channels, leased channel provisions, five percent franchise fees to the franchising authority, and universal service obligations. The social goals behind these regulations are not likely to disappear. Thus, the development and success of

51. Noam, Productivity and Innovation in Cable Television (1984) (working paper).

transmission systems that prosper from the absence of these requirements will be controversial.

It is possible that a "level playing field" would be created by the total deregulation of public cable. This deregulation would be unlikely, since thousands of municipalities would be opposed to giving up their share of cable revenues.

It is likely that landlord-affiliated private cable will generate some bad publicity. It is unavoidable that some operators will be overly aggressive in charging tenants for services, while others will be slow in bringing their systems to a reasonable level of channel capacity and service reliability. Others may overload the video channels with programming of their own ideological or moral biases. If these situations occur and receive publicity, the public pressure for some form of private cable regulation will grow and be supported by tenants who want to reduce their monthly payments and municipalities eager to form a broader base of cable revenue. It seems realistic, then, to expect that as private cable grows, it will be subject to regulations that closely resemble those of public cable. This would likely include a fee similar to the five percent municipal franchise fee and obligations to carry public access-type programming. Furthermore, as has been discussed, landlords may be required in the future to provide franchised cable TV with access rights in return for fair compensation.

It is also reasonable, however, to expect that the geographic limitations that restrict private cable to a single property will break down, allowing expansion to take place and enabling private cable to reap the benefits of economies of scale. Some of these regulatory barriers are already crumbling. As in the case of telephone and data communication, the small private forms of communication distribution that are emerging may expand to cover neighborhoods and partially overlay the public cable network. Through this process of expansion and partial regulation, private cable will be increasingly drawn into participating and contributing to the policy goals that have characterized American communications for some time, including universal service and diversity of information sources.

Opposition to this participation in the public goals of telecommunications policy is natural for profit maximizing firms that are responsible to their shareholders. The alternative to sharing the financial and diversity burden, however, is likely to be restrictive regulation on operations and expansion. This would be a financial burden on private cable and would limit its technological innovation and expansion into other communication areas.

III. INTERNATIONAL COMPARISONS

The array of different transmission links and networks fortells a future in which differentiated communication needs can be flexibly met under a customer-oriented, dynamic, competitive system. Such a system, however, is likely to lose some of the economies of scale of large-scale operations and the economies of scope (of offerings of multiple services) that have been the mainstay of conventional telephone communications for a century.

It is important to recognize that the approach of communications diversity the U.S. has chosen is not the same policy pursued in most of the other industrialized nations. The trend in continental Europe is essentially the opposite. There, the governments seek an *integration* of the existing separate telephone communication networks. This trend towards an integrated services digital network (ISDN)—after agreements on standards under the auspices of the Consultative Committee on International Telephone and Telegraph (CCITT) on protocols—is progressing. In addition, pilot projects have begun to incorporate the transmission of cable television video signals by linking it with voice and data service. In Germany, this is being tested in the BIGFON project (broadband integrated glass fiber optic local network). In France, government authorities are also planning to provide cable television through fiber optic star-configured networks, which could then be integrated with the general public telephone network. Limited tests have been underway in Biarriz. These integrations, however, are not yet close to being operational.

Similarly, on matters of competition in telephone services, the government-run telecommunication authorities (PTTs) mostly take a hard line. They oppose infringement of their monopolies, arguing that these advance universal service and economies of scale and scope. The increased integration of communication services into one powerful and complex ISDN has provided the PTTs with an additional argument for exclusivity. The creation of such a network is expensive and capital intensive, thus requiring special protection from "cream skimming." European PTTs have argued that they needed to make profits in business communications to subsidize universal residential service. For investments in ISDN, which is largely business-oriented, nearly the opposite is true. Protection from competition is now being claimed to be necessary to make it possible to provide businesses with a new communications network.

Similar centralizing developments have taken place in private cable. At the time when American users and landlords are increasingly providing communication networks of their own for business and residential entertainment uses, the opposite trend can be observed in continental Europe. In Germany, cable master antenna systems television was once privately provided, permitting apartment houses (and sometimes entire new residential complexes) to be linked by coaxial cable. In recent years, however, the German Bundespost has imposed a licensing requirement for such facilities and has reserved itself the right to provide its own system when upgrading is proposed.

IV. OUTLOOK

The development of private communication systems in the office setting and in the mass media market exhibit strong parallels. Business-oriented, private local telephone and local area networks, and the consumer-oriented, private cable networks overlap and fulfill some of each other's functions. In both instances, private building-based networks that are landlord-controlled and unregulated are emerging. This development involves a partial separation of the communication facilities from the established "public" systems of local telephone companies and cable television operators.

In the case of STS and LANs, the drive to achieve economies of scale encourages expansion and the clustering of office and apartment buildings. In the case of cable television, the managerial clustering that is now occurring will be augmented by a physical expansion of the service beyond the confines of property lines. As private cable operators begin to grow into neighboring buildings, a carving out of private cable neighborhoods from the public cable networks can be expected.

These developments not only contribute communication resources and flexibility to business users and middle class residents, they also exclude those who are outside these private systems—forcing them to contribute more to maintain their public communication services. The policy alternatives are either restrictive regulations, which are ultimately both costly and ineffective, or a different method of supporting communication services. The less restrictive alternative is for these new local networks to have fees levied upon them towards the support of universal service. The alternative would be several decades of regulatory strife.