The New Local Communications

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July 1, 1985

I. Introduction

New forms of private local networks are emerging in the business and residential spheres. The users are small or medium-sized, in contrast to the earlier global private networks of multinational firms. But their effect may be much more important in the long run. In the office setting these communications links are, first, local area networks (LANs), mostly for the transfer of high speed data and the connection of information equipment, and, second, shared tenant services (STS) within buildings or clusters of buildings that bundle the communications of small users and achieve economies of scale and flexibility that have previously been available only to large firms.

These two types of building-based office networks become interconnected and overlapping. They squeeze, from the user end, the local telephone companies by reselling their primary service, local transmission. (in the case of STS), and by keeping traffic from ever reaching the public networks (in the case of LANs) They shift capital equipment such as PBX switches upstream towards users; whereas in the past a telephone network had a smart center and "dumb" branches, the user end is becoming technically increasingly sophisticated and the branches are intensely utilized, while the use of private unswitched lines may make the center less significant, relatively speaking, than before. They also shift the scope of regulation, by moving functions of the regulated local exchange carriers upstream into the unregulated customer equipment (CPE) region.

This is the logical consequence of the largely artificial regulatory demarcation of regulated exchange services and unregulated CPE, commenced in Carterfone and established in Computer II and the AT&T Divestiture. With the constraints on the upstream network segment in place, the economic response is the move of entrepreneural activity and capital investment upstream, beyond the dividing point SNI (standard network interface), into the CPE section. Thus, more of traditional network functions are transfered to terminal equipment.

For LANs and STS, one major driving force are economies of scale. It is important to realize that the economic logic of aggregating users is not likely to stop at the building line. Hence, clusters of STS are likely to emerge in central business districts. In effect, they will become quasi-local exchange provides, through their specialized nature may merit a different legal designation. Similarly, local area networks may grow into "wide" area networks where LANs become WANs, also outside the public networks.

These developments are unavoidable, given two decades' experience in trying to block competitive entry through regulation. But they raised questions as to its effect on universal service and the public networks.

Furthermore, the AT&T divestiture has accelerated the move away from the one-stop communication system. Local telephone service, long-distance telephone service, and telephone equipment are now being provided by different suppliers. This increased complexity has generated incentives to recreate the one-stop service through integrated, landlord arranged communications packages, thereby reasserting economies of scope.

Parallel developments are likely to take place, though more slowly, in the residential market, where STS can start in large apartment house complexes, dormitories, etc. More significantly, "private cable" systems (SMATVs) are emerging as building-based video transmission networks. They compete with "public" cable television by reselling local video transmission. They, too, have potentially the ability to provide shared tenant services to apartment house dwellers, and eventually, entire neighborhoods.

These emerging private networks will add major complicating factors into an already complex communications environment. To anticipate these trends, it is necessary to understand these networks better in their technical, economic, and regulatory aspects, and to see the parallelism in their development. This is the aim of this article.

II. Office Communications Networks

1. Smart Buildings

"Smart" office buildings, a trendy development of recent years, increasingly offer telephone services and other communication features to their tenants. This "Intelligence" is becoming a selling point for office space in a glutted market (Denver 24.7 vacancy rate; Houston 19.5; Dallas 17.3; Los Angeles 12.4. Source: New York Times, May 1, 1985, p. 29) propelling real estate developers and landlords into the role of communications providers. Some smart buildings have accomplished building management systems (BMS) (such as electronic controls for heating, cooling, lighting, fire detection, and security), which can also be integrated with telephone communications links.

More importantly, however, a smart building can provide shared communications services to its tenants, such as shared PBX switching, a variety of communications links to the outside, and local area networks to link computers, PCs, word processors, and other equipment. There can also be terrestrial or satellite microwave links, facsimile equipment, shared computer and data processing and word processing, discounted long-distance telephone service, electronic mail, message service, videoconferencing, data storage, and telex service.

II. 2. 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 onto a few intensely used communications links. As a rule of thumb, eight individual internal lines call for one outside link. Existing PBXs have as many as 20,000 separate telephones stations connected to them. They are in effect software driven small computers with a variety of features such as voice messaging, call-forwarding, conferencing, and speed-dialing. Late generation digital PBXs are also increasingly able to switch high speed data transmissions, switch computer terminals to various computers, and link separate local area networks with each other. Some PBXs have also been equipped to allow computers using different communications standards to communicate with one another.

Of particular importance is that programmed PBXs have the ability to 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 tenant service PBXs can utilize a variety of private lines and other links that bypass the public switched networks of telephone companies. They have therefore been described as "reselling" local transmission service.

One economic advantage of PBXs to users is their "leakiness." Incoming long-distance calls can be routed into a building's PBX through a leased line, and then routed into the local network like a regular local call. Local telephone companies, which at present share on a per minute basis in long-distance tolls, thus lose revenue, since the long-distance nature of the call is undetectable.

Simple small PBXs are available for installations of as few as twenty telephones. These systems can cost as little as $300 per station but do not offer many features. Economies of scale can be significant. For an Inetcom IBX-80, which has a sophisticated central processor, the cost is about $1200 per line in a 100 station configuration and drops to about $600 per station in a 10,000 line system.

II. 3. Shared Tenant Services

Shared tenant services bring with them several kinds of economies of scale in addition to a reduction in per-line PBX cost. Through bundling of telephone services, volume discounts can be achieved. For example, AT&T's trans-continental WATS service costs $21.50 per hour use below 15 hours/month, and $14.18/hr above 80 hours. Thus, a low-volume hour is more expensive by

$7.32, or about 50%. For MCI, a similar comparison shows rates between $15.78 and $21.03 (low use) and $11.68 and $14.07 (high use), for a differential of 35-50%. [Source: AT&T Tariff Brochure, 1985; MCI price list October 1984].

Although LCR is technically feasible for even the smallest system, what really matters is to have enough volume to support low-cost long distance options from which to choose, such as WATS, FX, and other types of links besides the regular direct dialing service (DDD) of the several long distance carriers. These lines require traffic volume to be economical, and these economies increase with size.

A third major advantage of building-based aggregation is that it can make it economically feasible for small users to bypass the public switched network of the local telephone company and link up with other points, in particular with the long distance carriers directly by several of the routes that will be described below.

Such routing could be carried over lines leased from the local telephone company. Telephone company facilities would still be used, but there would be a substantial reduction of revenue to the local telephone company from such "service" bypass.

The advantages of shared use are usually less important to large users of communications who have already achieved economies of scale. Some experts set the threshhold up to which shared usage makes sense at 100,000 square feet/tenant. Since there are four to five telephones estimated per 1,000 sq. ft., this translates to about 400-500 stations per tenant as the maximum before switching to one's own PBX and leased lines. (On the other hand, there may be other advantages to keep staying in STS even beyond that size.) From the landlord's perspective, estimates consider that 150,000 square feet for a building is a minimum for shared telecommunications, i.e., at least 600 stations. Even that size may not be large enough to offer more than a shared PBX. [Better Buildings, p. 24.] Hence, shared services makes most sense in large buildings with small or medium sized tenants.

Smaller buildings could also piggy-back with nearby large buildings. InterFirst Plaza in Dallas shares its microwave links with surrounding buildings.

Shared tenant services are particularly suited for small to medium sized tenants with a heavy long-distance usage that is rapidly growing, so that they are likely to outgrow their own systems.

Residential usage of shared tenant services is also possible, though less popular than in an office setting. One California developer is providing every house with two voice lines and two data lines, connecting them with a central switch. It is aimed at software programmers who like to work at home. Residential and office use may also be combined. For example, universities can resell long-distance service to students in their dormitories after office hours, when leased lines are otherwise unused.

II. 4. Problems of Shared Tenant Services

Typically, the wiring in existing buildings is owned by the local telephone company, which charges for its usage. Even where the existing wiring could be technically used for a new communications configuration, it would have to be purchased from the local telephone company which has no incentive to reduce its rate base and make the bypassing of its services easier by agreeing to convenient terms of purchase. In most instances a rewiring becomes necessary, involving the laying of heavy riser cables through often congested ducts, coping with potentially asbestos-laden ceilings, and sometimes drilling new risers through existing concrete floors. Low-cost forms of rewiring may involve the disruption of telephone service to the existing tenants, which may be unacceptable. It may also mean the need to change telephone numbers, a major inconvenience for established businesses. However, the growing use and capabilities of fiber optic cables, with their smaller bulk, may make retrofitting significantly easier in the near future.

Investments may be significant. A 1000 station PBX can cost about a million dollars, and can become rapidly obsolete. Of the hundreds of suppliers, many are not likely to be around when problems emerge later.

Some cost advantage of bundling tenant's communications demands is also dependent on the communication rates available. For example, if WATS ceases to become cheaper per unit with volume, a major disadvantage for shared services will disappear. This could happen as long-distance companies develop overcapacity, as is likely to happen, and begin engaging in price wars that drive prices down for lower-bulk WATS, too.

Nor should tenants demand for STS be overestimated. Many tenants have no need for high speed data transmission, local area networks or video conferencing; other tenants' existing equipment may not be compatible with the new telecommunications system of the building; still others may be reluctant to become dependent on the landlord for the security, privacy, and confidentiality of communications.

Thus the degree of tenant utilization may be lower than anticipated given the cost savings, and leave landlord and remaining system users picking up higher costs than expected. At present, a 65-70% utilization is considered successful. (In the following, the term "landlord" includes also the landlord's deregulated telecommunications operator). Regulatory issues also lurk close to the surface. Tenants who may find it hard to move, may be dependent on the landlord's setting of communications prices. Furthermore, the components of telephone charges can be so complex and devoid of transparency to put tenants de facto at the mercy of a landlord's software program. These probems would be limited if the public telephone company had easy access to tenants as an alternative supplier of service.

On the other hand, the landlord too, exposes himself to large telecommunication bills run up by unreliable tenants, and to the headache of billing disputes.

Since tenant-landlord disputes on communications issues will unavoidably arise, it is likely that some forms of regulatory safeguards may be imposed in the future on landlords as providers of communications services. For example, some quasi-common carrier status has already emerged such that tenants cannot be precluded from using, for a fee, the landlord-owned wiring in order to access communication carriers that are not necessarily part of the landlord's package. Though many of these problems could be resolved contractually, tenants in a long-term lease situation may be unable to benefit from the advantages of emerging new communications options if access to them is controlled by the landlord's PBX, whose least-cost routing may be programmed to an inter-exchange carrier that permits the greatest cost saving from aggregation, but that is in performance less advantageous to a tenant.

Similarly, the landlord's chosen mix and quantity of outside lines can make a big difference to tenants. Too few such links result in difficulties in making outside calls, or in having incoming calls not get through. For some businesses, this can be of vital importance. There is also a public interest in these questions, since attempts to get through to a busy PBX from the outside impose a burden on the public network and its switches that are engaged by such attempts, but do not receive any revenue for uncompleted connections attempts.

A related consideration is liability. Suppose that a landlord's PBX fails for several days, causing severe financial losses to a tenant dependent on telephone connections. Telephone companies, by law, are free from consequential damages in such cases. But they are also regulated in their quality standards. STS operations presumably would seek, by law or contract, to protect themselves similarly. Yet it is unlikely that such protections would be entirely independent from certain quality and performance standards.

For the landlords, the various technical, financial, legal and maintenance problems involved may add a burden that is usually best shouldered by a specialized so-called shared tenant services provider. Such a firm selects, installs, and maintains the PBX, negotiates with the telephone company, runs the message center, and services the telephone equipment in the building.

Relations between landlords and these service providers introduce new complexities. Unreliable service providers could generate much unhappiness among tenants and the landlord may become the ultimate loser. There is a public interest in non-disruptive arrangements.

II. 5. Costs and Revenues

According to one estimate, the extra cost of a "smart" 750,000 square foot building is 2-4 million dollars. (Kitty Dawson and Andrew Fineburg, "Building Intelligent Offices," Venture, Oct. 1984, p. 90.) Additional staff requirements may be perhaps a dozen people, mostly for a message center, where the rule of thumb is one operator per 200 stations.

One per-foot estimate of the cost of installing shared tenant services is $5 per sq. ft., though some financing arrangements are said to reduce that to about 65 cents per sq. ft. [Teleconnect, p. 106.]

Per square foot, TeleStrategies estimates an after-tax profit of about $.60/year, and a return on investment by year 7 of 21%.

II.6 Local Area Networks

LANs make possible the sharing of equipment and its functional integration, thus reducing the cost of operation. A typical LAN is a network for personal computers. And it can also put the PC user in the easy touch with the much greater computing power and the large data bases of computer mainframes.

Such LANs carry in instances nearly 60% of an organization's communications flows. They are not only proliferating, but also being integrated through PBXs with by-pass options. They are also expanding geographically into "Wide Area Networks" or WANs outside the public networks.

LANs are distinguished by the way in which equipment can access the network. This is significant insofar as some access modes permit the assignment of priorities to different messages, which is important if voice communication is to be carried on the LAN integrated with data traffic. While data can and in fact is continuously chopped up into segments without major problems, this would make voice communications unintelligible. Thus, the prioritizing of such communication can now make uninterrupted voice telephone conversations possible.

II.6 Alternative Forms of Local Transmission

A driving force behind the interest in shared communication services is the potential for the usage of communications links alternative to those of the local telephone company. This is normally referred to as "bypass." A major reason for shared tenant services has therefore been described as the resale of <u>local</u> transmission service. A bypass using telco leased lines is termed by the FCC as a "service bypass," as distinguished from the "facility bypass" using non-telco transmission paths.

There are by now a good number of alternative forms of local distribution available, several of which are telephone company-supplied. The information provided below is summarized in Table 1.

1. The <u>basic switched voice grade circuit</u> can sustain transmission rates of 1,200 bits per second (bps) which can be upgraded with special equipment to 9,600 bps. For the higher speeds, lines must be unusually free of interference. Because of their cost and slow speed, their function is in volume transmission increasingly for backup and for short distances only. Line costs are, in Manhattan, $25.61 (including access charge) plus 8 cents for the first 5 minutes and 1 cent for each additional minute.

The transmission rate of existing twisted pair lines may be upgraded in the future through compression technology.

2. <u>Direct analog data communication lines</u>. These are private, unswitched lines leased from the telephone company capable of rates up to 9.6 Kbps, enough for several interactive terminals, but insufficient for many other data processing applications. They require four wires. For a 9.6 Kbps circuit, New York Telephone charges $111.60 (1 mile); $236.40 (5 miles); and $486 (10 miles) (Source: John Kadis, The Information City)

3. Digital Data System service permits medium speed Dataphone leased line usage between computers or terminals, with transmission rates of 2.4-56 Kbps. Cost of service is sensitive to distance and transmission rate. For a 5-mile distance, New York Telephone charges $135.75 for 2.4 Kbps and $373 for 56 Kbps.

4. "T" carriers, another class of leased line, permit high-speed data transmission for computer use. They consist of 24 time-division multiplexed channels of 64 Kbps, permitting a speed of up to 1.544 megabits/sec, known as the DS-1 or Tl rate. Tl signals carried over copper wires need to operate over at least 24 gauge, which is a larger diameter than most telephone wire plant in Manhattan; thus it is often difficult to get Tl service in many areas. Repeaters are necessary every mile. Tl channels are also used in order to combine signal streams of several slower-speed users. Tl rates charged by New York Telephone are $720.22 (1 mile); $2645.26 (5 miles); and $5051.56 (10 miles).

Improvements in the basic Tl system have permitted transmission rates of 6.132 megabits/sec, under the name of T2.

5. Technically different from copper wire lines are fiber-optics links. Fiber optics systems operate by transforming electric signals into rapid pulses of light and transmitting them through very pure glass strands. The advantages of this form of transmission include freedom from electromagnetic interference and reduced need for repeaters; whereas copper-wire Tl circuits require repeaters at every mile, fiber technology may permit a spacing of 30 miles. (In experiments, 75 miles.) Fiber cable also afford a high degree of security, since they are very

difficult to intercept. Also, since the glass strands are considerably thinner than copper or coaxial cable per equivalent transmission capacity, they permit a more efficient use of duct space. Experimental transmission rates of 1.5 billion bits/sec have been demonstrated. At present commercially available fiber optic links support T2 type transmission rates.

Disadvantages of fiber optics cables are that they are, at present, less convenient to install within buildings than traditional cable due to difficulties in bending, splicing, and tapping. Also, terminal equipment is quite expensive at present, and it is uneconomical to use fiber for low speed traffic.

6. Coaxial Institutional Cable (I-NET) has been used for high capacity voice and data transmission and for cable television. Its bandwidth has been continuously increased, and has reached 550 MhZ for cable television. It can now carry up to 70 video channels (or about 350 Mbps (280 T1 channels) and in the 1990s probably up to 90 video channels. Because of its shielding, it is relatively immune to electrical interference, and it can be worked on by semiskilled installers. Typical cost for laying coaxial cable per mile of cable is $10,000 to $15,000 above ground, but it can be high as $300,000 a mile underground. [Source: Gary Rothbard, "Underground Building Woes Push Costs Higher," Cable Age, Aug. 29, 1983, pp. 15-20.]

Because of their long-standing involvement with coaxial cable technology, and given their plant and service personnel, some cable television companies have offered data transmission services to large business users in the areas of their franchise operation. The first such service was by Manhattan Cable in 1974 which has offered customers data transmission over a trunk system that is "dedicated" and mostly physically separate from its television transmission. The company's headquarters functions as the equivalent of a telephone company's central office. Various transmission speeds are offered, depending on the customer's equipment. Speeds between 1.2 Kbps and 1.544 Mbps, the T1 rate, are available. Most usage is at 5.6 Kbps. Total traffic volume is moderate.

Because of the emergence of cable television as a ubiquitous second system of communication wires, the potential to broaden its communications offerings and to function as a communication carrier partly in competition with telephone companies is likely to increase over the long run competition between telephone and cable companies in a wide range of services. [Eli Noam, "Towards An Integrated Communications Market" in Federal Communications Bar Journal, 1983, and Walter Baer, "Telephone and Cable Companies: Partners or Rivals in Video Distribution?" in Eli Noam (ed.) Video Media Competition; Columbia University Press, 1985.

7. Point-to-Point Microwave transmission was developed during World War II and permits commercial transmission on bands that lie between 2 GhZ and 23 GhZ. It requires an unobstructed line-of-sight transmission path and is 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. On

the other hand, higher frequencies can carry more information. But in communication intensive areas such as Manhattan, the more desirable lower frequencies are virtually filled up.

Point-to-point microwave is most advantageous for heavy users with a limited number of destinations to link up to. (Gartner Group, Strategies in Telecommunications Services, August 1984, p. 4). A shared tenant services link to a long distance carrier is one such example.

An average microwave transmission channel in the 6 MhZ frequency range can support the equivalent of four T1 1.544 Mbps channels, or 640 channels of 9.6 kilobits/sec data traffic. At higher frequencies this can go up to 18 T1 circuits per channel.

8. Digital Termination Service.

DTS is a new point-to-multipoint microwave transmission technology which permits fairly small users from numerous locations to use microwave. DTS was originally developed by Xerox for its now abandoned XTEN national office communications network and was opened for licensing in 1981 by the FCC as the local end of an end-to-end national all-digital microwave system. It connects users of data-type service (2.4 Kbps - 1.8 Mbps). It is less well suited for voice, since only about 75 voice circuits are available simultaneously. Users can share channels, which makes dedicated channels unnecessary. DTS consists of central "nodes" that transmit and receive microwaves from all directions to and from customer-premise transceivers. These nodes in turn interconnect to each other and to long distance carriers by point-to-point microwave. The nodes have switching capability, and their range is about six miles.

At present, most service is point-to-point rather than switched, but that is likely to change.

9. Multipoint Distribution Systems 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 15-30 miles. A transmitter costs about $1 million and reception equipment is about $200. Because MDS is used largely for pay-TV transmission, though this was not anticipated when the service began, lease rates for data reflect the opportunity cost of video transmission which in turn depends on the status of cable television. An MDS channel can be leased in Manhattan for $5,000 per month.

10. Satellite links. Earth and space facilities provided by a satellite carrier or reseller such as Satellite Business Systems (SBS), or other firms such as USSSI and American Satellite. Prices are lower for long term leases, or where pre-emption by another user.

Another possibility is for a user or user group to lease or buy a transponder from a satellite carrier such as RCA or Western Union, and to use it for whatever transmission purposes it requires. At present, a transponder can sell for $ 3 million. Its maximum transmission capacity is 64 Mbps, divided in T1 channels.

Though in the past users had to buy or lease a full transponder, it has more recently become possible to acquire fractional transponders.

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. One of a satellite's advantages is that it can be used to reach multiple recipients simultaneously.

11. Cellular Radio is still another form of local transmission.

This technology, developed by AT&T, provides a significantly more efficient usage of frequency for radio communications. It greatly upgrades other forms of mobile communications such as loud mobile radio, citizens band radio, and satellite mobile communications. It is being introduced in major U.S. markets under an arrangement which provides for 2 licensed operators in each location, one is to be provided by the local telephone company or its holding company. The other license is given to one of the numerous applicants, many of whom are from the RCC (Radio Common Carrier) or paging industries. Despite the tremendous technological improvement that cellular radio provides, it is relatively expensive, and cannot sustain transmission rates above regular voice grade (1200 bps). New York subscription costs: per month ranges $15-69; usage charges range from a peak of $.40 - .75/min to non-peak $.25-.35/min. Equipment costs $1300-2200 installed. Data can be transmitted only from a stationary position, and at present is limited to a 300 bps rate. Cellular radio's main applications are likely to be mobile communications, both for voice and data. Thus, for example, a civil engineer in the field could be directly connected to his company's data base and computer capabilities.

12. Infrared transmission.

The use of a modulated light source such as infrared light or laser-generated light provides a low-cost transmission system which should not be overlooked. Such signals are subject to interference from other sources of light and heat, including the sun, or interference from smoke or haze. Primary use is for very short transmission paths such as the crossing of a street. Unlike the use of microwave (which requires 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 affords no regulatory nexus. T1-capacity (1.544 Mbps) transmission equipment costs $14,000; its range is 3/4 mile. [Source: Light Communications, Inc., Norwalk, Ct.]

13. Miscellaneous: 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; satellite mobile communications.

Some Cost Comparisons

Table 1 summarizes the information above for leased forms of local service. They are normalized for the price per 1 Kbps, to permit comparisons. As can be seen, microwave ($.2 - .65), fiber ($.3 - 1.7), I-NET ($1.15) and T1 telco carriers ($1.7) are the low cost providers.

Table 1

Price Comparison of Local Transmission Links

(Manhattan; leased lines or channels; 5 miles unless noted)

Transmission Medium	Price per Month (leased)	Capacity (kilobits per second)	Price/Capacity (1 kilobit per second transmission capacity per month)
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
T1 Carrier	2645.26(c)	1,544	1.70
Fiber Line	2644(i) 13,500	1,544 44,736	1.70 .30
Coaxial Cable Institutional(I-NET)	1750(m)	1,544	1.15
Point-to Point Microwave	1200(k) 1000	6,132 1,544	.20 .65
Digital Termination Service (DTS)	600(l)	56	10.71
Multi-point Distribution System (MDS)	5,000(j)	3,088	1.62
Satellite Transponder	110,000(d)	64,000 (max of 1,544 kbs)	1.70
Cellular Radio	2,000(e)	.3(f)	6667
Infrared	400 (g,h)	1,544	.25

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a. Assumes $21.16 basic business rate access charge, plus usage charge for 8 hours/day usage, 20 days/week.

b. Assume 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 peak/off peak. Assumes 4 hours peak/day; 20 days/month

($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. ((1.) T2 transmission. (2) T1 Transmission). Eastern Microwave's rate is $900 equipment, $22/mile video coverage. 6 Mbps.

l. On basis of 30% use of node ports (100 ports). Contemporary Communications.

m. Manhattan Cable.

For the user, the optimal choice of communication links depends on a large number of technical, economic, environmental, and regulatory variables. These include, for example, data volume, availability of duct space, microwave paths and frequencies, lines of sight, southern exposure, order-lag of leased lines, number of origination and destination points, and desired security and reliability. It also depends on the willingness to own and maintain equipment and a network, to be served by a multi-service communication carrier, or to deal with multiple communications providers for separate services.

Thus, in Manhattan, high volume data traffic between _two_ locations may be best accomplished by fiber optics (either private or New York Telephone's), because microwave frequencies may not be available, while duct space may be. In other locations, circumstances may dictate the opposite.

II.7 The Role of the Local Telephone Companies

Because STS provides a powerful mechanism to make some of the bypass options discussed above affordable to small and medium sized users, some local telephone companies have eyed it with hostility even if several others have also joined the bandwagon. They have argued revenue loss, duplication, fragmentation, difficulties in 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 for certain calls to exit the PBX into the public network and to re-enter from there into the PBX. Southern Bell is the other RHC that has been aggressively fighting STS, and its South Carolina tariff gives the company discretion to deny interconnection where local resale occurs. In Arizona, Mountain Bell's approach has been to structure a tariff that reduces the economic incentive for sharing.

The Arkansas PSC, on Jan. 7, 1985, granted an interim order that affirmed the local telephone company as the sole provider of local exchange service (Docket 84-213-U). It describes STS as the "resale of local transmission service" and requires for its exercise a certificate of public convenience and necessity. To obtain such certificate, a showing must be made that this STS is "privately beneficial and not publicly detrimental," or that the local telephone company "...is not providing reasonably adequate telephone service."

It also requires a partitioning of PBXs by users. Similar developments occurred in Oklahoma.

Texas, on the other hand, has permitted STS (Texas PUC, Final Order, Docket No. 5827), declaring:

> "Defining these services as local exchange 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.
>
> The Commission is of the opinion that where new technologies arise which can thrive only in an unregulated environment, then regulation should give way to technology rather than vice-versa...

Arkansas, in contrast, held that:

> "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 the 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."

Thus, the spectrum of the policy choice lies somewhere between the restriction of Arkansas and the permissiveness of Texas. The FCC's position is likely to be similar to that of Texas, and it is hard to perceive how an Arkansas-type restriction would survive legally, given the line of cases upholding shared CPE use, (Mebane, Murraysville; Commercial Communications, Heritage Village, Arkansas' position is part of a long line of attempts to protect the revenue base of local telephone companies in order to maintain low residential subscriber rates. In early 1985, both the North American Telecommunications Association and IBM petitioned the FCC for a declaratory reuling on the question of STS restrictions.

(Henry Levine, "Smart Buildings Come of Age: Multi-tenant Telecommunications Services," Leasing Professional, Oct. 1984, p. 1-6).

In the past, business communications have contributed towards maintainance of residential service; the transfer was undertaken largely within the old Bell system. There is no conceptual reason why such a transfer arrangement could not encompass communications outside of the Bell system, also, and go beyond the local companies and OCCs such as MCI, to reach also facilities-bypass which until now are not included as a contributor to the maintenance of universal service. Investors in bypass-based shared tenant communications thus should anticipate the possibility that a tax or surcharge will be imposed which will be used to subsidize some form of a universal service fund. Of course, the money for such a fund could come out of general revenue, but that seems politically less likely. What this means is that in the future we may see the charges for bypass communications equalized in some way with the contribution of non-bypassing business communications. Such a charge would make some bypass, and with it shared tenant services, less attractive. (Such levy should merely equalize contributions with the users of the public network; it should not be used to handicap bypassing.) A step in that direction has been taken by

Florida, where recent legislation provides for a tax on bypass equipment.

There are, of course, practical objections to the imposition of a bypass charge. Bypass has to be defined, and its existence must be known. It also needs to be quantified in some way so that a variable charge could be imposed against it. However, the existence of bypass is usually a matter of public record, since it may involve the licensed microwave frequencies, satellite transponders, public rights of way, or lines leased from carriers subject to regulatory oversight. Charges could be imposed on the basis of the transmission capacity of the bypass system, since such capacity will typically have a close relationship to actual usage.

One could hardly expect large users to be in favor of such a levy. However, the alternative may be worse from their perspective. Given the high political sensitivity of residential rates, it is quite possible that regulatory restrictions on the various forms of bypass and tenant service sharing and inside wiring could be instituted. Such restrictive regulations are likely to be much costlier than a contribution to universal service. There are already signs of such restrictions, as the Arkansas Public Utility Commission, discussed above, shows. A communications environment that is substantially deregulated, but in which the contribution to universal service are distributed over <u>all</u> electronic channels of voice communication increases the neutrality of selection to factors of technology and economics rather than regulation. It is of course possible to conceive of an outright elimination of <u>all</u> contributions towards universal service, but this seems to be politically unlikely and economically inefficient. Even large users, after all, benefit from the presence of small subscribers on the public network.

III. THE RESIDENTIAL MARKET AND PRIVATE CABLE

III.1 Private Cable and Office Communications Networks

Small-scale communications networks that are building-based are also emerging in the market for the distribution of video programs. They are generally known as "SMATVs" -- satellite master antenna systems -- in extension of conventional "MATV" master TV antennas that distribute over-the-air broadcasting programs to tenants. An SMATV adds an antenna for satellite reception of special channels such as pay-TV, and sell these services to residents, like a cable television operator. More recently, the term "private cable" has emerged, and this term is considerably move descriptive. The "S" in SMATV is really of secondary significance: any form of "importing" programming -- satellites, microwave transmission, whatever -- can do. What is significant is the emergence of cable television systems that operate, in an unregulated fashion, under the control of the property owners -- private cable, as opposed to regulated, franchised "public" cable network that is analogous in some ways to the public telephone network.

The rivalry between private cable and cable television is often presented as a conflict of two transmission technologies, analogous to that of, say, direct satellite broadcasting (DBS) with cable television. However, this form of presentation misses the point. Both cable television and SMATV use virtually the same technology -- transmission to subscribers, over coaxial cable of multipl channels of programming received via satellite and broadcast stations. Rivalry lies not in technology but rather over control (and profits) of the wire that delivers video programming into the home. In that sense, private cable becomes the residential and mass media equivalent of a building-based business communications. There are other similarities. A private cable system resembles a "bus" local area network in that it has a tree-and-branch architecture, high capacity, and coaxial mode of linking a large number of display terminals -- called television sets -- to a large number of information flows, which we call television programs. With proper adaptation, such plant can be used for two-way communications and used for interactive services such as videotex. It is also possible to have communications between the different terminals by providing some switching capability through a star architecture, or by cable packet switching. Similarly, the future use of the private cable plant for telephone distribution and shared tenant use in a residential setting can be an option if the appropriate PBX and architecture are installed.

At present, there is not much demand for non-video high-speed communications capabilities in residential markets, but the penetration of personal computer (17 mil in 1984 including in offices, up from 10 mil in 1983, and 5 mil in 1982) may change that slowly over time. Similarly, local area networks in business setting can be adapted for video transmission, though this is at present commercially more interesting for video conferencing applications than for television entertainment programming. But there is a substantial conceptual overlap of landlord-supplied video and business communications, even though the applications are distinct and use differentiated though convergent, technologies.

The regulatory issues, too, have similarities. Landlord supplied private cable television is being opposed on grounds of cream skimming, threats to universal service, unequal regulation in comparison to the dominant carrier, loss of economies of scale, and technological fragmentation. Just as in the case of telephony, the falling cost of the technology has encouraged entrepreneurial private cable entry which in turn has led to substantial deregulation by the FCC, in opposition to state and local authorities and established cable carriers. The struggle, however, is far less bitter than in telephony. Cable operators still have many growth opportunities -- including private cable -- and their service is considered to be far less of a public necessity. Thus, the struggle over private cable has been considerably more low-key than over private telephone networks.

III.2 THE EMERGENCE OF PRIVATE CABLE

Private cable emerged in the late 1970s, when in many large cities the cable franchising process bogged down in controversy, leaving a substantial portion of the nation's urban population without cable TV. In this situation, private cable systems which did not require a franchise emerged to fill the pent-up demand for premium programming. The development of private cable accelerated in 1979, when the FCC deregulated TV receive-only satellite antennas (TVROs). This lead to increased demand and a rapid drop in prices, and thus improved the economic feasibility of the service.

The origins of SMATV's lies in an often shady past. Signals of pay-TV suppliers such as HBO could be be easily received and distributed, without necessarily leading to payment to HBO. One study estimates that of the 500,000 SMATV users in late 1982, perhaps 150,000 were such "pirates". (Jane Henry, in Eli Noam (ed.) Video Media Competition; Columbia University Press, 1985.

Most private cable systems serve apartment complexes of 300 to 1000 units. However, the Co-Op City project in New York passes 15,000 apartments and the Rochdale project in Queens has 6,000 units.

III.5 Private and Public Cable and Its Competitors

Given the proliferation of transmission technologies, one question to ask is whether private cable and cable television in general will remain viable, if broadcasting technologies such as DBS, MDS, and others were able to provide similarly attractive programming at lower cost. However, the analysis of the other video media options does not lead to this conclusion.

The attached Table 2 provides a comparison of the various pay-TV transmission forms. As can be seen in the rightmost column which indicates the average capital investment per potential subscriber reached and per video channel offered, SMATV, ($11.50), as well as cable television ($17.20), and MDS ($14.60) are far and away the low cost providers. One should not attach too much significance to the difference between those three, since they may be affected by changes in the assumptions. What is important is that DBS, STV, and pay LPTV are all considerably more expensive, and that private cable is price competitive with cable and MDS.

III.4 Regulatory Status of Private Cable

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

The cable industry has complained about the advantages of private cable being unregulated. Similarly, regulators have posed the question whether the obligations imposed on cable TV operators through federal, state, and local authorities ought to also be applied to SMATV operators.

As in the case of local telephone service, the intertwined issues of public service obligation, cream skimming, unequal competition and economies of scale are made. Cable operators are required to fulfill a variety of obligations, which include providing services to the entire franchise area, including its economically less attractive parts. Furthermore, the basic subscription rates have been subject to local or state regulation, though this is likely to change significantly in the aftermath of the 1984 Cable Franchise and Policy Act passed by Congress. Furthermore cable operators must allocate a good number of their channels to programs from which they may not benefit economically, such as small UHF stations, and public access, governmental, educational channels. In the case of public access channels, they may also have, by the terms of their franchise contracts, to supply studio facilities at nominal or no charge.

The basis for such regulations is, among others, to prevent the emergence of an "information underclass" unable to receive or afford the media experiences available to the majority of the population. Furthermore, the provisions are aimed at reducing the gatekeeper powers of cable TV operators by depriving them of editorial control over at least a portion of the system's channels. Private operators do not operate under such restrictions, and thus save their costs. Most particularly, a typical municipal franchise contract, as well as the 1984 Cable Legislation, permits the franchising authority to collect 5% of gross revenues from a cable operator. No similar payments need to be made by private cable operators (though they do pay landlords.)

According to William Finneran, the chairman of the New York State Commission on Cable TV, "the proliferation of private cable will emasculate franchised cable operators' ability to wire non-attractive areas." CableVision. "NY SMATV Systems Gset Go-Ahead." March 5, 1984, p. 49.

For all of these reasons, SMATV operations are a thorn in the sides of municipalities, regulators, and cable companies --

parties which do not normally see eye to eye.

However, by now the confusion has been resolved insofar as the pre-emption of local and state regulation of private cable has been firmly upheld by the courts.

III.5 Regulation of Access by Public Cable

The second significant legal issue involving private cable concerns the access rights of its competitors, in particular of cable television. Given the relative high penetration rate that must be achieved for break-even by private cable system, direct competition from "public" cable television operators may well make SMATV uneconomical. Cable television operations enjoy certain economies of scale [Eli Noam, "Economies of Scale in CableTelevision", Working Paper, 1984] and therefore may still be the low cost provider despite the regulatory burden.

Conflicts about cable's access rights to apartment houses have been persistent. The local franchise grants a cable operator the right of access to public rights of way, but does not carry the right to enter private property unless state law creates such access rights. A cable operator must negotiate such rights with the landlord. From the landlord's perspective, he deserves compensation.

To protect tenants' provision with cable television, several states have passed statutes affording cable companies the right of access over landlord's objections. Reasonable charges may be demanded from the cable company or the subscriber, but they are limited to an amount that would be determined by the a state agency.

Loretto, a New York Landlord, nevertheless denied access to Teleprompter (now Group W Cable) of Manhattan. This led to litigation that ultimately reached the U.S. Supreme Court in Loretto vs. Teleprompter, (458 U.S, 419 (1982)). The court agreed in principle with Loretto's argument that such access rights to real property were a taking, even though the intrusion was only minor; on the other hand, the court held that a proper compensation would overcome such frustration of property rights. The New York State Commission on Cable Television, called upon to set such compensation, found that $1 per year for building was a just compensation. Thus, Mrs. Loretto had won her constitutional point, but the reality of a $1 per year compensation made it a pyrrhic victory indeed. For practical purposes, then, the state's right to establish access rights of cable companies to apartment complexes was established.

It has been argued that in setting compensation to landlords that their property values have not been negatively affected by the cable television's access; to the contrary, they may well have gone up. 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. Thus, given the lack of loss in property values, only a symbolic compensation has been held to by necessary by regulators. However, this economic logic is seriously flawed. The true measure of economic loss to landlords is not a reduction of property value, but in the value of the foregone earnings that they may have realized by setting up private cable distributions. As has been discussed above, for a thousand unit apartment complex, realized profits may be $15,000 per year, without any capital investment on the part of landlords. In turn, this earning potential should reflect itself in a higher present value. It is this increase in present value that is subject to a taking. The value of a cable - company served apartment building must be compared to an SMATV - served apartment building, rather than to an entirely un-cabled building.

Clearly, since landlords benefit from participation in the proceeds of private cable, they have an incentive to preclude cable television, unless adequate compensation is paid by cable operators. On the other hand, where cable access is granted as a measure of right, the compensation to the landlord may be set so low as to encourage entry that jeopardizes the economic viability of the private cable. And yet, affording private cable protection from cable television may lead it to complacency in the provision of services. How then can this dilemma be resolved? Both the solution of keeping cable and SMATV apart, and that of a Loretto-type virtually free access are extremes on a spectrum that permits intermediate solutions. A local cable television operator must be given the opportunity to reach willing customers, even where private cable exists. Such rivalry is not only likely to lead to better program and price offerings to viewers, but also to a technical innovation of existing systems which might otherwise lag. (Eli Noam, "Productivity and Innovation in Cable Television," Working Paper, 1984) To the extent that through such access private cable earnings are reduced, landlords (but not SMATV operators) ought to be compensated Absent that, they will find ways to obstruct the cable operator.

A competitive provision of cable services simultaneously by an SMATV system and a franchised cable operator would imply two parallel sets of wires in a building. This duplication is uneconomical, though it may have some offsetting benefits of increased efficiency and productivity.

A sensible solution would therefore be to let the cable operator have the right to some transmission capacity on a landlord provided internal wiring, with the right to upgrade this capacity when it is not adequate. Thus, in effect cable operators would be able to interconnect into a building's private cable system and reach potential subscribers directly. This 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 rights to provide his own communications system are balanced against the rights of the tenants to choose alternative services and to participate in a larger public network. In the video mass media field, it is too early to discuss such approach. 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, as they inevitably must, such shared approach, based on access rights and compensation, seems a sensible arrangement.

Into such a private cable system other suppliers' programs could also link up, on the basis of capacity leased contractually. One pricing mechanism could be for the landlord to charge a flat fee per video channel, plus a percentage of gross revenue of a program channel.

III.6 Private Cable Regulatory Outlook

One of the major issues that will shape public policy towards the emerging greater role of private cable is the regulatory imbalance relative to franchised cable television. Despite the trend to deregulate the latter, it is nevertheless subject to a variety of obligations, such as must-carry rules, PEG channels, leased channel provision, a 5% franchise fee to the franchising authority, and universal service obligations. The social goals behind these regulations are not likely to disappear. In this situation, the development and success of a transmission system that prospers from the lack of these requirements will be controversial.

It is of course possible that a "level playing field" would be created by the total deregulation of public cable. But that is unlikely, not the least because thousands of municipalities will oppose having to give up their share in cable's revenues. An elimination of the must-carry rule would require a frontal assault on large segments of the broadcasting industry. Hence, one cannot expect the regulatory imbalance between public and private cable to be resolved by a full deregulation of public cable.

Further, it is likely that landlord-affiliated private cable will generate its share of bad publicity. It is unavoidable that some operators will be overly aggressive in charging tenants for their services, while some others will be slow in bringing their system to a reasonable level of channel capacity and service reliability. Still others may load the video channels with programming of their own ideological or moral bias, or geared towards tenant types of their preference. As such instances occur and receive publicity, public pressure for some form of private cable regulation will grow, fueled by tenants who would like to reduce their monthly payments, and municipalities eager to form a broader base of cable revenue. It seems, therefore, realistic to expect that as private cable becomes a larger presence, it will be subject to regulatory burdens that more closely resemble those of public cable. This is likely to include a fee similar to the municipal franchise fee of 5% of cable. It may also include some obligations to carry public access type programming. Furthermore, as has been discussed above, landlords may be required in the future to provide franchised cable TV with access rights in return for a fair compensation. This access can be either through physical wiring, or through a cable system's rights to lease capacity on the private cable's wiring.

On the other hand, it is also reasonable to expect that in time the geographic limitations that regulate private cable to a single property would break down, and expansion could take place that would reap the benefits of economies of scale. Already, the legal barriers to exclusive or quasi-exclusive franchising are breaking down, as in a recent Ninth Circuit decision affecting a California franchise. As in the case of telephone and data communication, the emerging small private forms of communication distribution will thus 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 policy goals that have characterized American communications for a long time, and that include universal service and diversity of information sources.

Opposition to this participation in the public goals of telecommunications policy are natural for profit maximizing firms responsible to their shareholders or partners. However, the alternative to sharing the financial and diversity burden is likely to be restrictive regulation on operations and expansion, which would burden private cable financially, and reduce its technological flourishing and expansion into other communication uses.

IV. INTERNATIONAL COMPARISONS AND OUTLOOK

The array of different transmission links and networks is indeed impressive. It fortells a future in which differentiated communication needs can be flexibly met u nder a competitive system that is customer-oriented and dynamic in technology and applications. On the other hand, such a system is likely to lose the economies of scale of large-scale operation and the economies of scope (of offerings of multiple services), that have been the mainstay of conventional telephony. It is important to recognize that the approach of communications diversity which the U.S. has chosen, or more accurately has often let happen, is not the policy pursued in almost all other industrialized western countries. If anything, the trend in continental Europe is the opposite. There, in telephone communications, government policies seek an integration of existing separate networks, such as a public switched network, the telex network, and high capacity data networks into an integrated services digital network (ISDN). This trend towards ISDN--after agreements on standards under the auspices of the Consultative Committee on International Telephone and Telegraph (CCITT) to 64 kilobit channels and standards protocols--is progressing in steps. The digitalization of switches and of main trunks of the public switched network is in full swing and it makes possible the inclusion of higher speed data traffic on the general network. As a further step, pilot projects have begun to include the transmission of video signals of cable television linking it with voice and data service. In Germany, this is undertaken in the BIGFON project (broadband integrated glass fiber local network). In France, too, government authorities are planning the provision of cable television through fiber optic star configured networks, which could be integrated with the general public telephone network. The latter integrations, however, are a long way off. (Eli Noam, European Telecommunications in Transition, forthcoming).

Similarly, on matters of service competition, whether it be long-distance networks or local, the postures of the government run telecommunication authorities, (known as PTTs) are, with the exception of Great Britain, hard line. They fight any infringement of their monopoly, and protect it with the arguments of preventing cream skimming, economies of scale and scope, and universal service.

Some of the PTTs are also making the intensive use of communications through leased lines less attractive by moving from a flat rate pricing to usage sensitive pricing. They have also banned, including in Great Britain, the resale or even sharing of communications capacity over leased lines.

The PTTs are in their respective countries extremely powerful entities. The German Bundespost, for example, is the country's largest employer and investor. It operates outside the budgetary authority of parliament, being self-financed. It is politically supported by the government bureaucracy, by the political left (for ideological reasons), the equipment manufacturing industry (whose huge customer and trade protector it is), the unions (for reasons of employment security and ideology), the small rural towns (for regional protection) and the poor (for reasons of social policy.) A similar constellation is quite typical for most European countries. In France, the Mitterand government has nationalized and reorganized most of the telephone equipment industry, and has thus (at the same time that the U.S. has cut up AT&T), created for the first time a comprehensive government owned telecommunications complex of equipment manufacture and service monopoly. Great Britain has introduced potential competition and privitization, but this policy is essentially one formulated from above in order to encourage British technological competitiveness, rather than a response for changes pressures below by entrepreneurs, equipment suppliers, and users.

In the European context, the increased integration of communications services into the one powerful and complex ISDN has provided PTTs with a new argument for their exclusivity in that the creation of such a network is expensive and capital intensive and, it is said, therefore requires special protection from cream skimming. Though European PTTs have argued in the past that they needed profits in business communications to subsidize universal residential service, in the case of the investments for ISDN, which is largely business oriented, nearly the opposite is true. Protection from competition re-entry is now being claimed in order to make it possible to provide business with a high performance communications network.

The aspect of integration in ISDN also strongly stresses the economies of scope element of telecommunications provision, and adds it to the traditional economies of scale argument that communications monopolies have traditionally invoked.

Similar centralizing developments take 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. Cable master antenna systems television used to be privately provided, and permitted apartment house complexes and sometimes entire new residential developments to be linked by coaxial cable. In recent years, several PTTs have imposed the requirement of licensing for such facilities, which they interpret restrictively.

V. Outlook

This paper has discussed the emergence of private communications sytems, both in the office communications setting and in the residential mass media market. We have seen how the developments in both these areas exhibit strong parallels. Business-oriented private local telephone and local area networks and the consumer-oriented private cable networks are likley to increasingly overlap, and are likely to fulfill some of each others functions. In both instances, one can observe the emergence of private building based networks that are landlord controlled and largely unregulated. In each instance, this development involves a partial separation of the communications facilities of users from the established "public" systems of local telephone companies and cable televison operators.

There is no reason to assume that this process would stop soon. STS and LANs are driven by economies of scale, and their logic dictates expansion. In the case of STS and LANs, this means the clustering of multiple office and apartment buildings into local networks. In the case of cable television, it is likely that the managerial clustering that is already taking place will be augmented by a physical expansion of the service beyond the confines of property lines. Already, court decisions have raised doubts about the legality of quasi-exclusive municipal franchising. As private cable operators stand ready and willing to expand into neighboring buildings, municipal restrictions are likely to crumble. Hence, we can expect here, too, a carving out of private cable neighborhoods from the public cable networks.

These developments contibute communications resources and flexibility to business users and typically middle class residents; but at the same time, they are leaving behind those that are outside these private systems and require them to contribute more to maintain their public communications services. Since the public and universal goals and service obligations are not likely to be dropped, the policy alternatives are either restrictive regulations that are both costly and ineffective or a different form of supporting the communications services that is socially desirable. The less restrictive alternative is for these new local networks to become subject to some forms of levies or fees that will support universal service, and which would be similar to fees on the public systems, the proceeds would be used for some form of universal service fund. It is in the interest of social policy, technological progress, and communications policy to establish a social compact of telecommunications policy in which deregulation is encouraged but where communication needs of those who are worse off than before are supported by the other users. The alternative are several decades of regulatory strife.