From Liberalization to Open Networks

A Review of Open Network Architecture and the Evolution of Telecommunication Policy in the United States

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The Settine

In the United States, the system of public networks has been subject to forces of centrifugalism. While technology is one of the reasons, the driving force for restructuring of telecommunications has been the phenomenal growth of user demand for telecommunications, which in turn is based on the shift toward a service based economy. The shift towards such activity in highly developed countries was partly due to their loss of competitiveness in traditional mass-production vis-a-vis newly industrialized countries. It was also partly due to a large pool of educated people skilled in the handling of information. In consequence, electronic information transmission, i.e., telecommunications, became of ever increasing importance to the new services sector. It also became a major expense item. This made the purchase of communications capability at advantageous prices more important than in the past. Price, control, security, and reliability became variables requiring organized attention. This, in turn, led to the emergence of the new breed of private telecommunications managers whose function was to reduce costs for their firms, and who for the first time established sophisticated telecommunications expertise outside the traditional carriers. These managers aggressively sought to establish low-cost transmission and customized equipment systems in the form of private networks of power and scope far beyond those of the past.

Economic and technological development lead to an increased specialization. It became

difficult for the traditional carriers to keep up with all customized needs.

The globalization of commerce was another factor in increasing the forces of centrifugalism. If the communications system 1s restrictive, firms are disadvantaged internationally and choose to locate some of their activities elsewhere.

For satellite transmission, in particular, the marginal cost with respect to distance is virtually nil. Fiber-optic links have also lower distance-sensitive costs. The implications are that communication flows can be routed in indirect ways to circumvent regulatory barriers and restrictive prices. Arbitrage becomes possible. This undermines attempts to administratively set rules for prices and service conditions.

For these and other reasons, the public networks are subjected to centrifugal forces and the unified system of the network unraveled.

The History of U.S. Telecommunications Liberalization

To understand today's move to an open network environment in America, it is first necessary to understand yesterday's creation of a monopoly that was never quite stable. Telecommunications in the United States began in 1836 with Samuel Morse and his electromagnetic telegraph. The first US telegraph message, sent from Baltimore to Washington in 1844, was "What hath God wrought?" The same question was being asked one and a half centuries later when US telecommunications were being transformed by the policy of liberalization.

The U.S. has always been at or near the forefront of change in telecommunications,

partly due to its great internal and external geographic distances. From the beginning, the telecommunications system was never the centralized monopoly system prevalent elsewhere. In 1876, Alexander Graham Bell, a teacher of the deaf in Boston, introduced a workable telephone. Bell's father-in-law and other investors launched the Bell Telephone Company. Recognizing the huge task at hand, they first offered the patent rights to the dominant Western Union telegraph company. But that firm chose to protect its existing market by erecting walls around it rather than collaborate with the new one. Western Union never recovered from its imperfect foresight, and its fate has always been a fearful reminder to telephone companies of the danger in abandoning important new services and technologies to others. This attitude still affects today's telephone company leaders when it comes to computer enhanced telecommunications services.

The Bell firm grew and prospered, yet its dominance seems to have been not so much the result of a technological "natural monopoly" but rather the outcome of an effective managerial strategy led by its early guiding spirit, Theodore Vail. That strategy centered around the control of interconnection: of equipment to their own network; of rival local networks to Bell local networks; and of rival networks to the Bell (AT&T) long distance system.

Once the basic Bell patents expired in the 1980s, independent competitors entered those areas not serviced by Bell concessionaires, especially in rural districts and areas facing particularly high prices. Given the success of the new competitors, many followed their path

at an increasing rate rising from 199 entrants per year in 1895 to 508 in 1900 alone.[1] In manufacturing, Kellogg Switchboard and Supply, Automatic Electric Company, and Stomberg-Carlson Telephone Manufacturing Company provided sources for equipment not available to the independents through Western Electric, allowing them to compete at a much closer level.[2] For example, by 1904 independents competed against Bell in every significant community in Western New York, Texas, Illinois, and California.[3] In several major cities several systems competed side-by-side without interconnection.

After a few years the independents were nearly equal in size to Bell, and covered a much greater area in terms of geography. Robust competition existed not only in the provision of local service but also in the manufacturing of switching and customer equipment. The one main difference between the two segments, however, was interconnection. While the Bell Telephone system was fully interconnected on a national level through its long-distance network, the independents operated on a fairly limited regional scale. The Bell firm which has taken the North American Telephone and Telegraph squeezed the independents quite aggressively, and forced many to leave the market or sell out to AT&T.

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[1] Brock, Gerald W, *The Telecommunications Industry,* Cambridge, Mass.: Harvard University **Press,** 1981, p. 112.

[2] lbid.

[3] Alan Stone, Public Service Liberalism, (Princeton University Press, Princeton, New Jersey, 1991) p. 138 (referring to: J.J. Nate, Texas and Telephones, Telephony (1904): pp. 332-334; and E.J. **Mock,** Story of the States -- Illinois, Telephony (January 1907) pp. 1-8; and B.G. Hubbell, lnde_pendent Telel}hony in the Empire State, Telephony 6 (1903) pp. 210, 211; and _A.B. Cass, Inde_pendent Telephony in Southern California, Telephony (November 6, 1909), p. 459).

In 1897 the independent exchanges established a trade association which tried to put together a long distance network between its members which, if completed, would have been larger than AT&T. Absence of interconnection rights to AT&T's network led to its failure.

Several independent companies brought antitrust complaints against AT&T. As the number of lawsuits mounted, and as they were joined by Justice Department actions, AT&T chose in 1913 to negotiate an agreement with the US government known as the *Kingsbury Commitment.* AT&T guaranteed existing independent telephone companies interconnection to its long distance network and agreed not to expand further geographically by acquiring competitors or entering their territories. It also promised to limit its activities to communications. This governmental action to limit AT&T from total market dominance was part of a general trend of antitrust policy. Americans had become concerned with the enormous growth of business entities in the decades following the Civil War. There has always been a strong populist current opposing domination by big firms. This distrust was shared by the political left, farmers, small businesses, and westerners. But, at the same time, the primacy of private business in the economic system was never in doubt.

This political constellation led soon to the establishment of a regulatory system of utility commissions on the state level that supervised privately-owned utilities, including telephone companies. The private utilities were required to interconnect by state law, thus enabling the existence of a system of multiple carriers. This arrangement contrasts sharply with the system of centralized state monopoly telephone administrations prevalent in most countries.

In the United States, too government policies shifted towards monopoly. In 1918 the

California Railroad Commission decided that "there should be one universal service, as this will enable complete interchange of communication ... this, in addition to the usual advantages of consolidation of utility properties resulting from the elimination of duplicate propeny and duplicate operating expenses" .[4]

And a 1919 decision by the Missouri Public Service Commission concluded that "competition between public service corporations was in vogue for many years as the proper method of securing the best results for the public ... The consensus of modern opinion, however, is that competition has failed to bring the results desired ... Nearly all of the states in this country have adopted laws providing for the regulation of public service corporations … It is the purpose of such laws to require public service corporations to give adequate service at reasonable rates, rather than to depend upon competition to bring such results".[5]

AT&T's dominance grew, with the support of state and federal regulations. By 1934 AT&T built and owned 80% of all telephones and access lines in the United States and operated the only national long distance network. But the competing local services took a long time to disappear. In 1945 the last major competitive local loop service in the U.S., the Keystone Telephone Company in Philadelphia, was shut down. At the time of Keystone's shutdown it had

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[4] In Re Pacific Telephone & Telegraph Co., 15 Cal. R.C.R; 993 (1918)), quoted in Alan Stone, Public Service Liberalism, (Princeton University Press, Princeton, New Jersey, 1991) p. 126. An identical conclusion was reached by an Indiana regulatory board which concluded that the merging of competing operations "should be encouraged even if it is resisted". Central U. Teleph. Co., PUR 1920B, p. 813; and Indiana Bell Teleph. Co., PUR 1922C, p. 348.

[5] Johnson County Horne Telephone Co., 8 Mo. P.S.C.R. 637 (1919), quoted inAlan Stone, ·Public Service Liberalism, (Princeton University Press, Princeton, New Jersey, 1991) p. 127.

been providing its business customers with services that were then unavailable on the Bell system. One such example was "call through" which connected incoming calls directly to individual extension telephones without going through a private branch exchange operator.

Yet AT&T dominance was soon under attack. The "Walker Report", authored by one of members of the new Federal Communications Commission, challenged AT&T's vertical integration. World War II delayed any follow-up to the Walker recommendations, but once the war was over, the Justice Department filed an antitrust suit in 1949.

Intervention by the Defense Department, as well as the 1952 presidential election, stalled the case. In 1956, under a more supportive Republican administration, AT&T achieved a favorable settlement of the case. It was not forced to divest itself of its Western Electric manufacturing arm, but its activities were limited to telephony. Western Electric was confined to telephone-related research and manufacturing operations, and had to establish a more liberal policy in the licensing of its patents. But on the whole, AT&T had succeeded in avoiding a possibly disastrous antitrust judgement, though it had also, once again, watched its routes of expansion close.

In the early 1950s, universal service penetration in the U.S. was largely completed. The telephone reached most households, and an increasingly elaborate system of transfers kept residential rates low. This soon led to pressures for change by those large business users whose contributions supported low residential charges, and from alternative manufacturers of equipment. After 1956, the United States hesitantly began a policy of liberalization of entry and interconnection. The FCC had already been authorized in the Communications Act of 1934, to

mandate carrier interconnection when in the public interest. Under pressure from the electronics industry, whose importance grew in World War II, the Korean War, and the consumer prosperity of the 1950's, the interconnection of terminal equipment, then more restrictive than in Europe, was established. The two key decisions were *Hush-A-Phone* (1956) and especially *Canerfone* (1968), which permitted non-AT&T equipment to be connected to the network.

This interconnection policy was also extended to transmission. Military research, especially in the radar field, had opened the microwave spectrum to communications. In 1959, the FCC's *Above 890* decision permitted large users to operate in-house microwave long-distance service. These users felt that they were increasingly subsidizing local service and small customers, and they sought to move at least part of their traffic off the common system. By 1969, one microwave delivery company, MCI, won a coun ruling against a reluctant FCC and an adamant AT&T to permit "specialized common carriers" to provide private line service for *other* users. From there it was an inevitable step to interconnection. MCI soon wanted to expand beyond private line services into general public switched service. To do so successfully it had to be able to interconnect with AT&T's local networks in order to reach customers and be reached by them. This was permitted by the FCC in its *Execunet* decision (1978), which basically held that a common carrier such as AT&T has to provide access to all users, whether they were small residential households or AT&T's own competitors. Thus, by 1975 AT&T found itself once again facing a facilities-based service competition in telephony.

The policy changes were partly due to a general political and economic philosophy of limiting the role of the state, which made the public more receptive to allowing new entrants as

an offset to corporate power, and as a substitute to direct governmental intervention. This philosophy far antedates the conservative Reagan and Bush administrations. Inspired by Lockean principles of natural law, the classic American ideology of government seeks individualism, fragmentation of private power, limitation of government (with the major exception of its role in national security), and protection of property rights and contracts. As applied to telecommunications policy, this philosophy justified a governmental role that is far narrower than in most other countries: it centered on permitting competitive markets to limit the exercise of dominance by any single firm, and in permitting users to choose among service providers. This view is shared by those Democrats who are distrustful of concentration of private economic power and those Republicans opposed to government interference.

In 1974, the FCC accepted applications for *"value added carriers"* which leased services from common carrier and enhanced them with additional features and capacity. Following this decision, the FCC in 1976 went one step further and deregulated the resale and shared use of interstate private lines, even if they did not add value, by removing all legal restrictions *(Special Repon in* C. C. *Docket 79-164; adopted 12119179').* This decision was significant since the established carriers had previously attempted to restrict sharing and resale. In essence, it created a new sub-industry of resale companies. Before, AT&T left it to its own judgement whose resale it approved. It prohibited the resale and shared use by some private companies, but it leased lines to others for resale, such as the telegraph company Western Union.[6] Through the

[6] Wiley, Richard "Competition and Deregulation in Telecommunications", Telecommunications in the United States: Trends and Policies, Artech House, 1981, pp 53-4.

FCC's actions, the reselling domestic local and long distance transmission became allowed and is extensive. This includes sharing of bandwidth on satellite transponders and the reselling local transmission. Resellers do not require an FCC authorization; to sell directly to the public, they need only file a notification with the FCC and some state PSCs. Where there is no general offering - for example, one bank reselling its surplus transmission capacity to another - no filing is necessary. Private networking--often as sharing arrangements within large users or user groups-- is prevalent. Many early resellers were companies that had their own communications requirements, e.g. the Southern Pacific, Railroad company which led them to lease private lines from carriers and develop their own infrastructure. From there, it was only a small step to lease their excess capacity to others. And indeed, Southern Pacific Railroad (SPR) started its own long distance carrier, Sprint.

Continuing the liberalization of resale, in 1980 the FCC also ended the restrictions AT&T placed on the resale of some of its specialized offerings, such as bulk service (WATS) and freephone (800) service.

Facilites based alternative long-distance service started, as mentioned, with microwave service in the *Above 890* (1959) decision, and was expanded by *MCI* (1969) and *F.xecuner* (1978). The impact of long distance competition on AT&T was two-fold, in terms of market share, and in terms of structural integrity.

AT&T's long-distance market share steadily declined each year, reaching around 61% in 1992. The market, though flat in dollar terms, grew strongly in terms of traffic, increasing .by 13% annually and doubling usage from 37 billion minutes in 1984 to 75 billion in 1990.

Americans make substantially more phone calls per capita (1700) than users in other countries - two and three times as many in 1988 as the British (800), Japanese (550), Germans (500) and French (400).

Even more far-reaching to AT&T was the impact of competition on its corporate structure. Competitive developments eventually led to the break-up of AT&T, the world's largest telecommunication organization at the time. It was brought about by a 1974 Justice Department antitrust suit, (as well as a huge private anti-trust case by MCI) based on unfair business practices the firm allegedly employed to suppress its competitors, and resulted, after a 1982 consent decree, in 1984 in the most massive reorganization in business history. The divestiture agreement put AT&T' s local Bell operating companies (the BOSs) - approximately two-thirds of the company's assets and employees - into seven Regional Bell Holding Companies (RBHCs, often called 'Baby Bells' or RBOCs). These provided mostly traditional local exchange telephone service, but increasingly and aggressively sought other opportunities inside and outside the communications field and their service territories, and are becoming global and diversified communications companies.

The government's main argument for the splitting-up of AT&T was that it was inherently incapable of providing equal interconnection into its local network to its long distance competitors. Since regulatory requirements did not work in the·face of AT&T persistence, it was necessary, the government argued and the court agreed, to split off the company's local operations, the source of its bottleneck power. Thus, the resistance to interconnection brought .down the world's foremost telecommunications provider.

As a result of the divestiture decree, local exchange companies must grant access to all long distance carriers and to all telephone users. Customers indicate their "primary" carrier to which domestic and international long distance calls are automatically routed by a local exchange. Other carriers can be accessed by dialling a prefix number. Such a system is extended in several states to shorthaul (intra-LATA) long-distance service.

U.S. liberalization did not stop with domestic services. The FCC, in its 1974 *Domestic Satellite Decision* set an "open sky policy" which prevented AT&T from owning satellites but encouraged other companies to enter. For international satellite traffic, INTELSAT, the international consortium, was the satellite service provider for all civilian stationary international satellite communications, and its exclusive U.S. service provider was COMSAT, a "carriers' carrier" controlled partly by private investors, partly by the government.

In the spirit of initiating increased international competition, the FCC in 1983 began to approve the entry of other companies into the international satellite communications systems market. The intent of the FCC policy was along the lines of the domestic "open sky."

In 1977, the FCC deregulated receive-only television satellite services. The effect was an explosion in satellite services for television broadcasting, and ultimately led to further growth in all satellite services.[7] In 1980, the advent of Ku-band (and later Ka-band) satellites permitted companies to install smaller rooftop versions of earthstations so-called VSAT systems. These systems were effective for companies with data transmission requirements to multiple locations.

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[7]**McK.night, Lee,** "Implications of Deregulating Satellite Communications", ·Telecommunications Policy. Dec 1985, p. 276-80.

The approval of low earth orbit (LEO) satellites especially for mobile Communications is the next step.

The FCC also has sought to increase competition between types of transmission media. Prior to the advent of communications satellites, the FCC focused on authorization for and ownership of submarine cable facilities. The FCC scrutinized applications for these facilities to decide whether their need justified an increase in a carrier's rate base. Partly because investments in international submarine cables were visibly large in comparison to investments in most domestic facility application, the Commission reviewed them closely.

In 1983 Orion Telecommunications applied for a license to build a private satellite system over the North Atlantic. Orion wanted to launch its own satellites and not make use of any INTELSAT facilities. The application and others were opposed by foreign governments. d touched off a debate within the U.S. government as to whether the U.S. should endorse or permit international systems to bypass INTELSAT. A large part of this concern emanated from provisions in the INTELSAT agreements concerning non-INTELSAT international satellite systems.[8]

The FCC eventually granted several applications subject to limited conditions. [9] Comsat and INTELSAT sought congressional legislation to preclude such systems or to restrict their operations. Eventually, the private satellite system - Pan AmSat - secured an agreement with

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[8] Article XIV(d), INTELSAT Agreement, Aug. 20, 1971, 24 U.S.T. 564, T.I.A.S. No. 7532.

[9]In the Matter of Establishment of Satellite Systems Providing International Communications, CC Docket No. 84-1299, FCC 84-632 (Jan 4, 1985).

a foreign carrier and began in 1986 international satellite service.

In international submarine cable operations, the PTAT transatlantic cable received a license. The competitive submarine cables generally faced less regulatory opposition, and several private fiber links are operating. In 1982, the FCC forced COMSAT to restructure its services and permitted the firm to provide services to other end users, not just carriers. In addition, a private company could lease part of a circuit if it did not project enough demand for a full circuit. [10] The FCC also leaned toward direct access to INTELSAT' s network, bypassing COMSAT altogether, but a court order led to reversal of that policy, by identifying COMSAT as the US representative in international satellite issues. [11] In 1983, the and 1986, "streamlined regulation" for satellite carriers was introduced and simplified.

The vast Bell system and all of its customers -- comprising 80% of the total market -- were in the past substantially foreclosed to other suppliers by its vertical integration with AT&T's manufacturing subsidiary, Western Electric. Although many expected the BOCs to cling to AT&T as their equipment supplier after divestiture, in fact they embraced a wide variety of non-AT&T equipment quite rapidly. Procurement of network equipment by local telephone companies is governed by their obligation to state regulators to pay the lowest possible prices (where rate-of-return regulation applies) or by the incentive to keep cost savings as profits (under price caps).

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[10]McKnight, Lee, "Implications of Deregulating Satellite Communications", Telecommunications Policy. Dec 1985, p. 276-80.

[11]lbid.

AT&T' s national market share for central office switches dropped from 70% in 1983 to 53 % in 1989, with Northern Telecom reaching 40%.[12] Central exchange equipment costs declined from approximately $325 per digital line on an industry-wide basis in 1984 to less than $100 in 1991. This is significantly lower than those paid by telephone administrations in many other countries. AT&T has steadily expanded its telecommunications equipment business internationally through various alliances. On the other hand, it has not fared well in the computer field. In 1990, after six years of losses, it acquired the large computer firm NCR for $7.4 billion, to become the world's fifth-largest computer manufacturer. More generally, the firm faces continuing obstacles in attempting to reconcile its dual roles as communications service provider and equipment manufacturer. Its service activities are often in conflict with its best customers, the local exchange companies. As a consequence, AT&T's home base is less assured than those of its global competitors.It is difficult to separate an opening of the market to an interconnection of equipment from that of other carriers, because equipment may be merely the termination point for aggregated traffic by a service providers. As mentioned, the *Canerfone* Decision (1968) required AT&T to permit connection of non-AT&T equipment to AT&T lines. After some rear-guard resistance by AT&T about equipment approval and interfaces, the FCC allowed in 1975 terminal equipment to simply type-registered and then sold

[12] Egan, Bruce L. and Leonard Waverman, "The State of Competition in Telecommunications," in *After the Breakup: Assessing the New Post-AT&T Divestiture Era,* -edited by Barry G. Cole. New York: Columbia University Press, pp. 285-304.

for connection to the local loop network.[13] The next year, the registration process incorporated PBXs.

This decision opened also the PBX market to non-AT&T (Western Electric) equipment, including to international vendors. Digital PBXs increased from 22 % in 1980 to almost 90% in 1990. [14] While in 1969 there were four PBX manufacturers, by 1980 there were more than 30 vendors on the market. [15] The PBX became a gateway to the local loop and long distance carriers. 1991 market share figure are shown in the adjoining table.

199F PBX Market Shares By Lines

AT&T	28%
Northern	23%
ROLM/IBM	14%
NEC	6%
Mitel	5%
Siemens	3%
Fujitsu	4%
Others	17%

SOURCE: 1992 NATA Telecommunications Market Review and Forecast.

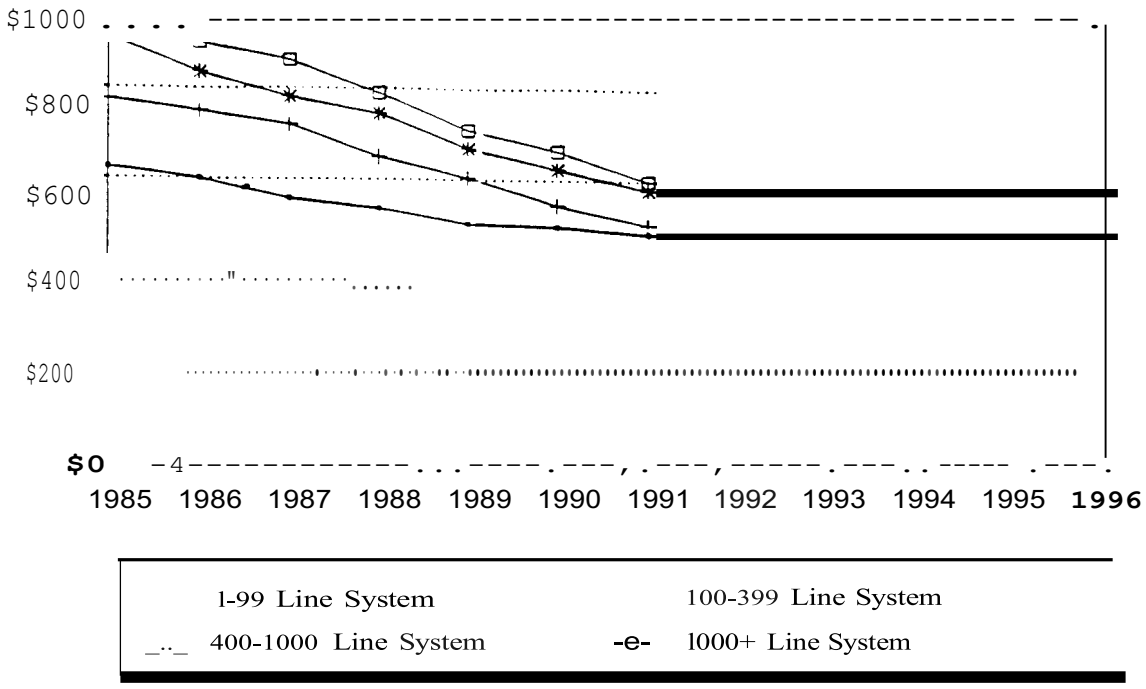
In 1981 a congressional subcommittee initiated hearings into allegations that AT&T, then vertically integrated in equipment and local service, purposely deemphasized the Centrex market in order to dominate the PBX business. It was felt that the Bell companies were attempting to block the entry of new PBX participants by inducing their traditional customers to sign long term

[13]Phillips, Charles, The Regulation of Public Utilities, Public Utilities Reports Inc., 1984, p. 650.

[14]Telecommunications in Transition, "InteCom", Harvard Business School, 1986. p.51.

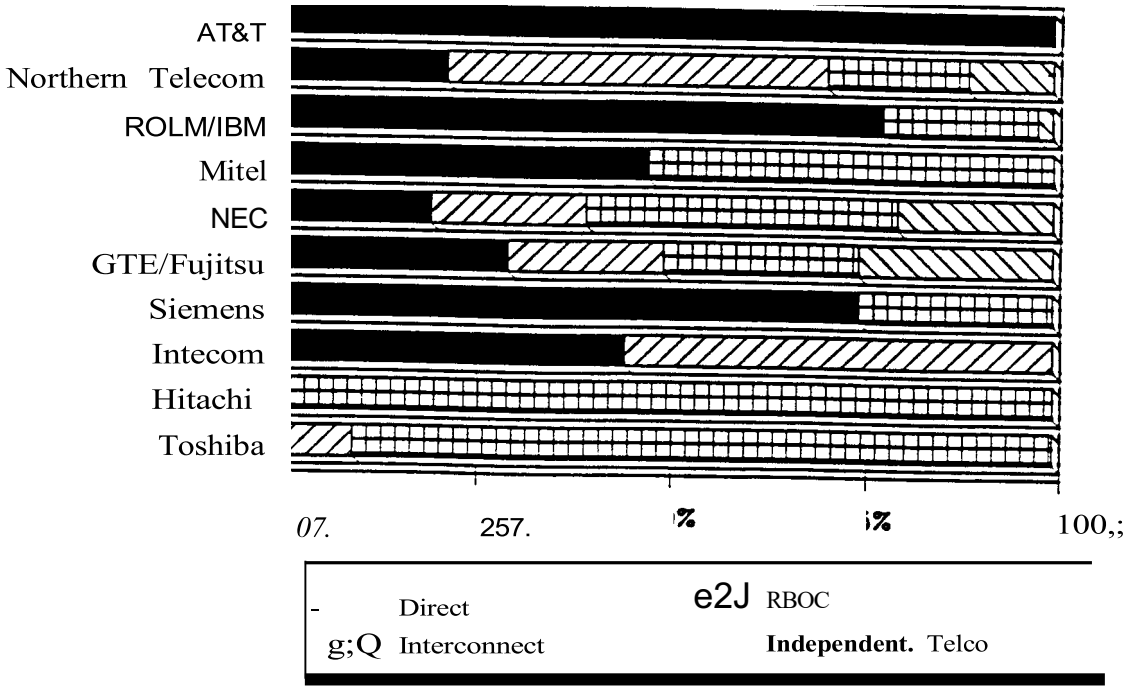
[15]0ECD Report, Telecommunications, 1983, p. 76.

PBX PRICES PER LINE BY SYSTEM SIZE, 1985-1996



Source: NATA **Market Research** Department

1991 PBX DISTRIBUTION CHANNELS BY COMPANY



Source: NATA **Market** Research Department

PBX contracts.[16]

After the divestiture AT&T had to sever its relationship with the BOCs, and the BOCs were no longer allowed to manufacture equipment, but they retained CENTREX services, which they now promoted vigorously. The complaints were now in the opposite direction.

In the process of liberalization, the FCC had to balance two principles -- non-discrimination (the "level playing field," as it became known) and the survival of competition. Even on a level playing field (let alone a discriminatory one) the new, young, and small competitors may not survive. And without competitors there would be no competition, pulling the rug under an entire policy. In consequence, the FCC has given some "infant preference" to the new entrants. In the long distance field, it set an access charge that was for lower than that paid by AT&T to it own local exchange companies. This was justified on the grounds.t at AT&T had preferential access, for example, no long access code was necessary such as the one to reach MCI, and better quality connections.

As "equal access" was phased in by the divested BOCs, these preferences to AT&T's competitors were being phased out. AT&T was also defined as a "dominant carrier." As such, it was under obligations its smaller rivals did not have to meet. For example, differences still exist in the regulation of dominant and non-dominant providers of inter-exchange services. Because the FCC still considers AT&T to be the dominant service provider, they are regulated differently than non-dominant carriers, such as MCI and Sprint, who continue to receive a

[16]Bolter, Mcconnaughey and Kelsey, Telecommunications Policy. p. 278-9.

discount through the Local Switching Rate Element (LS1, LS2). As per the FCC Forbearance rules, the FCC requires that AT&T file tariffs while the non-dominant carriers have no requirements. On November 13, 1992, the U.S. Circuit Court Appeals for the District of Columbia struck down the FCC Forbearance Rules. The FCC is likely to appeal this decision.

As a response to the growing private line industry, AT&T developed updated private line tariffs accepted by the FCC in 1985. The new pricing was intended to allow AT&T to compete directly in the private line end-to-end business by unbundling and repricing those services. But it was still under an obligation to offer all of its similar customers the sam terms under tariffs. Its competitors, on the other hand, were free to negotiate rates with their customers. In 1986, the FCC permitted AT&T under Tariff 15 to offer differential prices under the existing tariff if a competing company had offered the same to a potential customer.

Pacific Telesis

During the summer of 1992, Pacific Telesis Group reported that it considered spinning off its two LECs, Pacific Bell and Nevada Bell in effect a voluntary self-divestiture number two.[17] One goal was to enable the stock of the holding company to rise. Such was the effect of the AT&T divestiture, whose stock was valued $59.4 billion on the day before the RBHCs were split off. Eight years later, the combined stock of AT&T and the seven regional holding companies equaled $1 1.6 billion. While the Dow Jones Stock Index increased 152% over these

[17]Groves, Martha and James Flanigan, "Dial 'S' for Spinoff," Los Angeles Times, April 17, ·1992, p.D1

years, telephone companies grew at 206%.[18]

In 1991, Pacific Telesis earned total revenues of $10 billion and earned $1 billion, a 10% profit margin. The BOCs generated 89% of these revenues, and 93% of the profits. Spinning off the BOCs would have left Pacific Telesis with several unprofitable small holdings amounting to half a billion dollars in revenue, and PacTel Cellular, which earned $100 million from $600 million in revenue. However, would be free to venture into cable television, manufacturing, information services, and other businesses that Pacific Telesis, like the other RBHCs, are forbidden or dissuaded from entering.[19]

In December, 1992, Pacific Telesis made the move to divest. But instead of setting its BOCs free, Pacific Telesis Group decided to spin off its wireless operations into PacTel Corp., which will include PacTel Cellular, PacTel Paging, a small vehicle location business, and investments in various wireless projects overseas. Unencumbered by RBHC regulations, PacTel Corp. will be free to manufacture. In addition, PacTel Cellular could compete in long-distance telephone service, a possibility perhaps encouraged by rival McCaw Cellular's recent partnership with AT&T.[20]

The remaining companies within Pacific Telesis Group will have to spend less time

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[18]Noll, A. Michael, *The Continuing Saga of Divestiture: Now It's Pacific Telesis's Tum!,* Annenberg School for Communications, University of Southern California, August 5, 1992, p. 1-2.

[19]**Op. Clt., p.** 2-3.

[20]"Pacific Telesis Board Approves Plan to Spinoff Wireless Businesses," *Inside Line,* news release of Pacific Telesis Group, December 11, 1992.

explaining to regulators how they keep transactions of the unregulated. wireless divisions separate from those of the regulated local telephone businesses.

Impacts of Liberalization

What have been some of the impacts of the divestiture? There were many fears, but most did not materialize. AT&T' s long-distance rates were reduced by 40-45 % in real terms in the 1980s. (However, the end-user line charge has partly offset this saving.) The company was fairly successful in protecting its position, though its market share had no place to go but down. If short-haul interexchange service is included in the market definition (i.e. including the local exchange companies regional (intra-LATA) service, AT&T share is slightly below 60%. AT&Ts market share declined each year by about 2%. As a percentage of all users, however, AT&T's share is higher because it has more small subscribers.

AT&T's volume increased at an annual rate of 7.6% , but that of its competitors by almost 40%.[21] The number of competitors increased from 42 in 1982 to 451 in 1987 to 611 in 1990, before backing down to 597 in 1991.[22] Of these, most are resellers. Even if AT&T's market share is still quite substantial, its prices had to come down. MCI, the strongest of AT&T's rivals, by 1988 was healthy and profitable. In 1988 MCI was more profitable than AT&T, which took an extraordinary write off. US Sprint successfully completed a $3 billion

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[21] Data from FCC, Common Carrier Bureau, Industry Analysis Division, "AT&T's Share of the Interstate Switched Market: Fourth Quarter, 1987," Washington, D.C., 1987.

[22] FCC Industry Analysis Division, 1991, *Trends in Telephone Service,* p. 29.

network, and got 40% of the huge federal network contract, FTS-2000. By 1990, the major three carrier were engaged in intense marketing campaigns for customers, based on factors such as quality, reliability, and special features, and not only on price.

The prime beneficiaries were business telecommunications users whose costs, including toll, WATS and private line use, using 1984 as a base of 100, stood at 76.9 in the third quarter of 1988.[23] Some business users cut their communications cost by more than 50%. [24] But residents' overall rates remained relatively stable.

Overall telephone penetration did not decline after divestiture, as was predicted by many, but actually increased, from 91.4% in 1983 to 93.6% in 1991.[25] Though the rate of change for penetration has slowed[26], one would expect an asymptotic leveling off of growth rates as one approaches 100%. For the middle class (household income> $30,000/yr) penetration was 98% and higher.[27] For the very poor (income <$5,000 - 7,500; the official poverty line for a household of 4 was $11,012 in 1987), it rose from 82.7% to 84.9% in 1989 before sliding back to 82.8% in 1991. For Blacks in that income bracket, penetration rose from 74.7% in

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[23] New York State Telephone Association, Inc., Newsletter, Nov. 1988.

[24] Labich, Kenneth, " Was Breaking Up AT&T A Good Idea," Fortune, Jan. 2, 1989, pp.82-87.

[25] FCC Industry Analysis Division, 1991, *Trends in Telephone Service,* Table 1. ,

[26] Kimmelman, Gene and Marc N. Cooper. "Telephone Penetration," in *After the Breakup: Assessing the New Post-AT&T Divestiture Era,* edited by Barry G. Cole. New York: Columbia University Press, pp. 380-88.

[27] FCC Industry Analysis Division, 1991, *Trends in Telephone Service,* pp. 30-39, Table 1.4.

1983 to 80.0% in 1988, and then declined to 74.3% in 1991. For poor Hispanics, it rose from 71.1 to 72.6% in 1989 before falling to 70.2 % in 1991.[28] It needs to be seen whether the 1991 declines are caused by recession or by causes more long term in nature.

For senior citizens, telephone penetration is above the national average: 96.9% for 65-69 years old in 1991, and an even higher 97.3% for those above 70 years. Nor do rural telephone subscribers seem to have been pushed off the network. Rural states such as Iowa, Nebraska and North Dakota have telephone penetration well above the national average (95.6%, 96.0%, and 96.6%). 95% of all farms in the country have telephones.

One of the most immediate concerns was the likely effect of divestiture and liberalization on residential subscribers. Anticipated figures of 300% rate increases were frequently suggested by experts. The reality of has been different. Both in percentages or absolute numbers, the figures are far less dramatic. Nationwide, the Consumer Price Index (CPI) for local telephone service increased 56.2% between December 1983 (when it stood at 98.3) and June 1991 (when it hit 153.6), while in the same period, interstate toll service fell from 101.3 to 67.5, a decline of 33%. The CPI for all goods and services in that period rose just over 34%.[29] Throughout the period 1980-1989, an average household's annual expenditures as a percentage of its total expenditures remained a remarkably constant 2.0%.[30]

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[28] Statistics for low-income Blacks and Hispanics seem particularly subject to substantial swings from one reporting period to the next.

[29] FCC Industry Analysis Bureau, *Monitorin_g Repon, CC Docket No. 87-339, July 1991.*

[30] FCC Industry Analysis Division, 1991, *Trends in Telephone Service,* pp. 14, Table 10.

The benefits of divestiture were not shared equally but correlate with income. One study[31] concludes that the overall effect has been mildly regressive, with the lowest income quintile of households paying approximately $16 more per year due to telephone service repricing, and the wealthiest quintile saving about $15 per year. But these are not especially high figures. Those users whose telecommunications expenditures are weighted toward interstate toll service were most likely to benefit directly from the pricing trends that divestiture shaped. Business users reaped clear benefits. Their telecommunications costs, including toll, WATS and private line use, using 1984 as a base of 100, stood at 76.9 in 1988.[32]

Local rates did not rise as much as initially feared, in part because costs could be contained. Among the reasons were lower interest rates and taxes. But other factors were higher productivity, lower staffing, lower equipment prices, and long-term technological trends. Some of these will be discussed below.

Another feared result of the divestiture was a decline in service quality. However, service quality of local service on the whole, appears to have held steady, partly due to regulatory vigilance. In New York State, both medium-sized and large users reported greater satisfaction with their service than before (from 83% and 65% in 1984 to 92% and 95% in 1986

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[31] Crandall, Robert and Johnathan Galst. "Productivity Growth in the U.S. Telecommunications Sector: The Impact of the AT&T Divestiture." Unpublished paper, The Brookings Institution, 1991, pp. 112-15.

[32] New York State Telephone Association, Inc., *Newsleuer,* November 1988, p. 15.

through 1988 for medium and large customers) (NY Tel Survey).[33] For all customers, a "comfort" index of 18 objective service variables held roughly steady at about 88 out of 100 from 1984 to 1988 (NY Tel Survey). Similarly, customer complaints to the PSC were not increasing. Several other indices show a slight service decline in the first 2-3 years after divestiture, with subsequent improvements that brought quality back to the pre-existing levels. The maintenance of service quality did not happen by itself, but rather was the result of regulatory involvement.

The FCC, along with several of the states' utility commissions, tracked developments in service quality. Dial-tone delay has remained reasonably constant, and transmission quality has generally risen; but the more people-intensive on-time performance on orders for residences have suffered a steady if minor reduction since 1987. Intra-LATA calls have maintained a very high level of call completions (over 99.5%).

For long-distance service, the rapid transition to fiber-based transmission, with competing companies investing billions of dollars, seems to have improved sound quality and reduced blockage. Inter-LATA completion rates have climbed steadily since 1986. Thirteen long-distance firms sampled by the Florida PSC performed at a much higher level than the required 90% call completion rate, with the best quality performer, US Sprint, at 97.45 % . AT&T, despite its economies of scale, was ranked fourth, but the differences are minor.[34]

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[33] New York State Public Service Commission, from data collected by New York Telephone, 1988.

[34] Florida Public Service Commission, *Telephone Service Evaluations -- Fon Myers.* 1990. ·p. , Table 15.

Thus, service quality in regular performance has been high and rising. On the other hand, the system has suffered when it comes to reliability robustness to shocks. Here, the number of large-scale outages has grown in recent years. Just in 1991, there were a series of large service disruptions. In January, a fiber cut in New York City caused 6 million homes to be without long distance service and shut down the N.Y. Mercantile Exchange and Commodity Exchange. A signalling system failure in Baltimore, in June, led to loss of telephone service in 10 million homes in four states, and, in September, a power failure in New York City caused 2 million homes to be without long distance service and required the shut down of three major N.Y. airports for six hours. Similar outages affected service in other states. As society becomes more dependent on telecommunications, any service disruption becomes a matter of serious concern.

There was also a great fear about a technological decline, because Bell Labs' R & D would be curtailed by profit-minded management. Actually, the opposite occurred. One study found that total R&D employment rose from 24.100 in 1981 to 33,500 in 1985. (AT&T and the regionals' joint R&D firm, Bellcore, combined.)[35] By 1988, the regional companies were adding their own laboratories, and total R&D employment rose to an estimated 35,600. However, in comparison to many industries, overall RBOC R&D was still quite low.[36]

For AT&T's Bell Labs, the R&D budget increased from $2 bil. to $2.7 bil., of which

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[35] Noll, A. Michael, 1987, "The Effects of Divestiture on Telecommunications Research," Journal of Communications, Vol. 37 no. 1, pp.73-80.

[36] R. Harris, "The Implications of Divestiture and Regulatory Policies for Research, Development and Innovation in the U.S. Telecommunications Industry," Berkeley, 1987.

about 10% went to basic research, and the pace of R&D has picked up considerably. Research and development as a share of Bell System revenues was as much as 50% higher in the years 83-88 as it was between 1973 and 1983.[37]

Productivity growth for the telecommunications sector in the 1980s has been positive. Labor productivity for the seven Baby Bells, when measured in terms of lines per employee, show a cumulative gain from 1983 to 1988 of 34.9 % . The number of lines per employee rose from 132 to 178.[38]

Compared to several other major countries, the U.S. was slow in the upgrade of networks to all-digital ISDN systems.[39]. Similarly, in the introduction of Signalling System-7 technology U.S. penetration is 6.3% while in France it is 47.6%.[40] On the other hand, switching is quite advanced in the U.S., with 42.5% digital lines (compared with 70.7% in France and 2.6% in Germany).[41] If all electronically switched lines are considered (digital and analog) the U.S.

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[37] Crandall, 1991, p. 151. "Bell System" post-divestiture includes Bell Labs and Bellcore R&D but not RBOC non-Bellcore R&D. Crandall notes that ratio may actually be higher than estimated.

[38] Bolter, Walter and James W. Mcconnaughey. "Innovation and New Services," in *After the Breakup: Assessing the New Post-AT&T Divestiture Era,* edited by Barry G. Cole. **New** York: Columbia University Press, p. 295.

[39] *Ibid.* at 185, Table 5.19.

[40] *Ibid.* at 189, Table 5.20.

[41] *Ibid.* at 177, Table 5.14.

has 96.6%, far ahead of France (75.9%), Japan (44.8%), U.K. (23.5%) and Germany (1.5%). [42]

The number of employees at AT&T and its successor companies fell. By 1990, AT&T had reduced its work force by 90,000 jobs, 25,000 of which were cut in 1989 alone, from their pre-divestiture total of about 370,000. The RHCs dropped from 583,000 employees at divestiture to 542,000 by the end of 1991, a reduction of about 7% . This is partly attributable to the lower manpower requirements of digital equipment. Cuts in 1984 and 1985 were 2.8% and 3.1 %, respectively. In 1990 and 1991, RHC cut-backs increased again,[43] and these trends can be expected to continue. For example, Ameritech and NYNEX announced plans to reduce their work force by an additional 2,300 and 9,900, respectively. On the other hand, many of the new private or public carriers generated hundreds of new (but usually non-unionized) jobs, and the Bell companies increased employment in their subsidiaries.

Many employment losses were in customer terminal manufacturing and are part of the more general decline of US-based consumer electronics manufacturing. If equipment is defined more generously to include also computers, "smart" office equipment, etc., the number of manufacturing jobs has increased.

For both the telecommunications network and equipment, the Bureau of Labor Statistics predicts employment increases of 2% annually. but these figures seem somewhat over-

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[42] *Ibid.* at 179, Table 5.15.

[43] Bye, Marianne G., *Regional Holding Companies: Third Quaner 1991 Results.* New York: Shearson Lehman Brothers, Telecommunications Services Industry Follow-Up. November 19, 1991, p. 3.

optimistic.

The flip side of competition in equipment is that US firms lost enormously in terms of markets. The U.S. trade balance for telecommunications equipment, which had been positive though shrinking in 1981 and 1982, became deficits of $1.15 billion in 1984, $2 billion in 1986, and $2.6 billion in 1988.[44] Official trade statistics suggest an improvement to $1.93 billion in 1989, but almost $400 million of it is attributable to revised accounting methods rather than real gains. A further improvement occurred in 1990, with the trade deficit falling to $790 million.[45] Imports increased from $2.8 billion in 1983 to over $7.1 billion in 1987, while exports grew from $2.3 billion to $6.3 billion.-1[6] In central office switches, the foreign-based companies' share greatly increased.[47] The use of foreign equipment grew, in particular from Asian suppliers; in 1987, only 43% new terminal equipment certifications (so-called Part 68 Registrations) went to US firms (including licensees of foreign firms), while 49% went to the Far East firms.[48] All these tendencies created an unanticipated problem for U.S. foreign trade

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[44] Baudhuin, Michael D., "Issues of International Trade," in *After the Breakup: Assessing the New Post-AT&T Divestiture Era,* edited by Barry G. Cole. New York: Columbia University Press, p. 461.

[45] International Trade Administration, U.S. Dept. of Commerce, U.S. *Telecommunications Trade in 1990.* Washington: April 1990.

[46] Ibid.

[47] NTIA, U.S. Oept. of Commerce. *NTIA Trade Repon: Assessing the Effects of Changing the AT&T Antitrust Consent Decree.* Washington: 1991.

[48] Von Alven, William H., editor. "The Billboard: A Newsletter for Part 68 Applicants." ·February 1992.

which is likely to become a major issue for negotiation, since telecommunications procurement is a politicized process in most countries of the world.

The Next Wave of Liberalization: Local Competition

While the divestiture was predicated in part on facilitating long-distance competition by providing equal access to the local loop, there was far greater skepticism about the possibility for competition for that loop itself, i.e.. for local traffic. But. such competition has begun to appear, albeit almost always for larger users.

Local competition is emerging principally through fiber-optic metropolitan area networks **(MANs),** also known as alternative local telecommunications systems (ALTS) or competitive access providers (CAPs). Their revenues have been growing at a rate of about 22 % per year.[49] Estimates of total revenues for 1990 range widely, from $138.1 million to $400 million.[50]

Other potential competition in the local loop may come from access based on the cable TV infrastructure, from microwave systems, or from cellular and micro-cellular telephone traffic that serves stationary locations.

There is nothing new about local competition, however. Once the basic Bell patents expired at the end of the 19th century, independent competitors entered those areas not serviced

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[49] Teske, Paul and John Gebosky. "Local Telecommunications Competitors: Strategy Policy." Unpublished paper presented to the 18th Annual Telecommunications Policy Research Conference. October 1, 1990.

[50] Ibid.

by Bell concessionries, especially in rural districts and areas facing particularly high prices. The independents moved in large numbers. Between 1894 and 1902 3,039 commercial companies and 979 mutual associations were formed to enter the telephone industry.[51] These independents were commercial corporations, mutual systems, and farmer cooperatives. [52] In 1897 the independent exchanges established a trade association which tried to put together a long distance network between its members which, if completed, would have been larger than AT&T. [53] By 1904 independents competed against Bell in every significant community in Western New York, Texas, Illinois, and California. [54] In some cities several systems competed side-by-side, though often without interconnection.

After a few years the independents were nearly equal in size to Bell. Robust competition developed also in the manufacturing of switching and customer equipment that served the independents. The main difference between the two network types was interconnection. **While**

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[51]Alan Stone, Public Service Liberalism, (Princeton University Press, Princeton, New Jersey, 1991) p. 132.

[52] Alan Stone, Public Service Liberalism, (Princeton University Press, Princeton, New Jersey, 1991) p. 128 (referring to: J. Warren Stehman, The Financial History of the American Telephone and Tele raph Co.. (Boston: Houghton Mifflin, 1925), pp. 52, 53).

[53] Alan Stone, Public Service Liberalism, (Princeton University Press, Princeton, New Jersey, 1991) p. 139 (referring to: American Bell Telephone, Commercial and Financial Chronicle 64 (1897), p. 1040).

[54] Alan Stone, Public Service Liberalism, (Princeton University Press, Princeton, New Jersey, 1991) p. 138 (referring to: J.J. Nate, Texas and Telephones, Telephony (1904): pp. 332-334; and E.J. Mock, Story of the States -- Illinois. Telephony (January 1907) pp. 1-8; and B.G. Hubbell, Independent Telephony in the Empire State, Telephony 6 (1903) pp. 210, 211; and A.B. Cass, Independent Telephony in Southern California, Telephony (November 6, 1909), p. 459).

the Bell Telephone system was fully interconnected on a national level through its long-distance network, the independents operated on a limited regional scale. Under pressure by the Justice Department actions, AT&T chose in 1913 to enter into the *Kingsbury Commitment,* guaranteeing existing independent telephone companies interconnection to its long distance network and limiting expansion. The private utilities were required to interconnect, thus enabling the existence of a system of multiple carriers.

Yet government policies shifted soon towards support of the monopoly system. In 1918 the California Railroad Commission decided that:

> "there should be one universal service, as this will enable complete interchange of communication ... this, in addition to the usual advantages of consolidation of utility properties resulting from the elimination of duplicate property and duplicate operating expenses".[55]

In 1919, a decision by the Missouri Public Service Commission concluded that:

> "competition between public service corporations was in vogue for many years as the proper method of securing the best results for the public ... The consensus of modem opinion, however, is that competition has failed to bring the results

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[55] Alan Stone, Public Service Liberalism, (Princeton University Press, Princeton, New Jersey, 1991) p. 126 (quoting: In Re Pacific Telephone & Telegraph Co., 15 Cal. R.C.R. 993 (1918)). An identical conclusion was reached by an Indiana regulatory board which concluded that the merging of competing operations "should be encouraged even if it is resisted". Alan Stone, Public Service Liberalism, (Princeton University Press, Princeton, New Jersey, 1991) p. 126 (referring to: Central U. Teleph. Co., PUR 1920B, p. 813; and Indiana Bell Teleph. Co., .PUR 1922C, p. 348).

> desired ... Nearly all of the states in this country have adopted laws providing for the regulation of public service corporations ... It is the purpose of such laws to require public service corporations to give adequate service at reasonable rates, rather than to depend upon competition to bring such results".[56]

As a result, a system of de-facto exclusive franchises emerged, m which only one telephone company served any particular area. It was protected from rival entry, but in return was regulated in its rates and service conditions, and had to provide services to everyone who desired it. This system worked well in the phase of expansion of telecommunications. It was not until 1945 that the last major competitive local loop service in the U.S., the Keystone Telephone Company in Philadelphia, was shut down.

In 1974, the FCC accepted applications for value added carriers which 1 ed transmission services from common carrier and enhanced them with additional features and capacity. In 1976, the FCC deregulated the resale and shared use of interstate private lines. *(special report in* C.C. *Docket 79-164; adopted 12/19179).*[57]

Opponents to the new decision claimed that the new entrants would engage in "creamskimming" and effect the economies of scale inherent in the network. The FCC found that competition in the private line business was being hindered by the specialized carriers lack

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[56] Alan Stone, Public Service Liberalism, (Princeton University Press, Princeton, New Jersey, 1991) p. 127 (quoting: Johnson County Home Telephone Co., 8 Mo. P.S.C.R. 637 (1919)).

[57] **Wiley,** Richard "Competition and Deregulation in Telecommunications", Telecommunications in the United States: Trends and Policies. Artech House, 1981, pp 53-4.

of access to the local network to deliver private services. Initially the local Bells attempted to restrict or deny access to the local loop; however, the FCC ordered in 1974 (FCC Docket 20640) and in a court decision in 1977 that SPCCs have the same required access.[58]

This decision included local distribution for FX and CCSA services which gave large end users a dedicated trunk to a distant exchange switch. An effect of this decision was the need for a more sophisticated PBXs to terminate and distribute traffic from the end user location.[59]

But in the 1980s, a new wave of rival entry into local communications began. New transmission paths, such as microwaves and fiber optical, began to erode the physical and regulatory barriers.60J:

The evolution of alterative carriers has evolved from a number of sources including: need for varying technical requirements, diversity of routing, flexibility, reliability and, perhaps the most significant launching factor, price.[61]

One of the new companies major services was to route calls from the LEC's end-office to a long distance carrier's reseller's point-of-presence (POP). The routing from the end-office to POP is known as "local transport". Local transport can be either "common transport" where traffic is routed through an access tandem switch, or "dedicated transport", where a dedicated

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[58] op. cit., pp 49-52.

[59] Phillips, Charles, The Regulation of Public Utilities, Public Utilities Report, 1984, p. 647-9.

60-fhe Alts: An Emerging Industry, Connecticut Research Report, December 1989, p.11-12.

[61] **Op. C'lt., p.**3

line connects the end-office to a particular IXC's POP. Another step was for a new provider to aggregate traffic on its PBX, which terminated a dedicated access lines (leased or privately owned) to the IXC point of presence and then connect local business lines on the other side of the switch.[62] Others resellers employed alternative transmission techniques such as microwave, VSAT, and cable television coax trunks in order to bypass the LEC switch. From 1979 to 1984, • microwave was the preferred mode of transmission for bypassing the local loop.[63]

Two basic categories of local competition exist: intraLATA (local) and interLATA. A major example for an interlata provider is Allnet, a long distance reseller which became a wholesaler of private line services. Facilities based companies providing fiber optic networks include Institutional Communications Co. (ICC), out of Washington, D.C., which began as a cable TV distributor in 1980; Teleport Communications Co., out of New York, which began as a satellite link provider in 1983; and Metropolitan Fiber Systems (MFS), headquarted in Omaha, Nebraska, and owned by the large construction firm Peter Kiewit. These companies soon grew into alternative local transmission companies. Since their networks were mostly interstate in terms of traffic, the FCC allowed them to compete without regulation as non-dominant carriers. In 1984, Chicago Fiber Optic used the abandoned coal-delivery tunnels beneath Chicago to lay fiber to link up long distance services. In 1989 it was allowed by the Illinois Public Utility

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[62]"The Impact of Access Charges on Bypass and Universal Telephone Service", Bell Communications Research Report, Sept. 1984, p 15-17.

[63]Bolter, Mcconnaughey, and Kelsey, Telecommunications Policy for the 1990's and Beyond, M,E, Sharpe, Inc, Armonk, NY, 1990, p. 230.

Commission to compete for intraLATA service.[64] In New York, alternative local service was approved in 1985 by the Public Service Commission, and offered by Teleport, microwave companies, and cable TV providers.

As resellers and "bypassers" became more prevalent, the LEC provider was losing some revenue. Efforts to keep local rates low were based on the assumption that all local loop plant would be provided by LECs. The effect of such competition on revenues and cost was potentially disruptive. [65] In 1984, the FCC allowed the LECs to charge an end user access charge to recoup some of the costs of their network and and did away with the pre-divestiture system of transfer pricing for access to the local network with a fixed monthly rate access charge to the customer. The FCC also imposed a Common Carrier Line Charge, which was variable based on the per minute usage of the local network by each long distance carrier. Additionally, AT&T was charged at a premium rate due to its superior connection access. It was believed that this policy would help the new long-distance carriers against AT&T' s superior economies of scale, and would bring down prices through gradual competition.

However, the access charge system created a greater incentive to bypass the LEC network. The initial driver for alternative local service of bypass was often cost, rather than service quality or reliability. Later this changed, and the diversification of risk became more sophisticated.

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e Alts: An Emerging Industry, Connecticut Research Report, December 1989, p.13

[65]Bernt, Phyllis, Hans Kruse, David Landsbergen, The Impact Of Alternative Technolo ies On Universal Service And Competition In The Local Loop, The National Regulatory Research Institute (NRRI 92-16), October 1992, p. 71.

The evolution of alternative local access accelerated after a major fire in 1988 at the Illinois Bell central office fire in Hinsdale, local network failures in New York and elsewhere, and even nationally by the AT&T after a software failure in 1990. These events caused users to diversify risk and not to put all their eggs into one basket by adding or switching to another earner.

Shared tenant services allows small users to link up, through one of several routes, with other services, especially with long distance carriers. In addition to reducing the per-line PBX cost, volume discounts could be achieved through the bundling of telephone services. For example, AT&T's trans-continental WATS service costs $21.50 per hour of use below fifteen hours a month, and $14.18 per hour above eighty hours -- almost a thirty-three percent reduction in price.

A table summarizes 1985 prices for leased forms of local service in Manhattan. The prices were normalized per on kilobits per second for comparison purposes. As can be seen, microwave ($0.20-0.65), fiber line ($0.30-1.70), coaxial cable line ($1.15) and Tl grade telephone company copper carriers ($1.70) were the least expensive providers."[66]

The regulatory response to shared-tennant resale was varied. 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

[66]Noam, Eli, "The 'New' Local Communications: Office Networks and Private Cable," Computer/Law Journal. vol. VI, no. 2, Fall 1985, p. 263.

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-(69.16)b	1.2	97.60 (57.60)
Direct Analog Data Communications	236.4()c	9.6	24.60
Digital Data Service	373.()()c	56	6.70
T-1 Service Line (Copper)	2645.2&:	1,544	1.70
Optical Fiber Line	26441	1,544	1.70
	13,500	44,736	.30
Coaxial Cable	175()m	1,544	1.15
Point-to-Point Microwave	12QOk 1000	6,132 1,544	.20 .65
Digital Termination Service (DTS)	60()1	56	10.71
Multipoint Distribution System (MDS)	5,()()()l	3,088	1.62
Satellite Transponder	110,()()()d	64,000 (max of 1,544 Kbps)	1.70
Cellular Radio	2,000-	.3f	6667
Infrared	40()s.h	1,544	.25

a. Assumes $2Ll6 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. Asaumes 4 hours peak/day; 20 days/week ($1920 usage). Equipment installed $1300-2200. Asaumes 5 years life. Source: NYNEX.
f. Voica 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 "Ncwalink." pnmded by lllinois Bell in Chicago businaa district. Source: Illinois Bell Tec:bDical Reference Manual 1984.
j. Clua Y service (24 hours/day), one-way t"'8nunivin'l only. Source: Contemporary Communications.
k. Contemporary Communications. (The first number is T2 tranamiuio"', The second number is Tl t.Panuni1ion.). Eutern Microwave'• rate is $900 equipment, $22/mile video coverage at 6 Mbps.
l. On basis of 30% use of node ports (100 l)Ortl). Contemporary Communications.
m. Manhattan Cable.

Source: Noam, Eli M., "The 'New' Local Co • • Offi
Journal, Vol. VI, No. 2, Fall 1985, p. 264– mmurucations: ce Networks and Private Cable," Computer/Law

a certificate of public convenience and necessity. To obtain a certificate, a showing must be made that the STS is "privately beneficial and not publicly detrimental," or that the local telephone company "is not providing reasonably adequate telephone service. "[67] In essence, Arkansas saw the alternative exchanges leading to the exclusion of the LEC, creating islands of unregulated telephone carriers. Texas, on the other hand, in permitting STS, declared:

> "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.[68]

How did the LEC react to local competition? On the local level, the LECs initial reaction was to drop rates 20-30% for leased lines where competition existed. They also upgraded technologies such as fiber lines, improved customer service, and cut down installation delays. Competition from the CAPs grew nevertheless: Teleport claimed profitability in 1988 with over 25 % of the New York City high capacity line (DS-1) market. Metropolitan Fiber Systems (MFS), based in Chicago, became profitable in late 1989.

Collocation problems: The Public Service Commissions

The viability of local competition rises and falls with interconnection. And here the

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[67]1n re Southwestern Bell Tel. Co., No. 84-213-U (Ark. PSC Jan. 7, 1985)) Similar developments have also occurred in Oklahoma.(See Note, Smart Buildin s and Shared Tenant Services: A Preliminary Analysis. 37 FED. COM. L.J. 521, 529 (1985))

[68]Id.

critical issue was whether CAPs could interconnect on equal terms, in what is termed "comparably efficient interconnection" (CEI). Whether CEI needed to be offered by LECs to their rivals, and what CEI actually means technically and economically became the subject of intense struggle.

The focus of the discussion centered on the issue of "collocation." This meant a presence of CAP termination equipment, and a handoff of traffic, inside the LECs central office, as opposed to an outside facility from where the LEC would carry it to its central office on its own lines. CAPs wanted to carry the traffic into the LEC central office. LECs adamantly refused, for a variety of reasons, including control over their facilities, and competitive strategy. For the CAPs, collocation became the key fight.

Teleport took the initiative on collocation at telco central office switches by petitioning both the FCC and the New York Public Service Commission. New York acted first, with the FCC awaiting for two years the states decision and its impact before acting on the applications of Teleport and MFS, another alternative carrier.

New York Teleport was a persistent applicant. The New York PSC instituted a comprehensive proceeding dealing with interconnection and compensation arrangements between NY Telephone and interconnecting cellular companies, CAPs, etc.[69] In the instituting order released January 22, 1988, the NY PSC saw the promotion of compatible, economically-feasible interconnection of telecommunications elements as one of the most important regulatory

[69] **New York** Public Service Commission (NYPSC). Case 88-C-004, Order Instituting Proceedings. January 22, 1988, New York: NYPSC, p. 1-2.

obligations:

> "A well-integrated and interconnected network is essential to the State's economy. The State's communications infrastructure is the foundation for its economic competitiveness. For these reasons, we are soliciting information that would assist in the establishment of consistent principles for all types of potential interconnection."[70]

After two years of proceedings, the New York Public Service Commission issued in May 1989 its "Opinion and Order Concerning Regulatory Response to Competition"- Opinion No. 89-12. It held that:

> "... Allowing liberal interconnections with the local exchange network generally fosters competition and will likely provide more effective and efficient carrier access service.
>
> Teleport, as well as other interconnectors and similar networks of large users, should be allowed comparably efficient interconnections (or, in other words, virtual collocation) for the purpose of competing with New York Telephone for the transport portion of private line and dedicated carrier access services. If Teleport (or others) can offer better service, better terms, or lower prices, the public interest will be enhanced.
>
> Therefore, New York Telephone will be required to establish comparably

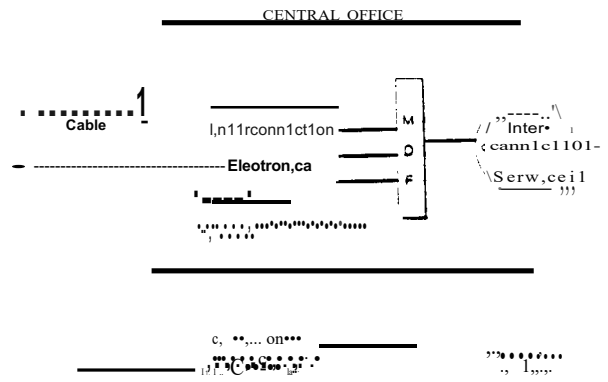
[7°]New York Public Service Commission (NYPSC). Case 88-C-004, Order Instituting Proceeding. January 22, 1988, New York: NYPSC, p. 2-3.

TCG'S EOUAL INTERCONNECTIONS

Federal Communications Commission. In The Matter of, Amendments of Part 69 of the Commission's Rules Relating to the Creation of Access Charge Subelements for Open Network Architecture (FCC 89-79), Supplemental Comments of the Ad Hoc Telecommunications Users Committee, September 30. 1992.

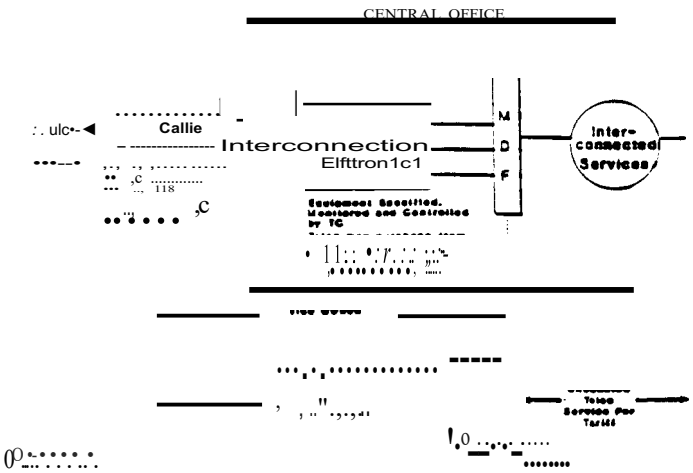
TELCO INTERCONNECT WITH ITSELF (ACTUAL)

(The Stanaara for 'Equal Intercon"ectu:in")



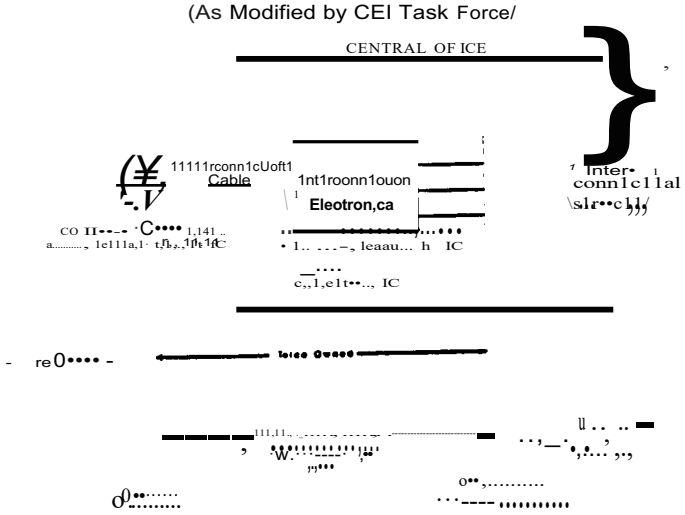
NEW JERSEY: (VIRTUAL)

(FOR INTERSTATE SERVICES)

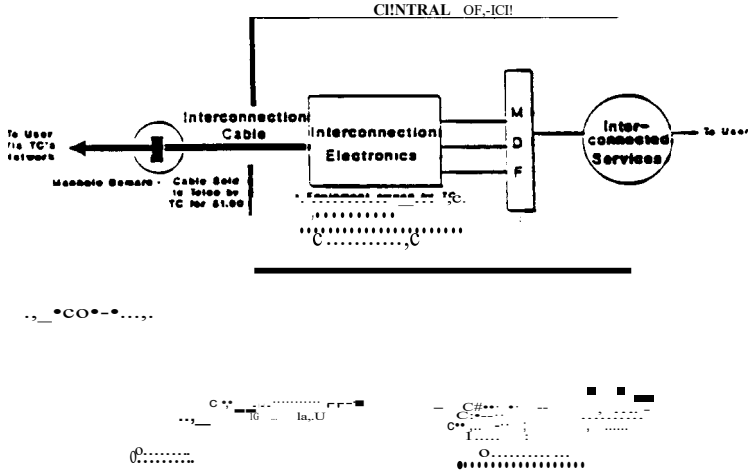


NEW YORK: OTIS 1 (VIRTUAL)

(As Modified by CEI Task Force/

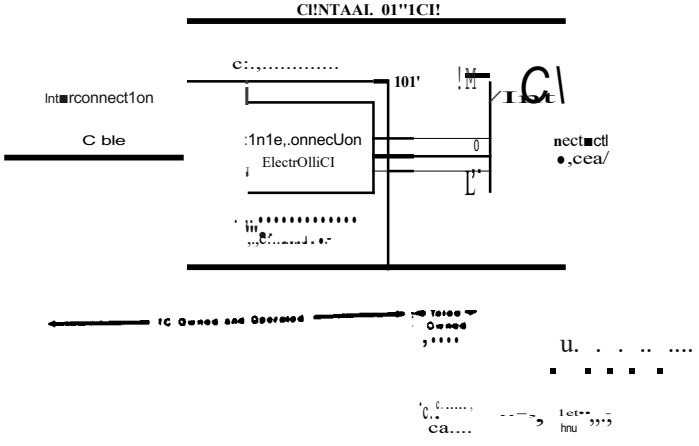


ILLINOISi 01S (VIRTUAL)

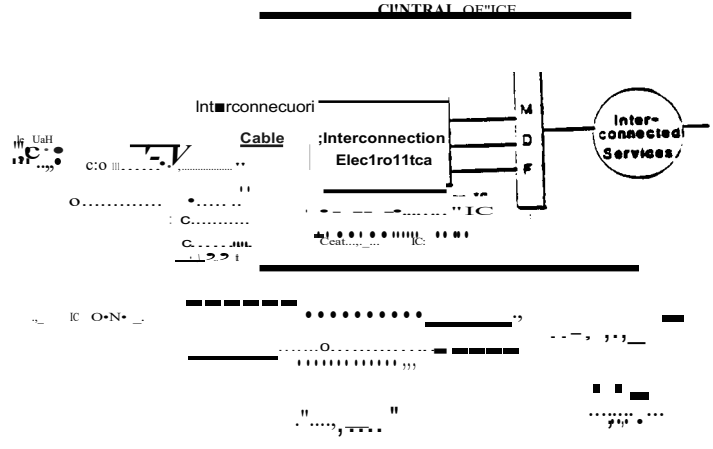


NEW YORK: OTIS II (ACTUAL)

MASSACHUSETTS: (ACTUAL)



CAUFORNIA: (VIRTUAL) (PENDING)



efficient interconnections at its local central offices with registered or certified carriers for the carriage of intrastate private line traffic in the New York metropolitan LATA. New York Telephone shall file, within 60 days, tariffs providing for non-switched collocation/interconnection ... "[71]

"Virtual" collocation was not quite physical collocation, since the LEC could offer hand-off traffic in an outside manhole as long as it was technically and economically equivalent to a physical collocation. In real life, however, New York Telephone agreed to physical collocation as simpler than a virtual collocation arrangement.

The New York PSC also required the interconnecting carriers to pay access charges above cost. This was based on a recognition that decreased revenues for the BOC would negatively affect the ability to provide universal service at affordable rates.

"Our action is designed to foster competition while minimizing unreasonable or extraordinary adverse impacts on other rate payers. To do so, it must be evenhanded and must consider mitigating demonstrated losses of existing contribution. ... we may require... Teleport (NYT & other to pay)... an "equal access" tariff structure, which produces a contribution in support of basic services... ".[72]

An additional problem m "comparably efficient interconnection", was that the LECs

[71]The Alts: An Emerging Industry, Connecti ut Research Report, December 1989, p.32

[72]op. cit., p.37.

the telcos had separate tariffs for each element of access, but sold access only as a complete bundle, thereby creating another hurdle for alterative access carriers. Figure [xx] shows dedicated access as composed of two types of termination charges (for "channel termination" and for "local distribution channel" on the two ends of the circuit) and a separate charge for transport, the "channel mileage charge", set according to mileage bands. Switched access consists of: a common line charge for the subscriber line, an end office switching charge, and a local transport charge. [73] These are billed as charge per minute of use (MOU), as part of the inter-LATA call, and cannot be purchased separate!y. MFS claimed that this tariff system forces CAPs to purchase the entire package, regardless of whether all components are needed, thereby hampering competition. MFS also asked the Justice Department to force the BOCs to unbundle elements of access- access, switching and transport- under the terms of the AT&T Divestiture Decree, which read:

> 'Each (BOC) tariff for exchange access shall be filed on an unbundled basis specifying each type of service element by element, and no tariff shall require an interexchange carrier to pay for types of access that it does not utilize.'

The response to the New York PSC 1990 order for collocation was for New York Telephone (the BOC) to file a tariff for OTIS--Optical Transport Interconnection Service-- as a CEI arrangement. ?TIS permitted a CAP to bring fiber optic cable to a point outside the NY

[73] **Op. €lt., p.** 34

Tel wire center. NY Tel could then attach an optical/electrical interface--Optical Line Terminating Multiplexer (OLTM)--to the cable, thereby establishing an interconnection for the ESP. OLTMs facilitate a high capacity (DS3) level of interconnection (672 voice grade channels). DS3 can be downgraded to DSl (28 voice grade channel) and DS0 (one voice grade channel) channels. The ALTs were to be charged for the full cost of physical interconnection plus a contribution over cost. The PSC Order required an ONA Task Force to deal with the ALT's and ESP's concerns on how to monitor and control the interconnection equipment from their own remote locations.

OTIS was not quite adequate, and led soon thereafter to OTIS II, which allowed physical collocation. The OTIS II tariff provides for rental fees for the use of New York Telephones central office, in return for floor space. access to equipment, power and security, and locations of their own equipment in the central office.

Very importantly, the PSC recognized that the Caps should have both an equality of rights and an equality of burdens. The OTIS tariff therefore includes charges above marginal costs, as a way to contribute to universal service. The charges are known as Universal Service Elements. [74]

At the same time, New York Telephone received, where the ESPs were competing a looser form of regulation:

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[74]Bemt, Phyllis, Hans Kruse, David Landsbergen. The Impact Of Alternative Technoloeies On Universal Service And Competition In The Local Loop. The National Regulatory Research ·institute (NRRI 92-16), October 1992, p. 111.

> "Specifically, New York Telephone will be granted the authority to increase rates for high capacity and interoffice private line services by 25 % annually, and to decrease them without limitation, so long as rates cover their relevant incremental costs. This tariff flexibility, designed to spur further competition, will apply throughout the New York Metropolitan LATA (where we are authorizing further competition), but New York Telephone will also be permitted to offer individual case billing arrangements on a non-discriminatory basis for these services in the New York Metropolitan LATA in response to competitive requests for proposals. In order to prevent cross-subsidization by basic services, New York Telephone shall file with our Staff cost support for price changes to competitive private line rate elements and individual case billing arrangements. The rates may become effective immediately upon such filing, unless Staff brings concerns to our attention."[75]

As the next step, the New York PSC undertook an analysis of the Centrex/PBX markets to eliminate undue carrier power of the LECs. In essence, it examined what arrangements would allow alternative providers to have the same type provisions as the LECs Centrex services, which would then allow a level playing field in which the LEC Centrex/PBX market could eventually become deregulated.

New York established a system for unbundling Centrex lines and PBX trunks into "link and port" components:

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[75]The Alts: An Emerging Industry, Connecticut Research Report, December 1989, p.32

"Because the boundaries of the monopoly enclave are ill-defined, a LEC may be able to use its monopoly power in one area to gain unfair advantage in a related, competitive field. For example, Centrex services provided by LECs compete directly with non-regulated private branch exchange (PBX) equipment offered by other vendors. Some competition in providing Centrex or Centrex-line service is at least theoretically possible today, since others have access to private loops in the New York metropolitan area under the comparably efficient interconnection (CEI) arrangements which underlie the Commission's Open Network Architecture policies. But because the LEC enjoys a monopoly over the access loops essential for both Centrex and PBX, it can gain anticompetitive advantage over its competitors.

To limit the potential for any such unfair advantage, the lines between monopoly and competitive services must be carefully drawn and must keep to a minimum the monopoly portion that can be unfairly exploited. To this end, the loop must first be unbundled into two components-- the "link" and the "port"[76] Then, would-be competitive providers of links must have at least "equal" access to the public switched network."*n*

The local exchange carriers opposed CEI in links. They believed that it was enough to

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[76]A link is a pair of wires, or a virtual circuit path, to the LEC switch. The port embodies the function of providing dial tone to the Public Switched Network and possesses a unique network address (eg. a telephone number).

n New York Public Service Commission (NYPSC). Cases 88-C-004 and 88-C-063, Opinion ·No, 90-31, December 26, 1990, pp 1-2, New York: NYPSC.

Source: Federal Communications Commission, In the Matter ot riling and Kevat:w 01 upt:n Nt:1wor1e Archllt:emre **Plana.** Memorandum Opinion and Order, FCC 88-381, CC Docket No. 88-2 (Adopted November 17, 1988; released **December 22, 1988) <Phase.**

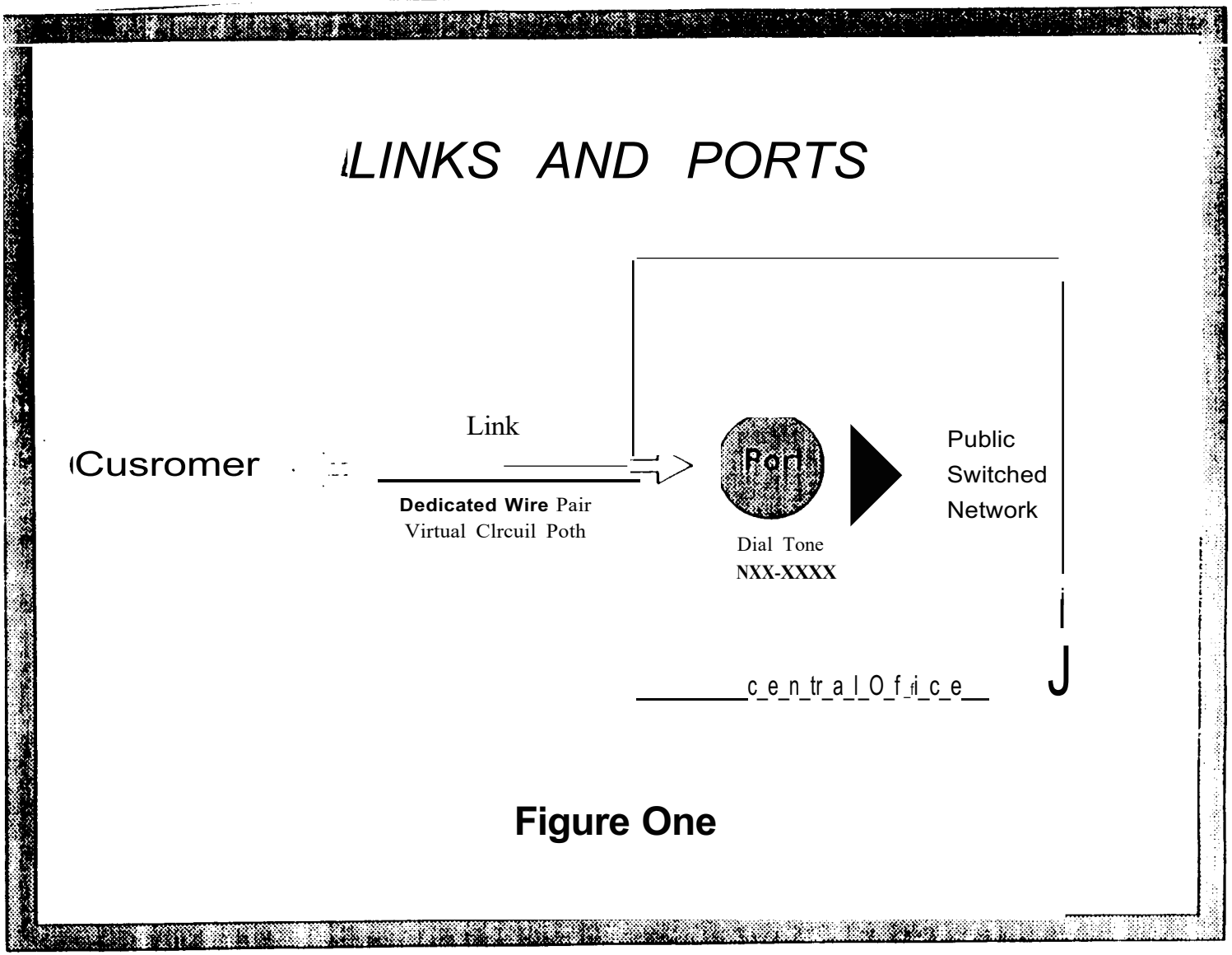

Figure One

institute an accurate cost allocation and pricing which would lead to competitive parity between Centrex and PBX and that the unbundling of loops was unnecessary. All that is necessary is an interconnection at a demarcation point on the customer's premises, in the main distributing frame of the LEC and not within the switch. The LECs were concerned with coordination and accountability if problems such as service disruptions arose, and problems of allocating costs.[78] Space availability in BOC central offices was one issue raised. However, such problems were substantially reduced by the emergence of digital switches which require much less space than the electro-magnetic equipment they are replacing.

The New York PSC judge found that the operational problems were being exaggerated. They:

> "represent the seemingly inexhaustible stream of trivial, clearly resolvable, questions local telephone companies can raise to frustrate competition. Similar issues were fairly and successfully resolved, often by direct negotiation between the parties without the participation of staff, in the course of implementing New York Telephone's physical collocation tariffs. This experience shows that none of the operational matters raised by the parties necessarily impede comparably efficient interconnection for links."[79]

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[78] New York Public Service Commission (NYPSC). Opinion No. 91-24 *(Case 88-C-004, Case 88-C-063, Case 91-C-1174).* Opinion and Order Concerning Comparably Efficient Interconnection Arrangements, and Insitituting Proceeding. November 25, 1991, p. 5, New York: NYPSC.

[79] Op. Clt., p. 20.

It was argued by the telcos that no abuse of Centrex has been found and thus no remedy was necessary. But the administrative law judge in the case found that this was because Centrex and PBX trunk services had remained tightly regulated, while the policy goal of the PSC was to create a more competitive environment in which Centrex could eventually be deregulated.

> "As long as the local telephone company's link and port rates remain "bundled" in the form of loop/trunk charges that are impossible to see, much less compete with, a competitive environment for links, generally, cannot exist. Competitive link providers need access to unbundled ports with which to interconnect their facilities in order to provide service to customers. But local telephone companies will not file unbundled rates on their own, and delay ill serves the public interest. Accordingly, we will direct all telephone companies that provide Centrex or PBX trunk services to file tariffs unbundling existing rates, in a revenue-neutral manner, into port and link equivalents." [80]
>
> " The unbundling described above will establish a physical demarcation point between competitive link and non-competitive Centrex exchange access and PBX trunk port facilities. The appropriate demarcation point for this interconnection is at the main distributing frame (MDF) of the central office, since this is the point where outside plant facilities (links) terminate, and access to the central office switch originates (ports). Interconnection at or near the MDF is accepted

[80] **Op. Clt.,** p. 24.

by virtually all parties as the most practical point for link termination, and it also represents a physical demarcation point conducive to such interconnection... This unbundling should be cost-directional and revenue-neutral overall" .[1]

There are other Centrex features, besides links, that can be competitive with PBX; these features may be subject to increasing pricing flexibility and potential deregulation. The PSC found several other features and functions to be non-basic aspects of Centrex, inasmuch as they are directly competitive with various aspects of PBX, including Centrex Intercom and Centrex features such as Touch-Tone, Custom Calling (eg. Three-way Calling), Station Number Assignment, Direct Inward Dialing, and Centrex LAN. "The sole aspect of Centrex omitted from this list is the exchange access function (i.e., access of the public switched network through exchange access ports). "[82]

Illinois followed the New York proceedings with a monograph entitled *Telecommunications Free Trade Zones: Crafting a Model for Local Exchange Competition.* The Illinois Commission proposed local competition in parts of Chicago, and permitted collocation arrangements.

The New York, Illinois, and California regulatory commissions have been the leading commissions in interconnection, at least as long as there was bottleneck power in some critical service element that could be leveraged. This interrelation of interconnection and modularization

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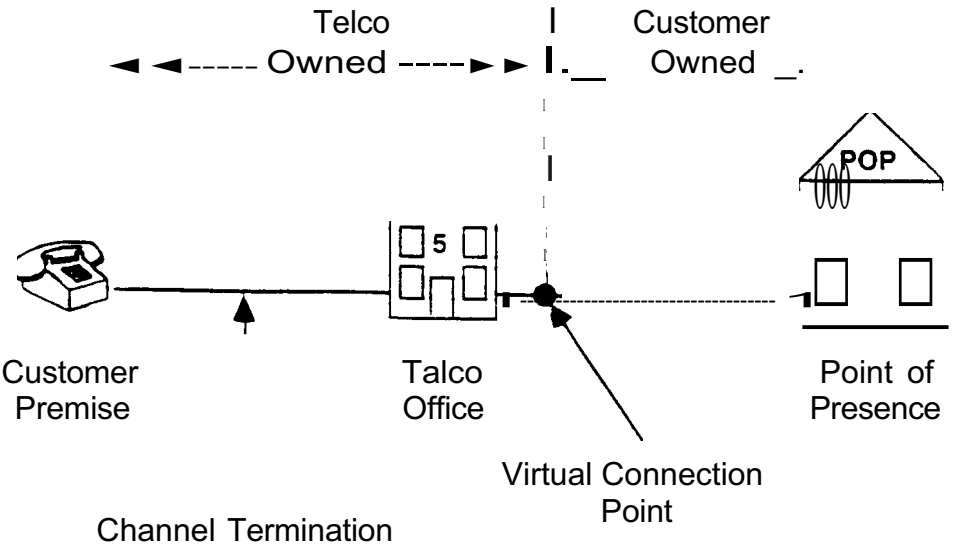
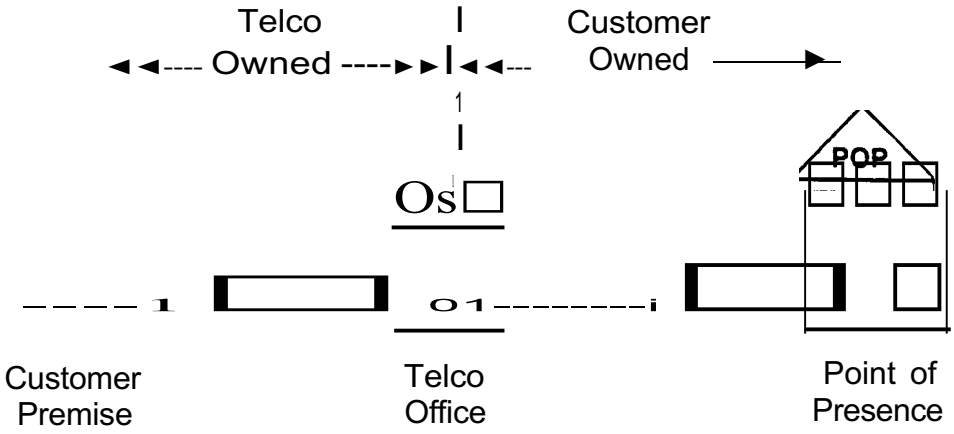
[81]op. cit., pp. 25-26.

[82]**Op. €lt., p.** 30.



Structure of the FCC's virtual colocation proposal.

FCC's Physical Collocation Proposal



Structure of the FCCs physical colocation proposal.

Source: Bernt, Phyllis, Hans Knise, and David Landsbergen, *The Impact of Alternative Technologies On Universal* Service and Competition io the Local Loop, The National Regulatory Research Institute, October 1992, p. 108.

is discussed further below.

In a decision regarding the unbundling of PBX and Centrex lines, the New York Commission notes: "Experience in telephony has shown time and again that monopoly prospers and competition flounders unless segregable services are unbundled and offered in their elemental forms, accompanied by reasonable and fair interconnection terms.

Expanded Interconnection: The FCC Actions

The second large voice in the collocation battle, Metropolitan Fiber Systems, initiated in 1989 a case before FCC and the Department of Justice. Under the umbrella of the Communications Act of 1934, MFS claimed that MFS and other CAPs were entitled to interconnection and physical (or virtual) collocation the telco central office. Section 201(a) sta t es.

> 'It shall be the duty of every common carrier engaged interstate communications to furnish such communication service, and where the Commission finds such action **necessary** or desirable in the public interest, to establish physical connections with other carriers. '

CAPs which are certified common carriers (MFS operates mostly as a certified common carrier) were clearly entitled to interconnection rights under Section 20l(a), according to

MFS.[83]

The FCC announced its decision in late 1992, more than two years after New York: "In this Order, we take a historic step in the process of opening the remammg preserves of monopoly telecommunications service to competition. "[84]

> "We here make numerous decisions necessary to turn our expanded interconnection policy into reality on an expeditious basis. Tier 1 LECs are required to file expanded interconnection tariffs for special access within 120 days of the release of this Order. These tariffs will include connection charges designed to compensate the LECs for services offered to interconnectors. The LECs will not be allowed to impose a contribution charge at this time. Instead, we are proposing to eliminate the only regulatory support flow that has been identified in this proceeding as potentially warranting a contribution charge -- the over-allocation of general support facility (GSF) costs to special access. [85] We also grant the Tier 1 LECs additional special access pricing flexibility in light of the increased competition that will result from this decision. We believe that

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[8]3The Alts: An Emerging Industry, Connecticut Research Report, December 1989, p.34

[84]Federal Communications Commission, Report and Order and Notice of Proposed Rulemaking, Expanded Interconnection with Local Telephone Company Facilities *(FCC* 91-141} Amendment of the Part 69 Allocation of General Support Facility Costs *(FCC* 92-222). FCC 99-440, CC Docket No.'"88-2 (Adopted December 17, 1992; released October 19, 1992.), pp. 3.

[85]The LECs may file requests seeking Commission approval of a contribution charge in the future to recover specifically identified regulatory support flows or non-cost-based allocations recovered through rates for special access services subject to competition.

these measures will establish an equitable regulatory framework for increased competition in the interstate special access market."[86]

The interconnection would be through physical collocation. LECs would have to open their central offices and allow interconnectors to run their own lines directly into central offices, interconnectors would be allowed to enter the central offices to install, maintain, and repair their transmission equipment, as an FCC spokesman explained. Equipment would be either fiber optic or, where feasible, microwave transmission facilities, but not coaxial equipment.[87]

Tier 1 local exchange carriers (those with revenues of over $100 million annually) would have to offer expanded interconnection of their own special access transmission facilities at LEC central offices to all interested parties, including competitors and high volume.

Interconnectors and LECs can negotiate virtual collocation arrangements if both parties prefer it over physical collocation. Waivers to physical collocation would be granted only if a particular central office lacks physical space, or if a state prefers virtual collocation.[88]

LECs will provide space to interconnecting parties to collocate their own transmission

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[86]**Federal** Communications Commission, Report and Order and Notice of **Proposed** Rulemaking, Expanded Interconnection with Local Telephone Company Facilities <*FCC* 91-141} Amendment of the Part 69 Allocation of General Support Facility Costs *(FCC* 92-222). FCC 99-440, CC Docket No. 88-2 (Adopted December 17, 1992; released October 19, 1992.), pp. 3-4.

[87]Telecommunications Reports, "FCC's Expanded Interconnection Decision seen as 'Historic' Step Toward Opening Local Exchange Monopoly to Competition; Special Access Order Mandates Physical Collocation, Gives LECs Pricing Flexibility; Switched Transport Item Offers Similar Arrangements," September 21, 1992, p.1-2

[88]*Expanded Interconnection Mandated for Interstate Special Access by FCC,* NARC Bulletin ·No. 39-1992, pp.3.

equipment for termination of interconnected circuits. LECs will also provide power, heat and cooling, and conduits for interconnectors' cable. Interconnectors' employees may enter the LECs central offices to install and maintain its equipment. Where space for physical collocation is exhausted in a central office, the LEC must offer virtual collocation for that office.

The choice of transmission equipment would be that of the interconnector, and an interconnector with a virtual collocation has the right to remotely monitor and control the equipment it uses.

LECs must make special access expanded interconnection available at all end offices, serving wire centers, and other points in their networks that are relevant for determining special access rates. They must specify points of interconnection as close as reasonably possible to their central office buildings. Interconnectors cannot "rachet," that is, interconnect with switched traffic using their special access expanded interconnection facilities. "[89]

Smaller LECs are not subject to these rules. Expanded interconnection is available to all interested parties, including CAPs, interexchange carriers, and end users. AT&T and any other party with facilities already collocated must interconnect under the same terms as other interconnectors."[90]

LECs can establish connection charges to compensate them for services offered to interconnectors, the LEC central office connection they need, based on direct costs plus reasonable overhead. There is no "net revenue test." The LECs cannot impose a contribution

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[89] op. cit., pp. 3-4.

<x> rbid.

charge. The only significant support flow identified that might require a contribution charge was the over-allocation of General Support Facilities (GSF) costs to special access.[91]

To deal with this item, the FCC proposed rules to eliminate the GSF over-allocation. It tentatively concluded that any benefit of this allocation was cancelled by its adverse effects on local competition.

The LECs got special access pricing flexibility, once they offer interconnection.

Special access rates will still be averaged within each zone, but can diverge over time, within a price cap system. " Subject to separate subindexes for services in each zone, LECs will be permitted to lower the average rate level in any zone by as much as 10 percent annually relative to the price cap index (PCI) for the special access basket, or to raise the rate level by up to 5 percent annually relative to the PCI, without triggering any of the additional cost justification or advance notice requirements contained in the price cap rules. The existing pricing bands for DSl and 0S3 services will continue to apply on an overall basis. LECs subject to the rate of return rules that implement expanded interconnection will be granted a similar degree of flexibility. "[92]

The FCC's decision was not without internal dissent. Even Chairman Alfred C. Sikes, in a separate statement, felt compelled argue:

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[91] *Expanded Interconnection Mandacedfor Incerscate Special Access by FCC,* NARC Bulletin No. 39-1992, pp.4.

[92] **op. C'lt.,** p. .

> While I am confident that we have removed many regulatory barriers to competition today, there is one aspect of our new rules on expanded interconnection that, for several reasons, troubles me.
>
> It's not clear to me what problems we are attempting to resolve by requiring the local exchange carriers to provide physical collocation to all interconnectors that request it. Often such a highly regulatory approach will create more real problems than the illusory ones it seeks to resolve. This requirement is intrusive and raises questions whether it constitutes a "taking" or confiscation of local exchange carrier property. I am also sensitive that our actions may appear to undercut any future state interconnection policies. Finally, I have serious concerns about the local exchange carriers' ability to control access to its network facilities and thus the impact of such a mandate on network reliability. While I am going to formally request the Network Reliability Council to take up the issue of mandated physical collocation, I do intend to let them know the question has been raised so they can determine whether it should be considered."[93]

By mid-1992, 11 of 27 eastern states had authorized some form of facilities-based local competition by the competitive access providers (CAP). CAPs existing in Connecticut, Florida,

[93]op. cit., p.6.

Illinois, Indiana, New Jersey, Ohio and Pennsylvania, have access to only non-switched local services (e.g. private lines). CAPs in Maryland, Massachusetts, Michigan and New York have several switched local services.

In Michigan, prior to 1991, the PSC allowed a certificate per CAP for all the non-switched services it provided. Now each service requires its own certification.[94]

Local service competition remains more rare in the western United States, with just four of the 23 western states, by mid-1992, authorizing some form of facilities-based local competition by competitive access providers (CAP). "Of the western states, only California, Colorado, Minnesota and Missouri have authorized CAPs to compete within telcos' local calling areas.

In late 1992, six states did not allow local competition: Georgia, Washington, and Oregon, Arizona, North Carolina and West Virginia.

Thus local competition was well on its way, with the interconnection arrangements necessary for the maintenance of a national "network of networks." It had become national policy, as Dennis Taratus, the New York PSC staff person most instrumental in the process recounts to the author:

> ti In the summer 1988, I was asked to take leadership of Staffs moribund ONA project. I protested what I thought was an unfair distribution of work and went to Dick Hesser, and asked why a project upon which others had worked for

[94]State Telephone Regulation Report June 4, 1992 vol.10, No.11,p.2

months suddenly required my involvement. Dick said he was exasperated by the criticism he endured from you that the New York Staff had lost its leadership role in the communications field, and he wanted something "radical" to address your view that ONA was crucial. The first thing I did was to request everything you had written on the subject both published and unpublished. I took this material home for the successful ONA plan: adoption of a "virtual" interconnection policy using Teleport's "$1" asset transfer management, complete unbundling under a "willingness-to-pay" approach, and statewide forums to address disputes outside the regulatory process. The interconnection recommendation died aborning (too radical; quite surprising actually since the case was established to address this issue in the first place). The inspiration, however, remained until the proper leadership--Richard Stannard--and opportunity--the Competition proceeding--presented itself. The idea of an ONA environment founded upon real interconnection was Commission policy less than a year later.

Now, it is national policy. The interconnection arrangements we have developed will be profound in their ultimate impact. The Bell companies have been shown the way out of the problems that have plagued them for decades and retarded their growth and development. The next steps are clear--reduction in state and federal regulation will follow a market driven rationalization of their costs and overall corporate mission. More importantly, the free flow of low-cost information, which is the real goal, will do more social development and

productivity than busing, clean air legislation, the war on drugs, or investment tax credits. The impact of the railroads and the interstate highway system on America's growth were immeasurable. The telecommunications/information revolution dwarfs both in its potential."[95]

[95]Letter for Eli from Dennis F. Taratus dated May 13, 1991.

History of ONA

The ONA concept is a process of granting equal access to ESPs, while allowing provision of enhanced services by the BOCs. It is a part of an emerging system of great institutional, technical and legal complexity, which may be best described as a "network of networks." How did the United States move in that direction? We have earlier discussed the general evolution of liberalization. Eventually the logic of this development reached the core of the network itself, the central office functions of the LECs. The concept of Open Network Architecture emerged through the question how to provide value-added service providers with non-discriminatory access.

The problem was not clearly defined in the FCC's early efforts to deal with AT&T's desire to enter computer services.

Computer I: The FCC first began to deal with problem of fair access to value added providers in 1970. Its initial proceeding was the *Computer Inquiry,* subsequently known as *Computer I* (1971).[96] The main question was how and whether to regulate the new computer-based services, including data processing and value added services. This question was closely linked to the questions of how to define these "enhanced" services, how to regulate them, and how to locate them within regulated firms. The FCC wanted to avoid cumbersome controls, but feared that the telephone companies, specifically AT&T, would

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9<,Re Regulatory and Policy Problems Presented by the Interdependence of Computer and Communications Facilities, Docket No. 16979, Notice of Inquiry, 7 FCC 2d 11 (1966), Final ·Decision and Order, 28 FCC 2d 267, (1971) aff d in part and rev'd in part sub nom.

use their control over basic telephone services to unfairly promote their own services to the detriment of new competitors in the value-added field. It was feared that they would cross-subsidize their services or discriminate in other ways against enhanced services providers **(ESPs).**

The FCC instituted a "functional" approach to the question whether a service should be viewed a communications and therefore be regulated, or computer data processing (which was unregulated). Services which combined both would be regulated on a case-by-case basis.

Computer II: In *Computer I,* the FCC distinguished between data processing and communication services, but there was no clear definition for enhanced services. Partly for that reason, a new proceeding, the *Second Computer Inquiry,* was instituted. *Computer II* (1980)[97] provided a distinction between enhanced services and basic services. It also led to a complete deregulation of terminal equipment, unbundling, detariffing, and removing it from their rate base by 1982. Equipment would still have to be approved by the FCC, but there was no discrimination between "network" and "non-network" equipment.

In *Computer II,* the FCC attempted to protect network access and prevent unfair competition by ordering the Bell companies (which soon became divested from AT&T) to fully separate their basic service operations from their enhanced services operations.. After

[97]*Re Amendment of Section 64.702 of the Commission's Rules and Regulations* (Computer In, Docket No. 20828, Notice of Inquiry and Proposed Rulemaking, 61 FCC 2d 103 (1976), Final Decision, 77 FCC 2d 384, PUR 4th 143 (1980).

the divestiture, AT&T was required to keep deregulated services -- information services -- at arms length in what the FCC termed a "fully separated subsidiary" which was first called American Bell (1983) and later AT&T Information Services (ATTIS, 1984).

Such full separation were based on the view that the market power of the local exchange companies and the remaining AT&T had to be controlled. They had to set up separate subsidiaries, with separate employees, accounts, etc., arid special conditions to insure full separation. A "Chinese wall" had to be created within each of the new seven "Baby Bells." The extent of the separation requirements included independent staffs, computer facilities, financial accounts, and marketing efforts. The affiliated enhanced services had to get transmission facilities from the BOCs which owned them, on the same condition as other value added providers.[98] The regulations were aimed at preventing them from charging basic telephone services to fund enhanced services, and discouraged them from discriminating against enhanced service provider competition.

Whether the full separation of *Computer II* fulfilled the goals set out for it is a subject for debate. BOC critics say that while it may have been successful in controlling the BOCs' monopolistic tendencies, the policy also increased the operating costs for the BOCs by creating duplicate staffs and facilities, and limited the potential effectiveness of the affiliated enhanced service operations by cutting them off from the resources and information existing in the main BOC operation.

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[98] Albert Halprin & Melanie Haratunian, In Defense Of ONA, p. 4.

Computer III: *Computer II* did not allow the RBHCs to directly provide enhanced services. It forced them to offer services such as data processing, voice messaging, and electronic mail, through fully separate subsidiaries. But soon, in yet another proceeding - *Computer III* in 1986[99] - the FCC abandoned such separation as excessively restrictive, and opted instead in favor of "nonstructural" restrictions on the BOCs. These new limitations included:

1. New budgetary rules for allocating costs between the common carrier services and the enhanced services
2. Rules to safeguard certain customer proprietary network information (CPNI)
3. Conditions for the handling of information dealing with technical changes in the basic network
4. Most significantly, a requirement that the RBHCs create and implement Open Network Architecture arrangements. ONA entailed the unbundling and independent tariffing of "the basic network features, functions, and interfaces underlying its enhanced service offerings."

Computer III also required AT&T and the BOCs to file quarterly nondiscrimination reports that provide comparative data on the timing of installation and maintenance, as well

[99]Amendment of Sections 64.702 of the Commission's Rules and Regulations (Third ·computer Inquiry), Report and Order, 104 FCC 2d 958 (1986) (Phase I Order).

as the quality and reliability, of the basic services offered as part of any ONA tariff. It also created network information disclosure rules that require AT&T and the BOCs to inform enhanced service providers of new or modified network services. And it imposed customer telephone information obligations on the ESP operations of AT&T and the BOCs similar to those we imposed for AT&T equipment operations: they may use such information for enhanced service marketing, if they establish procedures to permit customers to withhold such information on request.

The FCC stated its conclusion:

"We found that while structural separation is one way to serve the goal of preventing anti-competitive conduct, it does so at significant cost by imposing inefficient restrictions on the ways the BOCs can develop, technically configure, and offer enhanced services to the public."[100]

"We found that BOCs retain the incentive and the ability to discriminate against their competitors. We have also concluded, however, that such activities can be adequately prevented by regulatory measures with substantially lower costs to the public than the costs caused by structural separation.[11101]

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[100]pederal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. 88-2 (Adopted November 17, 1988; release December 22, 1988) (Phase I). p.11.

[101]Federal CommunicationsCommission, *Amendment of Sections 64. 702 of the Commission's Rules and Regulations* (Third Computer Inquiry), Report and Order, 104 FCC 2d 958 (1986) ·(Phase I Order), pp. 1012-1013.

The concept of applying Open Network Architecture to RBHC's was introduced to the FCC in a 1986 article Back to the Future: A Model for Telecommunications, by FCC chairman Mark Fowler and two members of his staff, Albert Halprin -- the bureau chief in charge of telecommunications -- and James D. Schlichting. The theory of ONA is to create a system in which:

1. The natural components of the systems are separated -- or "unbundled."
2. The natural components are interconnected at well-defined points which are optimal both for the component's electronic characteristics and the component's physical characteristics.
3. The architecture for these systems use accepted standards which, preferably, have been published and have been adopted by a large segment of the industry.[102]

The FCC's intent was made explicit in June, 1986. The FCC published an order[103] stating

"... we consider open network architecture to be the overall design of a

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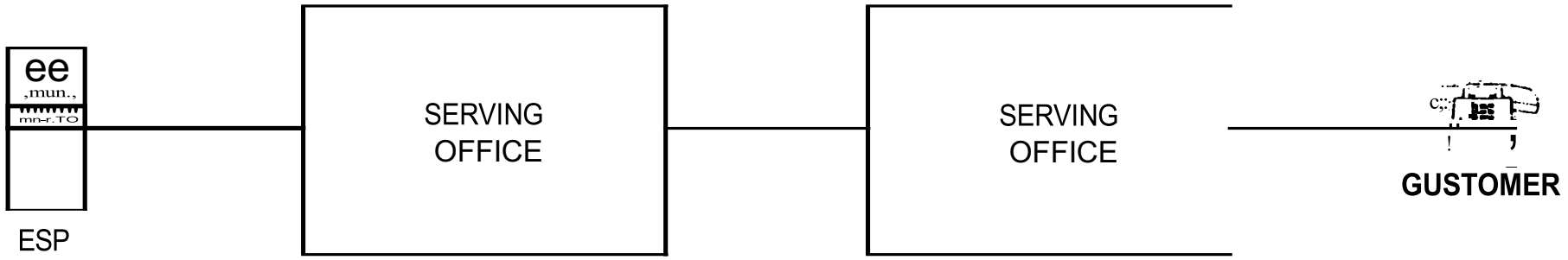
[102] Dale N. Hatfield, ONA, What it Means for Mobile, p. 29, Telocator (August 1989).

[103] Federal Communications Commission Report and Order adopted May 15, 1986, released June 16, 1986, In the Matters of: Amendment of Sections 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry); and Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Thereof; Communications Protocols under Section 64.702 of the Commission's Rules and Regulations, CC Docket No. 85-229.

Source: Norris, Jim, *ONA and the ONA Model,* Bellcore, October 1991.

ONA

Common ONA Model



Basic Serving Arrangement (BSA)

ACCESS LINK (AL)	FEATURES/ FUNCTIONS (F/F)	TRANSPORT /USAGE (T/U)
Alternatives	Alternatives	Alternatives
•		•
•	•	•

BASIC SERVICE ELEMENTS (BSEs) AND OTHER OPTIONS

COMPLEMENTARY NETWORK SERVICES

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> carrier's basic network facilities and services to permit all users of the basic network, including the enhanced service operations of the carrier and its competitors, to interconnect to specific basic network functions and interfaces on an unbundled and 'equal access' basis. A carrier providing enhanced services through open network architecture must unbundle key network components of its basic service and offer them to the public under tariff ... such unbundling will ensure that competitors of the carrier's enhanced service operations can develop enhanced services that utilize the carrier's network on an economical basis."

An example of this theory in practice is the original IBM "PC" micro-computer. This computer used open architecture accessible physically, electrically, and logically and resulting in a "user-friendly" system for consumers. The owners of IBM PC could continually expand and enhance their computer systems using hardware and software that had not even been developed when the system was introduced on the market.

The FCC required the BOCs to develop their plans for ONA by February 1988. In 1987, The BOCs had to file Comparably Efficient Interconnection (CEI) plans before offering an enhanced service from their affiliated ESP. Such a plan had to prove that unaffialiate ESPs had equal access to the switches and transmission lines as the affiliated ESP. Unlike the goal of Open Network Architecture (ONA), CEI did not guarantee that the .BOC network was sufficiently unbundled.

The FCC did not define the specific terms that should be included in the original BOC ONA filings due February 1, 1988. Rather, the BOCs were told to develop their own plans adhering to broad FCC goals. Such a vague order proved difficult for the BOCs and ESPs in the early stages of ONA.[104] The Bell thereupon came up with a basic framework, "The Common ONA Model" produced primarily by Bell Communications Research (Bellcore), their joint R & D arm, and structured different plans on its foundation.

The seven Bell companies filed huge ONA plans in early 1988. These were then subject to public comments. 54 parties filed comments, and 34 parties made additional replies. Changes were required by the FCC, to take effect by May 1989. They had to add to ONA services, modify tariffs, add technical information on network interfaces, improve nonstructural safeguards, increase uniformity, drop the classification of ancillary services, and promote future ONA services.[105]

AT&T, which also originally had to respond to a separate ONA order, was freed from ESP restrictions and from unbundling requirements because the FCC held it to have no market power. The FCC eliminated the requirements that AT&T report on the quality of its basic services as long as its ONA plan included a detailed description of its installation procedures that demonstrated its inability to discriminate, and as long as it submitted an

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[104]Jackson, Charles L. *Testimony before the House Subcommittee on Telecommunications and Finance* on the FCC's Open Network Architecture (ONA) and Comparably Efficient Interconnection (CEI) Policies. Washington, D.C.: July 30, 1987. Page 3

ios Federal Communications Commission, *In the Matter of Filing and Review of Open Network Architecture Plans,* Memorandum Opinion and Order, FCC 88-381, CC Docket No. 88-2 (1988) (Phase I). P.10.

annual affidavit attesting that it followed its procedures against discrimination against competing enhanced service providers.

Of the RBHC plans, the FCC found that:

".. some plans are generally better than others (Ameritech and NYNEX, for example, come closest to realizing our regulatory goals for ONA. Their plans have some deficiencies, however, in areas such as future ONA evolution and uniformity). "[106]

The Main Parties in the ONA Debate

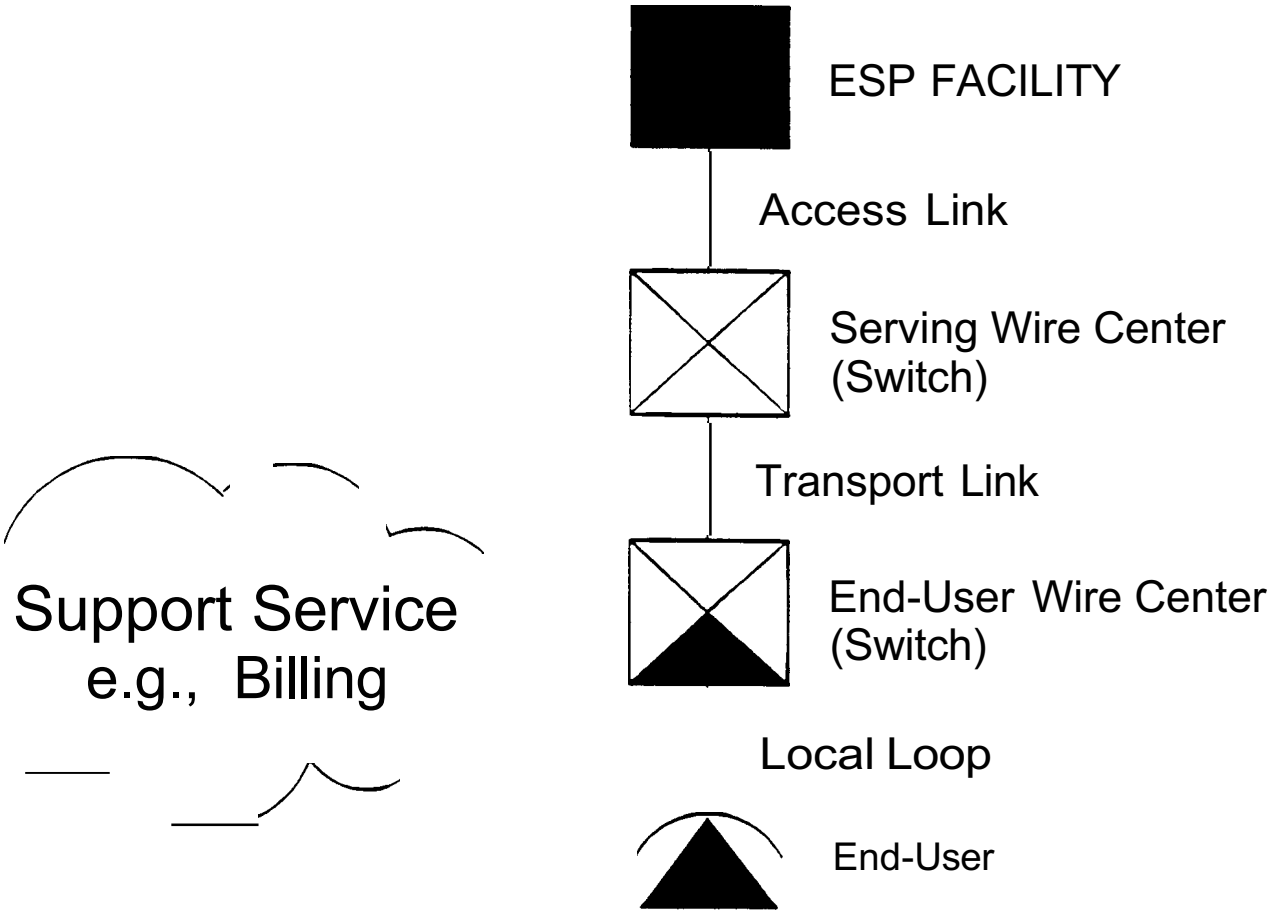
The Enhanced Services Industry

To understand the developments m ONA one must understand the evolution of the American value-added services industry, known as the "Enhanced Services Providers" **(ESPs).** The FCC differentiated basic data transmission from data manipulation, continuing to regulate the former while freeing the latter. The hope was to promote the enhanced services industry, which would offer consumers and businesses innovative telecommunications tools to enrich their lives and increase their welfare and profitability.

A key policy issue with respect to value-added networks is their potential to resell basic transmission to third parties. Arbitrage by a service reseller leads to loss of control by the basic network provider and to revenue reduction, at least in the short run. In the United States, such

[106] Ibid. p.13.

Typ:cal Enhanced Service



Tha enhanced seNice provider uses its facilities in co7junction with features and functions of the LEC's netvvork to produce enhanced services which are transported through the network.

Borrows, John D. and Robert J. Graniere, *An Open Network Architecture Primer For state Regulators* (NRRI 91-20), National Regulatory Research Institute, November 1991, p. 22.

resale is possible and widely practiced; lessees of circuits can do almost anything they want. Regulatory constraints exist only to prevent basic carriers from using internal transfers from their "captive" monopoly customers to competitive services in order to extend their market power into the applications stages. In contrast, monopoly TOs usually prohibit resale, though it may exist unofficially. But in time, many countries realized that the use of leased lines can give rise to sophisticated applications and that such services should be encouraged. They have consequently moved toward permitting the provision of services that "add value" to basic transmission, and the sale of such services to third parties. This technical addition legally transforms what would otherwise be an illegal resale into a legal sale. Another alternative to containing the resale of services is to establish usage-sensitive pricing for leased circuits. But this creates problems of economically efficient pricing.

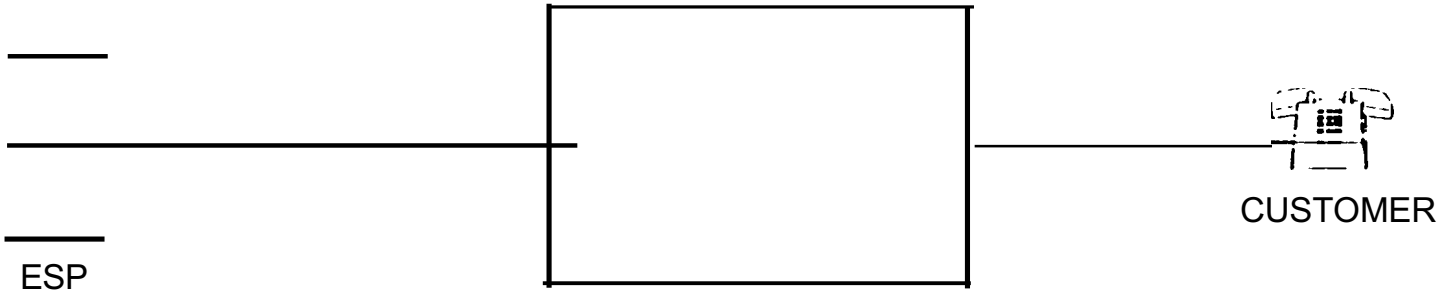
As with any attempt at price discrimination that is not cost based, one can never underestimate the ingenuity of arbitrageurs. Those who still wish to resell basic transmission but can only sell "value-added" service may try to add a trivial amount of value or an entirely unnecessary amount, solely to cross the line into legality. To prevent this it becomes necessary to require formal licensing of these value-added networks, which would involve scrutinizing the nature of their "value added" and of their pricing. A formal approval process and ongoing monitoring it was therefore often considered necessary to protect the system.

In the United States, as mentioned, such procedures do not exist. As a result, V ANs are merely a functional description and not a regulatory category. It is true that in the United States .there is a regulatory distinction between "basic" ·and "enhanced" services. But this distinction

Source: Norris, Jim, *ONA a11d rhe ONA Model,* Bdlcore, October 1991.

ONA

ONA Model - Example Voice Message Service



-4-------Alternatives ----------

BSEs

- Calling number ID
- Alerting (stutter dial tone)

COMPLEMENTARY
NETWORK SERVICES

- Local service E/W- Call Forwarding Busy Line and Call Forwarding Don't Answer
- Customer control of CFBL and CFDA

serves an entirely different purpose. Whereas TOs in the past often sought the regulation of VANs to prevent the resale of leased capacity and thus protect the basic service. the U.S. regulations serve to prevent the cross-subsidization by a dominant carrier of its value-added services through revenue gained in those dominant activities. In other words, the American "basic/enhanced" dichotomy is established to protect the newcomers from the established carriers, while the PTT licensing of VANs often aims at protecting their own position.

A Taxonomy of Telecommunications Services

The ESP system in the United States is dynamic, but also organizationally complex and interrelated. Terminology is vague, and some attempt at clarification is in order. Conceptually, it is useful to think of service providers in the U.S. as a system of multiple levels of sale and transformation. he first level consists of the basic transport carriers such as the AT&T or the local exchange companies.

The second layer consists of "generic service element providers." Such elements provide the additional software and organizational features that make for added value. The second-level providers can be identical to the first-level providers, and the operations can be functionally integrated. Conceptually, however, a distinction is necessary. The BOCs provide level-1 service as carriers and level-2 as providers of service elements such as call-forwarding, caller-identification, etc. (Other companies can offer level-2 elements, such as equipment manufacturers.) The relationship of these levels to each other and to other service providers is .what ONA is about.

Things are never neat in this field. Level-1 carriers can provide capacity directly to endusers, who can then provide their own level-2 enhancements in private networks for their own operations. In effect, these users create intra-organizational "private" ESPs. They can also make these private services available to their customers, suppliers, or business partners, and thus create a private "closed-user group" ESP.

Buyers for level-2 ESP services can be endusers of the generic service elements, but most likely they are providers of specific applications who add value to the generic services as level-3 ESPs. For example, a level-3 ESP can be a network of electronic store-and-retrieval service (a generic service element offering) that is made to fit the specific needs of the insurance industry, together with other generics, such as a bulletin board service, or a level-3 insurance network. A combination of several generic element services may be involved in such an application.

They essentially provide basic packet-switched transmission service and some basic protocol conversions as common or private carriers. Some providers can be described as "basic" value-added networks (in the United States, private ESP firms such as Telenet, Tymnet, the BOC packet operations, or AT&T Accunet; in Europe, PTT entities and sometimes subsidiaries such as Transpac.)

Another example for a level-3 system is a network that connect automatic teller machines. Providers of these network services often retail them to a number of banks, which thus need not establish their own system. The banks, in turn, give their customers access to their fourth-level ESP. Through open or hidden service charges, they in effect resell electronic .banking services to the public. Thus, when a customer uses a bank teller machine to withdraw

money, the communications may easily involve four layers of communications services and several carriers, and several ESPs, all contributing to end service in a distinct way.

Because of the peculiarities of the American divestiture of AT&T, one can often add to the U.S. scenario a long-distance carrier (which may in tum lease its capacity from another), and two local exchange companies at each end that have several sets of VAN relationships. The communications process could thus involve almost a dozen firms.

The system is incestuous because competitors can be at the same time each others' suppliers and customers of software hardware and transmission capacity. They can compete on level 1, collaborate on level 2. and compete again on level 3. These relationships are unavoidably complicated, but so are production and distribution of almost any sophisticated product. Rarely are all stages of production of a complex product vertically integrated within one company.

Level-3 ESPs: Generic Service Elements

The following are a few examples for the level-2 elements which level-3 service package together into services.[107]

Suppressed Ringing: Suppressed power ringing provides connection to line side access subscribers without applying power ringing (typically 20 Hz). This capability provides access

[107]From: NYNEX Telephone Companies, *In the Matter of Filing and Review of Open Network Architecture Plans,* CC Docket No. 88-2 (Phase I), May 19, 1989, Volume I, Appendix C.

for meter reading or other information gathering without alerting the line side access subscriber.

Call Forwarding with Call Screening: This capability allows the subscriber to specify a list of calling numbers from which to receive calls while having all other calls forwarded to the ESP. Or, on the other hand, provide the ability to allow the ESP's subscriber to specify a list of calling numbers that would route to the ESP, while all other calls would be terminated to the ESP's subscriber.

Monitor & Barge In: This is the capability for the ESPs' subscribers to monitor their own calls forwarded to the ESP, and to barge in and join the conversation if they desire.

Calling Number Identification (CNI): This is the capability to have the BOC switch deliver the calling number identification (calling
directory number) to the ESP at the time that a call is established.

Trunk Side Connection with Power Ringing: This capability provides signaling of the type that is normally provided only to line side connections, i.e. 2-wire loop start/ground start type supervisory signaling and DTMF/DP address signaling at a BOC tandem or end office trunk side interface.

.Access to Extended Superframe Data Channel: Extended superframe access provides the ESP

capabilities that utilize all or part of the 4 KBPS extended superframe data channel for control and performance monitoring of end-to-end facility.

Ability to Notify or Interrupt a Customer: This has two parts. The first part provides a message waiting indication. The second part (Interrupt) is the ability to interrupt a particular ESPs subscriber's call in progress (with permission of the ESP's subsctiber).

D-Channel Data Delivered on B-Channel: This feature provides for multiple D-channel data streams to be multiplexed on a B-channel, with multiplexing via TEI (Terminal End-point identifier) mapping.

ESP Access to D-Channel Signaling: This is a request to provide, on a subscription basis, nonswitched access to the D Channel signaling packets going between the subscriber and the BOC switch. The ESP might modify these packets.

ESP Defined Dynamic Routing: This is the real time ability to reroute traffic from one ESP location to another.

Ability to Detect Breaks in Telco Line Within 60 Seconds: The provision of central office and customer equipment that signal each other every 60 seconds to check the integrity of the ESP clients' lines.

Distinctive Ringing: The ESPs can provide ringing their subscribers such that the subscriber can recognize that it is a priority call. This feature provides a pattern of ringing different from the normal one.

User Initiated Diagnostics: This provides ESPs with the ability to assist the BOCs in the diagnosis and restoration of Service. This capability allows an ESP to provide diagnostic information to the BOC maintenance systems.

Bridging: This provides the ability to obtain multipoint dedicated services.

Virtual Dialtone: This is the ability to provide dial tone or prompt character, at the initiation of any call as signal that the network is ready to receive digits or other addressing and other user-entered codes into the voice or data, circuit or packet switched, network for processing and routing.

Call Redirect: Call Redirect is a feature which allows the network to redirect a call to a backup digital termination line if the primary line is busy, out of order or if there is a systematic redirection of the call by subscription option for the interface. The primary line may designate a list of secondary numbers called a back-up list. The network may be able to search the list in sequence until a connection can be established. Call Redirect can be available for Async and .X.25 interfaces.

Automatic Ring Back - Call Busy Line: This is the capability of BOC Switch to recognize when the subscriber goes on hook and ring back the subscriber to alert him that a message is waiting at the Answering Bureau.The following sections describe some of the more important upper-level VAN services.

Call Identification: Common channel signaling system #7 permits an identification of the incoming call and has made possible several features: call screening (blocking of undesired callers), a selective call forwarding, identification of incoming call numbers, call-back of last number(s) that had called in but were not connected, and special rings for preselected incoming calls, to permit, for example, separation of incoming personal and business calls. These services are important in a broader sense. since they give some measure of choice over the telecommunications process to the party being called, who in the past has had to guess at the nature of the incoming call.They also permit verified billing arrangements.

And there are many more.

Level-2 ESPs -- General

Packet transmission originated with a Pentagon effort, whose Defense Advanced Research Projects Agency (DARPA) had the firm of BBN (Bolt, Beranek, and Newman) develop in the early 1970s the "Arpanet" nationwide network to link researchers with each other. Arpanet was a major success and induced BBN to start the commercial network Telenet, which has been in

operation since 1975 as the precursor to packet-switched (so-called X.25 protocol) networks around the world.

Telenet was not profitable and it was eventually sold to GTE. In the period 1978-1983 Telenet grew at rates of up to 40 percent annually. After this period, growth slowed to a still high 30 percent. But it reached critical mass and broke even only after 1983, with revenues of about $100 million. At that time it connected about 2000 host computers and it averaged 200,000 sessions a day. In 1986, GTE Telenet was combined into GTE's joint venture with United Telecommunications, soon dominated by the latter, which in turn contributed its own Uninet packet system and a substantial fiber-optic physical network.

Tymnet, the second-largest, packet switching operation, was originally an internal operation of Tymshare, but its initial advantage of having a customer base of time-sharing computer users turned out to be a problem later on, as time-sharing went into a steep decline with the advent of inexpensive mini- and microcomputers. Users typically accessed the packet-switched networks' "nodes" either through leased lines (digital or analog) or, after 1985, through dial-up synchronous X.25 access over public lines. Tymnet and its parent Tymshare were acquired by the aircraft manufacturer McDonnell Douglas, which resold it in 1989 to British Telecom.[108]

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[108]AT&T's involvement in packet switching service was tumultuous and has so far been unsuccessful. Regulation caused some of its problems, but others were a result of its own operations, and indicate that economies of scale should not be overvalued in this field.

Following the divestiture decree in 1982, it was unclear whether the Bell Operating Companies could provide VAN service and whether the Computer II rules regarding separation of enhanced from basic services applied. This was clarified by the FCC when it declared basic

Level 3 ESPs - Specific

The following services are some examples for the variety of level 3 (specific applications) of VAN-type services that have emerged. Several other applications have already been mentioned above.

Accelerated international trade payments. This service, its providers claim, accelerates international payments often by two weeks.

International trade shipment data service. Helps trade shipment transactions, documentation, billings, insurance, and so on.

Company dealer networks. Used for orders, product information, service problems, billing, customer information. Also referred to as Electronic Order Exchange (EOE).

Health care providers and insurance networks. Permits transactions between hospitals and insurers.

Credit card verification and processing. Merchants have terminals that can read credit card magnetic stripes and transmit the information to a central location for approval and processing. Some transactions are handled by local banks or bank associations, such as **VISA** for its members. Others are offered by public level 4 VANs. Credit authorization is being integrated into electronic record keeping and transaction accounting.

Point-of-sales services. These retail services permit merchants to transfer payments, send bills, verify credit, and reorder inventory. Because of the high cost involved to set up such a

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packet switching (X.25-to-X.25) to be a "basic." service that BOCs therefore could provide, subject to regulation.

system, several point-of-sale switching networks exist. Some are affiliated with automated teller machine networks and often are owned by several banks or by more general service providers.

Voice Mail Services: Voice messaging (also known as VSR, or voice storage and retrieval, not to be confused with electronic mail) is a service that permits a computer to store digitalized voice messages, like an answering machine, but of an almost unlimited length, which can then be called up by the holders of the voice "mail box" from any location. Different configurations are possible: voice mail can be part of PBXs; it can be resold by service bureaus; and it can be embedded in the central telephone switch. Typical level users' applications of voice mail are purchase-order-taking systems, ticket reservations, scheduling of work crews, hospital paging, and hotel reservations and guest messaging.

Voice Retrieval (Audiotex): Voice retrieval (audiotex) is related to voice mail, but with the emphasis on retrieval rather than on input and storage. A computer typically stores a large variety of information in digital voice form that can then be recalled from afar by calling in. One level-3 application is detailed weather forecasts, which pilots can access and select according to region. Similarly, a theater reservation system can have the ticket availability of each play stored separately, along with a brief description of the play and the cast. Other applications are train schedules, ordering of merchandise, airline ticket reservations, and mass announcements such as dial-a-joke or music juke-box. These services can be lodged in customer equipment or in the network itself. These applications will be considerably boosted as synthetic voice technology develops.

Electronic Mail: In Europe, CEPT has set standards for "e-mail" service known as

teletext. In the United States, electronic mail, much more decentralized and heterogeneous.

Audio Conferencing: In addition to the standard teleconference bridges, more advanced systems permit dial-up (operator-free) conferencing, for both voice and data/text, and without subscription. A "meet me" option permits conference participants to call in to join the conference, without having to wait to be contacted.

Video Conferencing: Video conferencing is an active area. Many large firms have video-conferencing facilities, and desktop use is emerging through videphone capacity. Several U.S. hotel chains have nationwide interconnected video-conferencing facilities. In the United States there are also several resellers of satellite transponder time for video-conferencing purposes.

Telemetry: Alarm systems can be offered based on a new "derived channel transport" that overlays the regular voice channel with a second narrow channel, creating an independent transmission path for low-rate data. In addition to alarms, it can be used for utility meter reading and for pay-per-view cable television control. Alarm service can also be carried by cable television networks on their cable.

Computer Bulletin Boards: Computer bulletin board systems (BBSs) have proliferated in recent years with the increase in personal computers. In the United States, there were an estimated 25,000. They are run by a "sysop" (systems operator), mostly an amateur enthusiast, and often include a wide menu of subgroups and services, including personal mailboxes. Specialized BBSs include professional conferences and matchmaking services. The major .problems for these digital affairs is the imbalance of men to women among computer users.

Call Forwarding: For some years, telephone service providers have offered enhanced services such as call waiting, automatic call forwarding to other numbers, speed dialing, and three-way calling.

Electronic Data Interchange (EDI): Can replace traditional practices of purchase orders, invoices, bills of lading, and so on, that require separately processed documents. Instead, the documentation of an entire transaction is electronic, integrated, and nearly instantaneous. An important application for EDI is for "just-in-time" production, such as for automobiles. Some automobile manufacturers established an EDI system with their suppliers. Purchase orders are entered entirely automatically, if desired, according to programmed instructions, and sent to suppliers, who confirm, process, ship, bill, advise, get paid, and so on, all within the same set of documentation. The system provides some of the advantages of vertical integration and single sourcing without some of its cost. EDI systems can be provided by the private network of a firm, an industry group, or a public VAN. The EDI market is potentially quite large.

Manufacturing design. Computer-aided design and manufacturing (CAD/CAM) has led to private VAN applications. GM's blueprints are electronically accessible by its suppliers (which are thus forced into the electronic mode of design themselves). The high cost of a CAD/CAM terminal, plus computer, software, know-how) has been a problem for small suppliers. In response, reselling has emerged in this segment.

Factory production. Automation produces and requires constant data flows. One development priority for the near future is to permit equipment to interconnect better with each other and with support services. Electronic data interchange (EDI) systems offered by several

VANs provide some such integration and permit a "just-in-time" production process, with interconnection with suppliers and programmed purchase orders. GM has adopted a manufacturing automation protocol (MAP). It has acquired the major data-processing firm EDS, which has set up sophisticated networks with dealers and suppliers.

Spare-parts service. Industrial database/transaction systems provide information on and transactions for millions of products, parts, and supplies.

Service dispatch. A combination radio beeper/access terminal permits input and communications with service personnel in the field.

Electronic banking and brokering. A number of financial institutions enable customers to use their computers to reach their account information. obtain investment data and place stock orders.

Electronic Fund Transfers (EFf). This is one of the earliest network transaction uses. Various clearinghouse arrangements exist domestically and internationally, and were discussed earlier with the examples of Telekurs and SWIFf.

Automated teller machines (A TM) networks. The popularity and low cost of the automated bank presence of ATM has spread enormously. In the United States, a 1986 Supreme Court decision permitted ATM placement out of state, and thus enabled banks to move across state lines, which they could do before only to a limited extent.

Large banks can offer these services on private networks. Smaller and medium-sized banks depend on VAN intermediaries. Several ATM switching networks exist, often owned by a consortium of banks. Large data processors also provide such services. Increasingly, the

ATM of one bank accepts transactions for some others.

Commodity trading. Trading in commodities and precious metals, where time is of the essence, has been enhanced by networks with brokers, in some instances simultaneously using regular voice call, viewing market data, transacting trades, retrieving customer information, and entering notes about the call.

Insurance industry networking. Because many independent insurance agents deal with many underwriter firms, it was important to provide them with a network for communications. Such a network had to fit many firms' modus operandi and business forms and had to be compatible with thousands of different equipment systems in agents' offices.

Medical communications. An information and transaction network exists to connect doctors and drug companies as well as reference services and advanced medical education databases.

Moving CAT-SCAN images. Medical CAT-scanning procedures are expensive and very data intensive. One ESP transmits image data from smaller hospitals to larger data facilities for processing and storage.

Consumer information. ESPs provide a variety of consumer information and transaction services.

Job searches. There are data banks for employment, panicularly for data-processing professionals.

On-line databases. These are discussed elsewhere in this book.

Teleshopping. Several varieties of teleshopping exist: on computer on-line services, on

cable television, and by automated phone-in orders. One supermarket chain permits call-in orders with automated reception from a 4000-item catalog, with the teleshopper picking up the order three hours later.

A ricultural networks. Information and transaction systems exist for commodity trading, weather, help, and advice.

Hotel in-room services. Services permit guests to access information and electronic mail from their rooms and to receive information about city or hotel activities, airlines, and so on.

Grocery networking. VANs can provide an electronic data interchange (EDI) for a grocery industry group, which permits them to pool their purchases and realize bulk discounts.

Up- and down-loading with personal computers. PCs can be used as data input and output terminals for a mainframe. Data can be exchanged, software can be shared, and so on.

Yellow Page service. On-line service permits nationwide compilations and searches of businesses.

Automobile collision estimation. This service permits garages and insurance companies to estimate repair costs.

Animal breeder services. Permits matching of livestock.

Librazy shared cataloguing. Permits interlibrary searches, exchanges, acquisitions, and automation in cataloging.

Credit history. Several commercial systems permit lenders to check on the credit history of borrowers. This application, more than any other, has been controversial and has Jed to laws protecting privacy and accuracy.

Telemarketing. Automatic dialing machines call potential customers randomly or from prescreened lists. The sales message is taped; responses are given either to a person who comes on the line or to a voice mailbox.

The list of services and applications is not indicative of their commercial or technical success. It would not be surprising if half of today's offerings and services would be gone in a few years and replaced by other services and other companies. Given the rapid developments in hardware, software, and user organizations, the main attribute of an ESP system is not predictability of success but flexibility of process.

The providers of such information and enhanced service providers are usually younger and smaller industry segments, but are often allied with the powerful media and computer industries. Newspaper publishers, for example, are active in the debate over information services, and are concerned about the telecommunications industry's ability to become a provider of information services. They are represented by the American Newspaper Publishers Association (ANPA).

Many ESPs not affiliated with the LECs represented on ONA issues by CONAP, the Coalition of Open Architecture Parties. What such service providers want is assured access to many elements of the network at nondiscriminatory rates and connections relative to LEC offerings, and at the lowest rates possible. They also seek access to network management and signalling channels used to route calls and data more efficiently. Some of the ESPs also seek restrictions on the LECs, such as keeping them entirely out of certain services as long ;is they can exercise restrictive powers on their competitors.

When it comes to policy liberalization, VANs ride on the coattails of equipment. A liberalization of equipment has meaning primarily when the equipment can be used in varied ways. Conversely, one cannot expect dynamic VAN development if users are limited in their choices of equipment to a few slowly approved models. Yet what is meant by the term "equipment?" Suppose a PBX is the terminating point for a whole array of private network services, LANs, etc. Just as one can connect a piece of equipment into a network, one can plug an entire network into another. In conceptual and regulatory terms, the two become almost indistinguishable.

Carriers

The Local Exchange Companies

There are 22 Bell Operating Companies (BOCs), some specific to a single state (eg the New York Telephone Company), others covering several states (eg, Southern Bell). They are organized under seven Bell Regional Holding Companies (RBHCs). The BOCs, together with GTE whose size is equal to an RBHC, provide the bulk of local service. Additionally, more than 1,000 mostly small independent telephone companies serve approximately half of the nation's geographic area and operate 20% of all access lines.

Local Bell companies are restricted under the AT&T dive-stiture decree to service regions called Local Access and Transport Areas (LATAs), and may not normally provide inter-regional (inter-LATA) service, or international communications serving their regions. They are also substantially excluded from manufacturing and information services. The

extent of restrictions on the companies has been the subject of continuing legal, regulatory, and political battles.

Following the divestiture decree in 1982, it was also unclear under what rules the Bell Operating Companies could provide packet switched data service. This was clarified by the FCC when it declared basic packet switching (X.25-to-X.25) to be a "basic" service which BOCs therefore could provide, subject to regulation and non-discrimination.

This still left the BOCs without authority to provide protocol conversion, even X.25-to-X.75 for purposes of intemetworking, i.e.. for long-distance packet transmission. These conversions were considered to be "enhanced services," and had to be originally undertaken by a fully separated subsidiary. Although this structural solution addressed a real problem, it created in operational and accounting problems, and the BOCs petitioned for increasingly expansive waivers of the rules, which they received up to a point. In 1985, the FCC removed barriers from the BOCs and permitted a bundled provison of basic packet transmission with the "enhanced" protocol conversion asynchronous-to-X.25 and X.25-to-X.75, thus opening an important part of the VAN market to the Bell companies. However, they had to provide such services also to their competitors at non-discriminatory tenns; they had to file an accounting plan of separation, and they could not unfairly cross-subsidize their service. Specific rules were established for cost allocation and pricing.

As a consequence of *Computer III,* the BOCs were increasingly able to be active and flexible in setting up ESP service, while at the same time they aimed to profit from the eselling of their networks' capabilities for the use in other ESPs applications. The latter was

a significant evolution in the thinking of the telephone carriers. They began to recognize that with the network as their asset they should increase usage rather than control.

ESPs believe that for the BOCs, a three percent increase in public network usage would generate more net revenue than from their entering into the enhanced services market.[109] Others in the BOCs, on the other hand, perceives ONA as more of a burdensome condition forced by the FCC as an admission ticket to enhanced services without the onerous full structural separation requirement. Within the BOCs, these two perspectives coexist uneasily, with the negative scenario more prevalent at the top, but not exclusively. Some leaders in the companies are also mindful that it could be a historic mistake for them to stall ESPs. The lesson of the AT&T divestiture is there for those who can draw the parallels. AT&T dragged its feet on the interconnection of other long-term distance carriers, and eventually the political-legal process became frustrated enough and sought the radical approach of a divestiture. If the BOCs would use interconnection as a strategic tool to repress competition, they may be threatened by a similar fate, and their exchange operations may become organizationally separated from their transmission functions in a second divestiture.

While the Independent Local Telephone Companies were not subject to the restrictions of the AT&T Divestiture decree or of *Computer II* and *Computer III,* it was clear that the basic policies unbundling would apply to them eventually, with the possible

[109]Jienry D. Levine, Marketing ONA: A User Perspective. p.4 (unpublished paper).

exception of small carriers. Thus these companies took positions that were on the whole similar to those of the BOCs.

The Alternative Local Telephone Companies

These companies, often referred to as CAPs (Competitive Access Providers) frequently serve special ESP needs, and they have similar access and interconnection conflicts with the LECs as the ESPs have. While their services stress basic transport layers and not only the upper-layer software functions of pure level-3 ESPs, the similarities were large enough for them to vigorously support the ESPs and thereby establish principles of non-discriminatory access and unbundling that would be applicable to their own concerns.

The Long Distance Telephone Companies

In long distance ("interexchange") service AT&T in 1992 controlled about 48% of the market defined as including also intraLATA inter-exchange service (short-haul interexchange). Using the more traditional definition of inter-LATA service, AT&T had about 61% in 1992. BOCs provide long distance within their own LATAs, accounting for about 20% of the market. AT&T's principal competitors in interLATA service are MCI, with about 11% of the market and Sprint, with 8%. Thus, in long distance service, AT&T was the predominant carrier, although its market share kept declining even as overall volume was growing.

AT&T's involvement in ESP service was tumultuous and not very successful. It began

it 1975, when AT&T still felt secure as a near-monopoly. Its intention was to provide an "Advanced Communications Service" (ACS) with packet switching, protocol conversion, message storing and forwarding, and private network provisions. Technical development took its time. AT&T had wanted to have a large-scale star architecture, so that all the data would come to one central location. This did not work technically. It took the years 1978-1982 to rearrange the network and write the very complicated software. The legal status of the ACS, also known as Bell Data Network, offerings was part of the FCC's *Computer I* and *Computer II.* Eventually AT&T was permitted to offer "enhanced services," and on an unregulated basis. but only through an organizationally fully separated subsidiary (which it eventually named AT&T Information Systems, ATIIS), in order to reduce the potential for competitively unfair cross-subsidization of the enhanced services. AT&T then created "Net 1000" which provided packet switching, computer time sharing service, and other services. Because of the Computer II restrictions, AT&T offered the underlying basic packet switching service (BPSS) under the name of Accunet Packet Service (APS) a regulated and tariffed service available to other ESP suppliers as well. NET 1000 pursued some applications, in particular the mortgage and the purchase order segments of the market. It was unsuccessful in both. Thus, the telecommunications market leader had failed in this field, largely because it had been technology-oriented rather than demand driven.

AT&T feared that ONA-style unbundling, applied to itself, would give competitors such as MCI and Sprint access to network features that were then only used by AT&T for

special services such as call screening, blocking, and routing based of time of day.[110] At the same time, AT&T, along with other IXCs, desired as convenient an interconnection into the LECS as possible, both for its own direct use, and for the alternative local service providers who, if successful, could provide it with less expensive transport to the LECs' central offices, and more generally would reduce the remaining bottleneck power of LECs. For the IXCs, a huge part of their operating cost are the access charges payable to the LECs due to the interconnection into their local network. They have therefore strong incentives to see that local bottlenecks are eroded as much as possible. In this matter all IXCs - AT&T, MCI, Sprint, etc. - concur. AT&T's interest diverged partly when it came to its own obligations to other interexchange carriers and to ESPs.

Other Communications Providers

The cable television industry has gone through a remarkable building period, in which it wired most of America in a very short time with a highly effective second communications link. There are also various types of over-the-air broadcasters, including several microwave distribution systems, known as "wireless cable" and direct satellite program providers. In the 1990s, cable companies began to enter telecommunications services in various ways by entering mobile communications; through the acquisition of alternative local telephone carriers; and by direct use of the cable plant for telecommunications services. As

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[11]°Bruce, Robert R., Jeffrey P. Cunard, Mark D. Director *The Telecom Mosaic: Assembling the new international structure* Butterworths 1988, p.58, 60.

telecommunications providers, they are interested in interconnection issues, but they have also taken a low profile.

Cellular telephone service in the United States operates as a duopoly. There were 6.5 million subscribers in 1991. Customers in each major service area have a choice of two licensed cellular providers, one being their local "wireline" telephone company; the other was an independent provider. There has been a major consolidation in the independent mobile industry, with most firms being acquired by telephone companies from other regions. Mccaw, the major independent firm left, leads the industry with 12% of the market. In November, 1992, 30% of McCaw was acquired by AT&T.

In general, the second cellular telephone companies and aspirants to PCN personal communications networks, (a micro-cellular technology) share an interest in easy and cheap interconnection to the LECs local networks and functional ties. On the other hand, where they are owned by RBHCs, the interests are mixed.

Regulatory Agencies

To understand some of the problems and issues of ONA, it is critical to understand the U.S.'s regulatory structure in telecommunications and its internal tensions.

The basic framework of government involvement in US telecommunications is complex. Unlike most other countries, the public sector did not own or operate civilian services, except for a few small municipally owned cable television operations, rural elephone systems, and educational television broadcasting stations. Although almost all

civilian telecommunications facilities are privately owned, their use is often - but not always - subject to licensing and regulatory oversight. These regulations are set on the federal, state, and occasionally the local level.

For all the talk of deregulation, the number of regulatory bodies, in two senses of the word, is larger in the United States than anywhere else. Federal policy emanates primarily from the Federal Communications Commission, a body of five commissioners, from both parties, appointed by the President and confirmed by the Senate, but thereafter independent from both. It tends to be dominated by its Chairman. The FCC, as other independent commissions, operates as a hybrid within the American constitutional order, exercising legislative powers (adoption of regulations), executive authority (enforcement of its rules), and a judicial role (adjudication of cases). It allocates frequencies and regulates all broadcasting, satellite, and other civilian uses of the electromagnetic spectrum. The FCC is in charge of *interstate* telephony - that is, transmissions from one state to another - and everything affecting interstate communications. The FCC also has jurisdiction over cable television.

State regulatory commissions, generally known as Public Service or Public Utility Commissions (PSCs or PUCs), are independent of the FCC. They play an important role in regulating *intrastate* telephony, and in some instances cable television. Commissioners are appointed by the governor in two- thirds of the states; in the other states, they are popularly elected by state-wide ballot. Municipal authorities regulate cable television through their power to grant franchises.

There was no *federal* regulation for the first 35 years of telephony, until the 1910 Mann-Elkins Act, which gave an undefined regulatory authority to the Interstate Commerce Commission. The ICC was established to oversee the railroads, and showed little interest in telecommunications, which were regulated by the various state utility commissions that were created in the early part of the century. When the Communications Act of 1934 was drafted, creating a more specialized and potentially activist Federal Communications Commission, the states urged a statutory limitation on the new FCC's powers over intrastate wire communications. Congress responded positively. Its report on the bill stated that "some 97½ or 98% of all telephone communications is intrastate, *which this bill does not affect."* But this assurance to the states proved empty, because separating the national from the regional regulation of an integrated network is difficult.

Public policy makers were under continuous pressure to reconcile the statutory fiction of separation of intrastate and interstate network components with the reality of their integration. What emerged was a system of co-regulation. For several decades, the cooperative spirit was great and the federal level permitted a system of revenue transfers to the state-regulated domains to support low local rates for which the federal government had no direct oversight responsibility. The system, however, could not last when its constituents' fundamental goals diverged. This occurred when the FCC began to embrace the economic concepts of efficiency, competition, markets, and entry, while the state commissions continued to emphasize equity and redistribution.

Fore two decades, the FCC almost routinely "pre-empted" state regulation that was in

conflict with its own deregulatory policies. This changes in 1986, when the Supreme Court released its opinion in *Louisiana* and overturned a FCC preemption order. Up until *Louisiana,* the case law had been clear: if the FCC wanted to preempt it could do so and win in the courts. In *Louisiana,* however, the court held that Section 2(b) of the 1934 Communications Act limits the FCC in preempting state regulation. The Supreme Court noted the following limits on FCC authority under the Communications Act: (l) the Act is properly interpreted as enacting a "dual regulatory system," both federal and state; (2) the FCC may not preempt state law merely to effect federal policy. The FCC is an agency that has no power to "act, let alone preempt the validly enacted limit the application of the Section 2(b) exception without express statutory authority."[111]

The rates and terms of service of intrastate communication are regulated by state commissions, traditionally on the principle of rate-of-return regulation. Several states have relaxed these rules either by outright deregulation or by instituting price regulation in place of rate-of-return rules. The principle of rate-of-return regulation is to permit a "fair" return on invested capital. Because this return is aggregated, some cross-subsidies can exist from one type of service to another. Furthermore, rates tend to cover less of the costs for rural than for sub-urban users, and less for residential than for business users. Because price setting is meaningless without a definition of the product, federal and state regulators also set

[111]Bernt, Phyllis, Hans Kruse, David Landsbergen. The Impact Of Alternative Technologies On Universal Service And Competition In The Local Loop. The National Regulatory Research institute (NRRI 92-16), October 1992, p. 98.

service quality requirements. In recent years, states have moved from the regulation of profits to that of price regulation (so-called price-cap regulation) or even. in the case of Nebraska, substantial deregulation.

Regulators are affected by a variety of constituencies. Residential users desire ubiquitous, reliable service at reasonable rates. They are represented by a variety of private non-profit groups and governmental consumer advocacy bodies. They have not been actively involved in the discussions over ONA. Rural users are primarily concerned with receiving basic service at rates similar to urban and suburban ones; they enjoy wide congressional support. Large business users, on the other hand, were active in ONA issues. They want innovative technology options, dynamic and reliable service, prices that are not above cost, and minimal restrictions on operating their own private networks. A variety of organizations speak for these large users. On the labor side, the Communications Workers of America ... (CWA) and the International Brotherhood of Electrical Workers (IBEW) are the primary labor unions operating in this sector, they are heard particularly on changes that affect employment.

The Federal Department of Justice plays a major role through its Antitrust Division, which enforces the 1982 court order that broke up AT&T. The primary authority in that case is Federal District Court Judge Harold Greene, who frequently decides whether the Bell Companies and other parties are complying with his divestiture decree, and who has thus been a major presence in telecommunications matters.

Conforming to a broader policy trend in US government decision making process,

other federal courts - particularly the Court of Appeals for the District of Columbia - have also become a significant locus of de facto policy making. These courts hear appeals from trial courts and administrative agencies; their decisions can be reviewed only by the Supreme Court, which hears only a small fraction of appellate cases. For example, the DC Court of Appeals forced the FCC in the *Hush-A-Phone* case to allow non-AT&T equipment manufacturers to sell terminal units for connection into the local AT&T exchanges, making competition in the equipment market possible.

The fundamental law is the Communications Act of l934, which has rarely been amended, despite many attempts. But Congress -- the legislative branch -- often wields substantial power indirectly, giving signals to the FCC through bills, resolutions, hearings, and the budgetary process.

The political parties of the US have had at best an indirect impact on the formation and exercise of telecommunications policy. Generaliy, the nature of the political party in power did not greatly affect the direction of change in telecommunications policy, though at times it affected its pace. There is a considerable of overlap among the two parties over telecommunications issues. But the tone or emphasis can be slightly different. The Democratic position has been somewhat more oriented towards protecting residential users and creating high technology initiatives. Republicans, conversely, have placed somewhat more emphasis on economic development by free market means, and on large users. While this may translate into a greater reliance on market forces, though Democratic-dominated FCCs have been just as active in that direction, and the AT&T divestiture case was initiated

under liberal Democrats and was concluded under conservative Republicans.

The multiplicity of decision-making bodies at several levels of government can frustrate coordinated and comprehensive policy making. But this process also accommodates decentralized and ad hoc decisions, many of which are responses to specific problems, rather than part of a grand design. Lack of a single all-dominant governmental body thus may not have prevented a fairly rapid re-orientation of US telecommunications policy, and indeed may have helped it considerably.

When it comes to ONA, the Federal Communications Commission's policy was to allow communications companies freer access to the telephone network, as part of a general encouragement of entry into new services and of competition in existing ones, and as part of spurring economic and technological dynamism. The FCC wanted telecommunications networks to be dynamic, open, and responsive to market demands. Seen as a possible solution to the bottleneck characteristics of dominant carriers, ONA would force the RBHCs to unbundle their services and allow other communications companies access to their networks. Thus, the FCC's position had been to encourage the LECs to unbundle the capabilities of their local networks and make them accessible to other telecommunications companies, even if that was accomplished by intervention.

For state Public Utility Commissions, on the other hand, the concerns were somewhat different. They had long been on the defensive need, seeking to protect their eroding juridiction relative to the FCC. Second, they sought to protect local residential rates, which .are politically sensitive. For many PUCs, competition in the local loop was not analogous to

competition in the long distance market. Local services are more "political," and PUCs are sensitive to increase of rates for basic residential local service. Some tariffs provide some subsidy for local service but if market forces drive prices toward costs, the source for subsidy contributions is eroded. The PUCs were also concerned with the integrity of the main telcos in terms of quality operations. And lastly, the entire notion of competition was not comfortable to a number of more traditionally minded PUCs.

The PUCs are also mindful of the new complications associated with ONA, and the potential increase in their own burdens as regulators. When it comes to ONA, state PUCs must concern themselves with:

- unbundling BSAs
- keeping ONA tariffs in line with market prices
- use and user restrictions
- market demand for ONA
- how geographically available a service must be for it to be deployable within a state.
- tariff shopping between interstate and intrastate jurisdictions
- cost splitting between inter- and intrastate components of an enhanced service[112]

[112]**Graniere,** Robert J. *Implementation of Open Network Architecture: Development, Tensions, and Strategies.* The National Regulatory Research Institute: September, 1989, p.17-·18.

It is critical not to view ONA as merely the promotion of new service providers. Just as important is that the competitive environment created by ONA permit a relaxation of traditional governmental controls over LECS. It is possible to gain the impression that the ONA process tended to "take" form the LECs and to "give" to the ESPs. To some extent this is true, since the reduction of barriers to competitors has this initial effect. At the same time, the long-term goal was to reduce and eventually eliminate direct controls over the LECs. A reasonably competitive system is the precondition for a withdrawal of government interference. In time, this will lead the LECs to be on their own. If there is a problem with this scenario, it is that some regulators at times do not connect the two sides of that equation, and persist in treating the LECs, even after the establishment of competitive conditions, as if nothing has changed.

An important questions is whether ONA retards or prevents a modernization of the network infrastructure. The argument might be that profits in services are necessary to subsidize an infrastructure which is not profitable itself. Because ONA may promote rival ESPs, it would cut the profits on the service side, and thus deprive the infrastructure of its support.

This argument is incorrect. Any profits that a monopoly monopolistic LEC affiliated ESP would reap due to barriers to entry is derived from the source of such market power, which is presently the LEC's control over the local network. The allocation of prices on profits among the infrastructure and the services is largely malleable. Thus if services become competitive, the LEC, left to its own device, could merely lower its ESP prices and

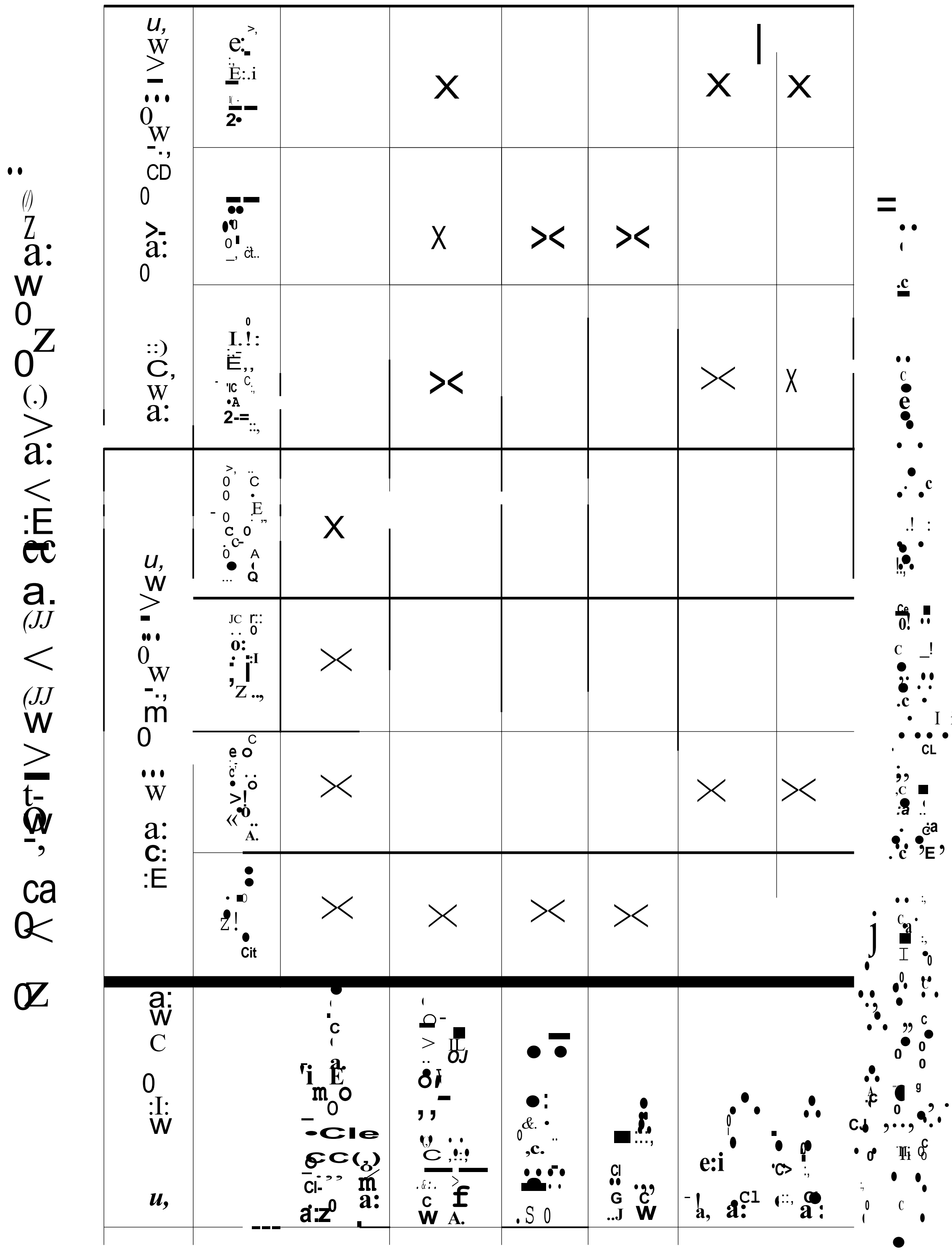
raise its access rates to all ESPs. The only constraint might be regulation. But if regulator positively desire to provide LECs with profits for infrastructure construction, they could do so through access charges just as much as through the restriction of ESP entry.

However, neither policy seems necessary, because the greater dynamics of a competitive ESP system is likely to accelerate innovation in application, which would be reflected in a greater utilization of network usage, and probably in greater demand for upgraded features.

The Aim of ONA

The term "open architecture" was not originally coined by the FCC to describe the BOC network unbundling. The term was first applied by the computer and communications industries. Open System Interconnect (OSI) is a decade-old standard developed by the International Standards Organization (ISO) to help ensure that mainframes of different manufacturers could communicate with one another. Similarly, the IBM PC micro-computer has always had an "open architecture" which allows users to open up the machine and attach chips, cards, and other equipment made by non-IBM manufacturers. IBM published its software and hardware specifications to encourage this practice when the original PC was introduced in 1981.

Telecommunications are today shaped by two basic but conflicting tendencies: the trend towards technical integration on the one h3.11d, and the trend towards institutional and



Graniere, Robert J., *Implementation Of Open Network Architecture: Development, Tensions, and strategies* (NRRI 89-13), National Regulatory Research Institute, September 1989, p. ix.

business diversity on the other. To some extent these two are substitutes for each other. To advance technologically, one can upgrade a telecommunications systems by more powerful integration, such as through integrated narrow and broadband networks (ISDN and IBN), and benefit from their economies of scale and scope, and from their greater technical standardization and compatibility. Or one can choose a more competitive diversity and benefit from its dynamism and cost-consciousness. Generally speaking, the European PTfs stressed ISDN-style integration. whereas the US mostly followed the path of diversity. Diversity is the comparative advantage of American society. Japan's has been fairly balanced in combining a major push for both diversity and integration.

ONA network-type unbundling is for the United States one step on the road to diversity. The main idea is that ONA can invigorate the provision of new and alternative communications services by lowering the barriers to their participation in the network system. On the other hand, ONA it does not do much for integration. If anything, it accelerates the centrifugal forces in the network.

Diversity can lead to innovation, but it can also retard innovation where there are many independent parts of a system which must interact. Then, change can become much harder.

In order to permit alternative service providers access and interconnection into the "public" network, American regulators embarked in the late 1980s on a set of actions to establish an open network. ONA expanded the concepts of service alternatives and network fragmentation into the very core of the networks, and aimed to lower barriers to entry for

rival and varied communications services. Under an ONA the various functions of the network, including the central office functions, would be accessible and separately available and subject to potential competition.

The FCC's objective, in promoting the ONA concept, was to get the local exchange companies to allow other communications providers freer access to their telephone networks, and to do so by "unbundling" their various network services instead of selling them as packages. ONA was seen as a solution to the bottleneck characteristics of dominant carriers. The impact of such opening was to be networks that were dynamic, open and responsible.

While most households or businesses can freely access the highway network, this is not true for access to the telecommunications network. Because the local exchange companies, where competition does not exist, maintain substantial control over local access to endusers, they have some gatekeeping power and may, absent some protections, establish unfavorable access conditions for use to other service providers. This would be especially a problem if the local exchange companies were themselves engaged in the same services as those requiring access, and would thus be able to restrict their competitors. The need for unbundling was farther accelerated by the emergence of rival local transport networks, at least in the short term, where the critical issues are to create an interconnected whole, a network of networks. On the other hand, in the long term, local competition, may reduce the need for a regulated unbundling policy by removing the bottleneck of the "last few miles."

Example for ONA:

An answering service bureau wants to screen the incoming calls for its subscribers, routing some of the calls to his private residence, others to their workplace, assistants, and still others to their stock brokers. To do so, the answering service would need to know the identification number of the incoming call, and match it to its own data bank. It would then instruct the local and long-distance companies how to forward the call.[113]
All the service bureau needs for its service is the incoming ID information, which is readily available to the LEC. But suppose the telephone company would not provide this essential service except bundled with other service, such as Centrex, which the answering bureau does not need. Or suppose that the telephone company offers similar "smart forwarding" service on its own, and charges the answering bureau a high fee for the service, thus making it uncompetitive. Or that the answering service wants to route the call over the lines of a competitor to the LEC but is precluded from doing so.

This is not to say that a network operator will only be restrictive. The value of its network physical and economic accessibility. But the extent of accessibility will not be the same if the optimization calculus does not encompass also other service providers and endusers in the equation.

In New York, the Public Service Commission, which took a lead on ONA among the

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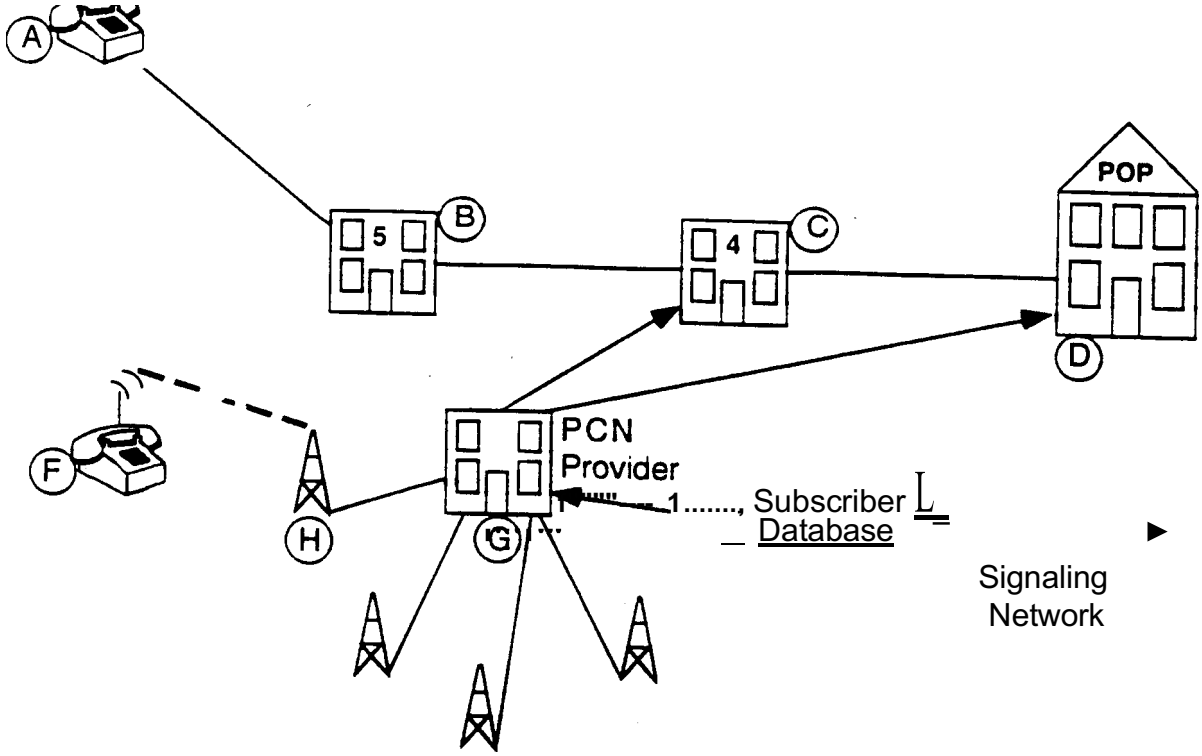
[113]Andrews, Edmund L. *Opening rhe Nation's Phone Networks.* The New York Times, °January 16, 1991, p. D5.



A fully deployed PCN. The interconnection to the LEC network follows the concept of the Type 2 cellular network. The PCN provider's switch assumes all functions of the class 5 office. Also shown in this figure is the possibility of a direct (i.e., non-LEC connection between the PCN switch and the IXC network. This connection could be owned by the PCN provider, or leased from an Alternate Access Provider.

So rce: Ben:it, Phyllis, H Kruse, and David Landsbergen, *The Impact of Alternarive Technoio ies On Universal* Service and Compet1t1on m the Local Loop, The National Regulatory Research Institute Octoti!r 1992 p. 35.

country's state commissions, held: "It should be the Commission's policy to encourage competition and innovation through increased and non-discriminatory access to network and central office functions. [11]

> "... for the ONA concept to work, the network must be disaggregated into its truly elemental component parts and customers should be allowed to subscribe to these elemental parts on an unbundled basis. It may not initially be technically or economically feasible to unbundle the network completely and offer its component parts for lease. Nevertheless, we feel it is vitally important that the plan structure be conducive to as complete a disaggregation as possible both now and in the future. Current technical and economic impediments to achieving this goal should be considered temporary obstacles to be overcome, not permanent limits in and of themselves.[11114]

> "The ONA process, in very broad terms, is an avenue to increased competition in telecommunications markets, not simply a device for encouraging the development of information services. Our ultimate ONA objective is the creation of an environment in which all users can create their own services or

[114]New York Public Service Commission (NYPSC). Case 88-C-004, Order Instituting . Procedures for the Implementation of Open Network Architecture. September 29, 1988, p.10-13.

networks using, where necessary or desirable, the functional elements of the LEC's local networks."[115]

The FCC's policy, similarly, was summarized as:

"our goal is to encourage development of future local exchange networks that are as open, responsive, and procompetitive as possible, consistent with our other public interest goals. such as ensuring network reliability and integrity and avoiding the imposition of uneconomic costs."[116]

One company, Metropolitan Fiber Systems (MFS), an alternative access provider, in petitioning the FCC for opening up the local access markets, advocated a local exchange network in which:

"... each separable component of the exchange access network must be priced on an unbundled, cost-supported basis, and competing access service vendors must be allowed to connect to the BOC networks at reasonable interface points so that they

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[115]State of New York Public Service Commission, Case 88-C-004, Opinion and Order Resolvin ONA Issues and Adoptin a Statement of ONA Principles, Opinion No, 89-28 (issued September 11, 1989), p. 6.

[116]Federal Communications Commission. CC Docket No. 91-346, *In the Matter of Intelligent Networks.* Statement submitted by Commissioner Duggan, December 6, 1991, page .1, para. l.

> can selectively purchase only those bottleneck components that they need without being compelled to pay for other, competitive components that neither they nor their customers want or need to use."[117]

Is ONA necessary for the development of value added services?

In promoting **ONA,** the FCC and other agencies are squarely in the horns of a dilemma: On the one hand, they aim at promoting a free-market approach with minimal governmental intervention. On the other hand, they seem forced, in promoting such competition, to mandate various access and interconnection arrangements, and then engage in a regulatory policy in furtherance of deregulation! They are interventionist in order to create free markets, and in the end offend both the purists of laisser-faire and of traditional regulation.

It is an important question whether the policies of ONA, such as unbundling, would be realized by market forces rather than regulation. One theoretical analysis finds that

> "networks mutually profit from interconnection when it creates services that compete directly with existing ones. Given the opportunity to move first, an integrated network will choose not to foreclose its non-integrated rivals. Generally we find that when two or more networks contribute components to a service, double marginalization reduces industry profit and consumer surplus...

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[117]Metropolitan Fiber Systems, Inc. Petition to U.S. Department of Justice for Enforcement of Modification of Final Judgement, November 14, 1989 p. 10.

despite its monopoly over an essential component, an integrated network prefers not to foreclose its non-integrated rivals. However, we observe that an integrated network may price its essential component higher than its end-to-end service. This practice has the flavor of a vertical price squeeze."[118]

The FCC, as mentioned, professes general support for the market before considering a regulatory approach:

"as a matter of policy, the Commission believes market forces, rather than regulatory fiat, should drive the development of national telecommunications assets. Market forces alone, however, may not provide the incentives for LECs to develop networks that explore all the options of interest to network users, particularly users that are potential competitors."[119]

Many ESPs request for service elements were not supplied by the BOCs. For example, of the 143 original ONA service request put forth to NYNEX by the ESPs, the BOC addressed offering 68. NYNEX stated that the remaining 75 would be re-evaluated in the future, considering changes in technology and the market. To ensure that such re-evaluations help ONA evolve with the times, the PSC established a ad-hoc New York State

[118]Economides, Nicholas S., and Glenn A. Woroch. Benefits and Pitfalls of Network Interconnection, (EC-92-31), November 1992, p. 35.

[119] Telecommunications Reports, September 25, 1991, p.1.

Inter-industry ONA task force.[120]

> But this does not prove that such BSEs would not be provided later.
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> "Virtually all parties to this proceeding, including both BOCs and ESPs, agree that ONA, if it is to be meaningful, must be an evolutionary process rather than a short-term, flash-cut "fix." Indeed, the parties agree that the most significant implementation of ONA will take place in the future when the BOs deploy advanced technologies like CCS7, ISDN, and Intelligent Network/2. These new technologies. most parties contend, will provide both greater opportunities for unbundling and a richer set of features and capabilities that independent ESPs and BOCs alike can use in developing innovative and efficient enhanced services for the American public."[121]

"Staff believes that for the ONA concept to work, the network must be disaggregated into its truly elemental component parts and customers should be allowed to subscribe to these elemental parts on an unbundled basis. It may not initially be technically or economically feasible to unbundle the network completely and offer its component parts for lease. Nevertheless, we feel it is vitally important that the plan structure be conducive to as complete a disaggregation as possible both now and in the future. Current technical and

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[120]New York Public Service Commission (NYPSC). Case 88-C-004, Order Instituting Procedures for the Implementation of Open Network Architecture. September 29, 1988, p.27.

[121]Filing and Review of Open Network Architecture Plans: Memorandum Opinion and _Order, FCC, p.200, para.378 (referred to as FCC Phase I ONA Plan Order).

economic impediments to achieving this goal should be considered temporary obstacles to be overcome, not permanent limits in and of themselves."[122]

An example for the reluctance to unbundling:

When a business decides to change its telephone service from a normal business line to a fancier network configuration such as Centrex or Private Branch Exchange (PBX), it often must switch to a new telephone number, which is often inconvenient if the old number is well-established. There is a network service that would enable customers calling the business's old number to be automatically forwarded to the new number, called Wire Center Number Retention Service (WCNRS).[123] However, the terms and costs of such a service, when it was offered in New York, were seen as unreasonable and anticompetitive by a telecommunications management company, CENTEX, and an alternative local access provider, Metropolitan Fiber Systems (MFS).[124] These companies argued that NY Telephone's rates were well above what other local exchange companies were charging, and that the exclusion of PBXs to qualify such transfer was unnecessary.[125]

The staff of the NY PSC decided that the concerns of the ESPs were justified, and

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[122]**New** York Public Service Commission (NYPSC). Case 88-C-004, *Order Instituting Proceduresforrhe Implementation of Open Network Architecture.* September 29, 1988, p.12-13, New York: NYPSC.

[123]New York Public Service Commission (NYPSC). Case 92-C-0685, Order Establishing an Open Network Architecture Task Force to Address Wire Center Number Retention Service Issues. October 13, 1992, New York: NYPSC.

[124]op. cit.

[125]op. cit.

recommended that a task force of the carriers, the ESPs, and the PSC be established to address the engineering and rate issues.[126]

Furthermore, it is unlikely that LECs would go quite as far in opening their network as they would do under some regulatory requirement, for reasons of maintaining control. For example, through ONA, ESPs will be able to access the BOC's operations and network management system.

One short-term benefit of the ONA process in itself is that it has made the BOCs more attentive to the demand for enhanced services.

> "To the extent that serving the enhanced industry more efficiently meant losing sales of old-fashioned network services, [the BOCs'] incentive was not to rock the boat. Today, the BOCs face both a carrot and a stick. The carrot is the opportunity to make money in the enhanced services marketplace. This carrot will cause the BOCs to work harder to understand the enhanced services market and to understand how improvements in local exchange service can aid enhanced service providers. The stick is the FCC's requirement that the BOCs must develop broad general ONA plans, which call for improving interconnection for all enhanced services -- not just those which the BOC will compete against. "[127]

126op. cit.

[127]Jackson, Charles L. *Testimony before rhe House Subcommiuee on Telecommunicaiions and Finance* on the FCC's Open Network Architecture (ONA) and Comparably Efficient ·rnterconnection (CEI) Policies. Washington, D.C.: July 30, 1987, p.22-23.

Furthermore, ONA-type offering may not have been widely extended in geographical terms. For example, **NYNEX** planned to emphasize the unbundling in concentrated markets, too.

Concerning the rate of ONA roll-out, Ameritech's projection was that its initial **ONA** services would be available to more than 60 percent of the total access lines in its territory by the end of 1989.[128] Bell Atlantic projected its initial ONA services would be available in 12 metropolitan areas comprising 78% of its access lines.[129] Southwestern Bell's plan was to make its initial set of ONA services available, within one year after its plan is approved, in 12 metropolitan areas containing 80 percent of the population in its territory."[130]

One major enhanced service provider, the packet-switched data service Telenet, argued to the FCC:

> **"ONA** offerings promise to bring advanced communications technologies and enhanced services to the public at large for the benefit of all. The offerings do not serve the needs of urban or business subscribers to the exclusion of rural or residential ratepayers. Rather, if allowed to flourish they can serve the needs of all. Computer-based remedial reading lessons that give disadvantaged

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[128]Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. 88-2 (Adopted November 17, 1988; released December 22, 1988) (Phase I), p. 180

i29op. cit.

1Joop. cit.

children in remote areas access to the same advanced learning techniques that their urban and privileged counterparts enjoy, data transmission services that give farmers access to important weather and price information on a timely basis, and electronic data base services that provide, for example, information on the availability of human organs for emergency transplant operations benefit all customers. Inhibiting the development of these services can benefit no one...n1

To look at the empirical evidence. the actual ONA offerings did not cover the requirements of the ESPs:

"The overwAelming majority of ESPs and user'.:: argue, mostly in general terms, that the BOCs' initially proposed ONA services do not constitute a sufficiently high proportion of the 118 NCs [Network Capabilities] listed in Report No. l, and do not meet ESPs' needs. " [132]

To which the BOC responds, according to the FCC:

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[131]US Sprint/Telenet Communications Corporation, *Open Network Architecture Background and Issues,* September, 1988, p. 5.

[132]Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. _88-2 (Adopted November 17, 1988; released December 22, 1988) (Phase I). p.63.

"(a) the ESPs have provided inconclusive demand data and have inadequately participated in the market research process; (b) some NCs that parties claim to be omitted from the initial offerings already exist as tariffed services; (c) several requested NCs that have been omitted from the initial ONA offerings are technologically infeasible, or depend upon the implementation of future technologies such as ISDN." [133]

"Bell Atlantic analyzes the list of 118 NCs in terms of their potential utility to the various sectors of the ESP community. Its study, also in matrix form, indicates the usefulness of the NCs on an industry-wide basis by matching each NC to each of the five following ESP sectors: Telephone Answering; Alarm Systems; VANs; Data Base Providers; and Transaction Services."[134]

"Some parties do, however, offer specific examples to support their position that the initial ONA offerings do not respond to their needs. For example, Telenet and Tymnet submit a list of five priority requests that, they claim, the BOCs have not adequately addressed: (a) Calling Number Identification (which, they claim, is provided only by SWBT); (b) Uniform Access Numbers

[133] Op. cit., p. 64.

[134] op. cit., p. 66.

Number of Useful Nes2

::.SP Sector	Arnone: 118 (list total)	among 29 (7 Regions)	Amonsz 37 (not offered anywhere)
Tel. Ans.	70	14	26
Alann	47	13	14
VAN	85	23	28
Data Base	64	1a	21
Transaction	78	20	28

Source: Bell Atlantic carte filing and Commission Staff Analysis. letter from Donald E. Lavin, Bell Atlantic, to H. Walker feaster, III (filed June 30, 1988).

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2 The entr; • this table signify, for example: (a) among the 29 NCs tha areoffere .n all regions, 14 are useful to the Telephone Answering sector, etc. and(b}among the 37 NC.s that are not available in any jurisdiction, 26 of these would be useful to the Telephone Answering Sector.

(provided only by Bell Atlantic); (c) Derived Data Channel Access (provided only by **NYNEX);** (d) D-Channel Data Delivery on B Channel (only Ameritech, Pactel, and SWBT have agreed to support standards development); (e) improved installation, maintenance, and diagnostic capability (not proposed by any of the BOCs)."[135]

"Several companies in the alarm industry also discuss specific capabilities that, they claim, the BOCs have not appropriately addressed. ADT lists five such requests: (a) NC #20, Derived Local Channels (lack of commitment by the BOCs to develop this technology); (b) NC #68, Derived Local Channels that Comply with UL and NFPA Standards (no commitment to supply backup power for derived local channel equipment at the end office); (c) NC #70, Derived Channels Compatible with ISDN (no response to a request to make these compatible with ISDN); (d) NC #85-86, User Initiated Diagnostics and Pass Through Diagnostics to User (not being offered); (e) InterLATA Alarm Signal Transmission (no indication of how this would be handled)." [136]

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[135]ibid.

[136]Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. _88-2 (Adopted November 17, 1988; released December 22, 1988) (Phase n. p.64-65.

"AICC states Bell Atlantic has not unbundled those BSEs that the alarm industry would find useful, claiming that: (a) Bell Atlantic has substituted REACT for the Derived Local Channels NC, but REACT is an inadequate, existing local service; and (b) Bell Atlantic has also substituted existing services for (i) the Detect Breaks in Telephone Lines in 60 sec. and Remote Alarm Signals. API/Wells Fargo, filing as an alarm service provider, claims that it had requested that Pactel unbundle its derived channel, Poll Star. but Pactel has not responded to this request." [137]

"NCR claims that the BOCs have rebuffed almost all of its ten ONA service requests for diagnostic testing and network configuration tools on the ground that the necessary technology will not be in place by the end of 1989. IDCMA also asks for customer controlled network management capabilities. It says the BOCs have discussed such capabilities in general terms for future deployment but have not included these capabilities in the initial ONA service sets." [138]

"Finally, ANPA cites a study, which it commissioned, that surveys the ONA requirements for the electronic publishing industry. ANPA claims that three quarters of the capabilities identified in its study are not addressed in the ONA

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[137] **Op. C'lt.,** p. 65.

[138] **Ibid.**

plans.[11139]

How does ONA relate to new services? When it comes to ISDN, the RBHCs, especially PacTel, were ready to provide access to ISDN D-channel for data packets.[140] On the other hand, the RBHCs planned the deployments of CCS7-based services without including them in their initial ONA service sets.

It is important to recognize just how complicated these questions are. How finely unbundled should BSEs be? How fast should they be deployed? Who should pay for their development? How standardized should they be across the country and across customers? How customized can they· be, and if so, how should the costs be distributed? Can BSEs be resold? What should the extent of facility unbundling be, when at the same time technological forces strengthen the importance of integration, such as in ISDN and integrated broadband networks? What about interconnection to telcos' software programs, data bases, storage capacity, signalling channels, network management functions, billing arrangements, technical specifications, or customer information?

The use of signaling channels with their command-and-control possibilities by outside companies is not favored by the phone companies. While these channels would facilitate data transfer and remote-controlled provision of services by ESPs, the RBHCs are concerned that

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[139]Ibid.

[140]op. cit., p. 195

networks may become susceptible to sabotage. It is unclear to what extent there should be access by ESPs to network management and other functions that the BOC-ESP may utilize. Examples for such functions are telco software programs, data bases, storage capacity, signalling channels, network management functions, billing arrangements, technical specifications, or customer information. On the one hand, many of these functions are needed for a full interconnection and a level playing field. On the other hand, there is presumably some limits to a "creeping socialization" of carriers by extending unbundling and common carrier principles into its management functions. Furthermore, a full disclosure of technical information may have its cost in terms of innovation, since it may reduce the incentive to develop proprietary technology.

The FCC was not satisfied with how BOCs planned to bundle new technologies, such as Signalling System No. 7 (SS#7), ISDN, and the Advanced Intelligent Network, and required the BOCs to address these issues.[141]

ESPs also move into competitive intelligent networking themselves. One company, ALLNET, proposes equal access by all competitive intelligent network service providers (CNIPs) to the Intelligent Network (IN). "Each end user designates a CNIP as its Intelligent Network Presubscribed Universal Telecommunications Provider ("INPUT Provider")". Service is provided to the user over the existing local loop with no additional hardware or

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[141] *Telecommunications Repons,* November *25,* 1992, p. 25.

digits to dial. IN equal access would place all CNIPs on an equal footing with LEC.[142]

The FCC decided to let the BOCs' ONA offerings packages go ahead despite their problem as a first step, but it recognized that they needed a further push to provide additional services.

> "Although only 29 of the 118 NC requests will be provided in all seven regions, the initial BOC offerings will permit ESPs to ob n useful network functions and capabilities that are an improvement upon the status quo. We thus permit the BOCs to begin implementing their initial sets of ONA services." [143]

> "However, there is merit to commenters' concerns regarding the long-term need for the implementation of more requested NC, and the lack of uniformity among the initial offerings. We require the BOCs to implement their initial services consistently with the guidelines for uniformity, deployment, and network evolution. In addition, we require the BOCs to describe more fully their reasons, other than technical infeasibility, for not offering other

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[142]Summary, CC Docket No. 91-346, *Comments of Al/net Communications Services, Inc. on Intelligent Networks and Intelligent Network Equal Access for CNIPS.,* March 3, 1992.

[143]Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. 8-2 (Adopted November 17, 1988; released December 22, 1988) (Phase I). p.67..

NCs...[144]

"In deciding whether to deploy each of 118 requested NCs, the 7 BOCs collectively made 826 separate "yes-no" decisions. Our analysis indicates that 379 (46%) of these were positive decisions for immediate deployment, while 447 (54%) were decisions not to deploy initially. A further analysis of these negative decisions indicates that 387 (87%) of the negative decisions, were based upon technological considerations, while 46 decisions (10%) were based upon general policy or pricing grounds, and 14 (3%) were based upon other reasons (such as lack of data)." [145]

"Analysis of Table 8 of Appendix E reveals that near-term technological infeasibility is the preponderant reason for not offering 37 NCs in any region. (Analysis of Table 8, Appendix E, shows that of the total of 259 negative decisions made by the seven BOCs in rejecting 37 NCs for their initial offerings, 234 decisions were for reasons of near-term technological infeasibility. Nine rejections were based upon lack of sufficient information or for unspecified reasons. Sixteen rejections were based upon reasons related to policy, pricing, or regulatory constraints.) BOCs claim that: (a) at least 22 of

[144]Ibid.

[145]Op. C•lt, p. 69.

these NCs are not technologically feasible in the near term because the NCs depend upon technologies that are not yet deployed, such as ISDN, IN2, CCS#7, and OSS; (b) most of the remainder are technologically infeasible for other reasons (These features could be technologically infeasible because of incompatibilities with existing transmission media, or because of the unavailability of required generics for stored program switches.); (c) not one of the 37 NCs has been unanimously rejected for non-technical reasons, such as corporate policy. If we subtract these 37 NCs from the list of 118 NC, a total of 81 NC requests are technologically feasible in the short term. From this perspective, the initial ONA offerings of the BOCs include from 60% to 72% of those NCs that are technologically feasible." [146]

"We find that, at this time, the BOCs have made a convincing presentation of the manner in which they have applied the technical feasibility criterion... "[147]

"[But]... the BOCs have not sufficiently justified the application of the market

[146]op. cit., pp. 69-70.

t47Ibid.

demand and cost feasibility criteria to the NC request screening process." [148]

The Basic Elements of ONA

After the FCC's *Computer III* mandate, the RBHCs and Bellcore collected ESP inputs for ONA planning. Bellcore held two national Open Network Architecture Forums open to all interested parties and including, ESPs, independent telephone companies, interexchange carriers, manufacturers, user groups, and state PUCs.

Subsequently, the seven RBHCs formed a National ONA Ad Hoc Committee to synthesize the information, and issued a list of 157 ONA capability requests as a common starting point for the national ONA planning process. A technical advisory group (TAG) was formed, and produced four ONA Special Reports for the RBHCs.

Report No. 1[149] tabulates 118 requests for Network Capabilities (NCs) that the TAG derived from the initial list of 157 capabilities compiled by the Ad Hoc Committee (the other 39 requests were deemed not to have the BSE characteristics, such as billing and collection, and unregulated services such as protocol conversion). "Network capability" is a term introduced by the BOCs in this proceeding. It subsumes, in addition to BSEs, other tariffed

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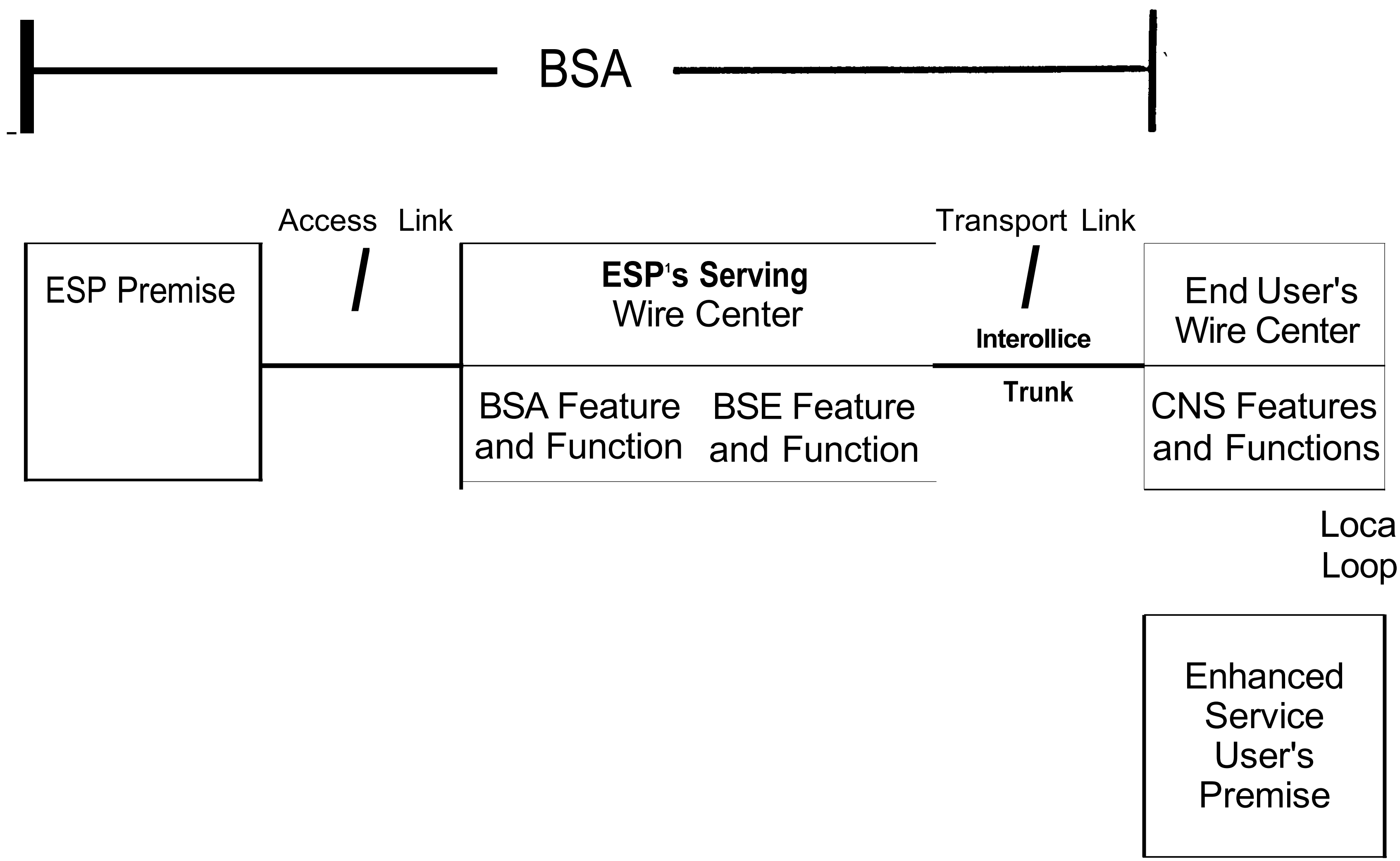
[149]B0C ONA Special Report No. 1, Issue 2, Enhanced Service Provider Reguest for ·Network Capabilities (Oct. 1987).

COMMON ONA MODEL: SIMPLIFIED SCHEMATIC



Borrows, John D. and Robert J. Graniere, *An Open Network Architecture Primer For State Regulators* (NRRI 91-20), National Regulatory Research Institute, November 1991, p. 14.

services, as well as untariffed service, such as billing and collection and protocol conversion. For each NC, the report provided a standardized name; described the major operational features in a general sense; and stated the manner in which an ESSP could use the requested capability.

Report No. 3 analyzed these 118 NCs whether it was technically feasible to implement that NC in the BOCs' major switches: the AT&T 1AESS and 5ESS, and the Northern Telecom OMS lOOF.[150] The BOCs issued a disclaimer, that the technical feasibility of a NC "does not necessarily signify that it will be a BOC offering."

This soon led to Report No. 4[151], which defined a "common ONA model," developed by the BOCs, which adopts a standardized nomenclature for the various components and features of the network architecture. The model was to "facilitate the discussions among industry members of BOC ONA Plans are prepared."[152]

Subsequently, the seven RBHCs formulated their own ONA plans, and submitted

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[150]BOC ONA Special Report No. 3, Technical Analysis Report, Enhanced Service Provider Request for Network Capabilities (October 1987).Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Qrger, FCC 88-381, CC Docket No. 88-2 (Adopted November 17, 1988; released December 22, 1988) <Phase n. p.64-65.

[151]BOC Special Report No. 4. Common ONA Model (November 11, 1987).

mFederal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. 88-2 (Adopted November 17, 1988; release December 22, 1988) (Phase I). p.27.

them to the FCC early in 1988.

The basic framework proposed the creation of four components:

A. Basic Serving Arrangements (BSAs): A BSA in simply a technical agreement between a BOC and an ESP for physical access into the network. Such access permits ESPs to provide services to their customers. Four types of BSAs were defined in the Bellcore plan:

1. circuit switched,
2. packet switched,
3. dedicated,
4. dedicated network access link.

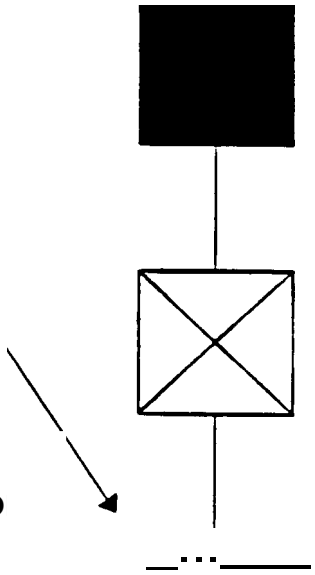
A typical BSA consists of 1) an access link (dedicated) from the interconnector to the Central Office, 2) basic central office functions (circuit switching, packet switching), and sometimes, 3) transport between COs.

B. Basic Service Elements (BSEs): BSEs are individual components which each individual ESP may need in the provision of its business. Such components often include software and signaling systems.

An example for a BSE is "Direct Inward Dialing" or "DID Trunk Queuing." This

BSE
Basic Service Elements

Switch based features and functions used by the ESP in conjunction with its BSA. Switch based features and function associated with the end-users loop are NOT BSEs.



ESP FACILITY

BASIC SERVICE ELEMENTS

Switch features and functions that are

1) **NOT required for minimal transpo (They are BSAs) and**
2) **NOT associated with individual end user line (They are CNSs)**

Switch features associated with the end users line are NOT BSEs.

End-User

Borrows, John D. and Robert J. Graniere, *An Open Network Architecture Primer For State Regulators* (NRRI 91-20), National Regulatory Research Institute, November 1991, p. 24.

BSE momentarily delays incoming telephone calls when an ESP has no available lines to accommodate the additional traffic. Usually in such cases the incoming caller gets a busy signal and the ESP risks losing a customer. Using DID trunk Queueing, the incoming call is held until a line becomes available and the call is then passed on to the ESP.

ESPs with a "barebones budget" may be able to function with a minimum of such features, while an ESP providing "luxury" services to its customers may require many more. Under the basic ONA theory, new types of BSEs will continually be developed and incorporated into the networks as the new BSEs are made technically feasible and are subject to demand in the market place.

BSEs have various signalling and support features that make certain enhanced services and complementary network services feasible. The service providers have the option of selecting the particular BSE suited to the type of service they provide; customers choose the service they desire. An important point to note is that the BSE is a basic underlying technicality on which is fabricated a service that the customer may use. Therefore, the customer need not have the option to choose the BSE; he need only have the option to choose the service -- enhanced or complementary. A BSE that could provide the enhanced feature--call forwarding-variable-remote activation/control-- would be call routing based on time of delay. So, a BSE is an underlying protocol that allows a part of or a complete enhanced feature.

C. Complementao: Network Services {CNSs): These are services which end-users elect as options. These services are provided to customers on a separate basis from the

services provided by the ESPs. The fees for such services are paid for by the end-users. As with BSEs, new types of CNSs are expected to be capable of incorporation into networks as demand for these CNSs are produced in the market.

An example of a CNS is "call-waiting". This allows private customers to keep a second caller on hold while communicating with a first caller using a single line telephone system. Another example is "Call Forwarding-Variable-Remote Activation/Control". This allows customers to have telephone calls forwarded to other telephone numbers on a temporary basis. The customer can program this new forwarding telephone number from a remote location and can change the forwarding telephone number as frequently as desired.

D, Ancillary Network Services (ANSs): These are unregulated services that the BOCs can optionally offer to ESPs on a contracted basis. One example is billing services.

Understanding the concepts of ONA which evolved from these plans is not easy. • • "The computer service companies want to be able to piece together just those options that they want," wrote a senior policy advisor of the Federal Communications Commission. "And, the telephone companies, for their part, want to continue selling 'option packages.' They're willing to unbundle those packages a bit; but, of course, not as much as the buyers want. At issue is how much unbundling to require."[153]

In order for an ESP unaffiliated with an RBHC to obtain unbundled BSE service elements, it must first establish a connection to an LEC's central office. This connection can

[15]31-etecommunications Policy Review, Vol. 7 No.16.•Friday 22 April 1988, p.2-4

Acronym	Name	Meaning	Tariff
BSA	Basic Serving Arrangement	Services that provide ESPs (or IXCs) access *to* the network	State Exchange Tarift (Business Line) or Inter-state Access Tariff
BSE	Basic Service Element	Network functionality - other than transport or access - used by the ESP (or IXC)	Interstate Access Tariff State
CNS	Complementary Network Service	SeNices associated with an end user's line	State Exchange Tariff No Federal Tariff
ANS	Ancillary Service	Nontelecommunication seNice useful to ESP in providing its service	Detariffed or Deregulated

be one of three types: circuit switched, packet switched, or direct. These access categories the RBHCs have named Basic Serving Arrangements, or BSAs. Circuit and packet switched BSAs include line side connections, which serve local subscribers, and trunk side connections, which link interexchange carriers. Direct BSAs include voice grade, Data-Over-Voice, video, and others.[154] In addition to these access links between the interconnector and the central office, BSAs may also consist of transport between central offices as well as basic central office functions.

Only by purchasing a BSA is an ESP allowed to access specific RBHC network functions (a Basic Service Elements). The RBHCs uniformly sought to establish BSAs apparently to prevent pure transport interconnection or line termination, or to avoid ESP exchange access through other carriers that would permit the piece-mealing and bypassing of their networks and challenge the existing pricing structure. By establishing BSAs the RHCs in effect side-step an important part of unbundling. To mix metaphors, they unbundled the bells and whistles (BSEs), but not the meat and potatoes (basic access).

The ESPs, however, do not want these basic access arrangements, at least, or they do not want to pay much for them. One local transport competitor, Teleport Communications, objected to the bundling of interoffice transport functions with central office functions, insisting that "The Commission should reject efforts by the RBOCs to use

[154]New York Public Service Commission (NYPSC). Case 88-C-004, Order Instituting Procedures for the Implementation of Open Network Architecture. September 29, 1988, p.6-7, 'New York: NYPSC.

their ONA plans as a means to perpetuate their bottleneck control of basic services through unnecessary bundling of basic services to Basic Service Arrangements offered to enhanced services providers" [155]

The New York Public Service Commission, in its own ONA proceeding, pointed to the voice access BSA as an example where NYNEX's ONA plan did not unbundle network components finely enough. The BSA consists of the local loop line, a port at the central office, and a connection to the main frame. At the central switch, potential BSEs such as database access, signalling, switching, recording, and billing, remain bundled within the BSA. The ESPs, stated the PSC, could use these services as unbundled BSEs in useful ways. In addition to this deficiency, the PSC noted that the NYNEX plan offers many BSEs only in conjunction with a BSA. Such packaging, it recommended, should be eliminated.[156]

To decrease reliance on RBHCs, ESPs seek to provide their own service arrangements, which means that they want to use their own trunks and their own terminating and multiplexing equipment directly connected with the LEC central office equipment, a process called physical collocation. A BSA that is similar to -- technically and economically -- physical collocation is referred to as "virtual" collocation or comparably efficient

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[155] *Comments of Telepon Communications Group,* filed before the Federal Communications Commission in the matter of Filing and Review of Open Network Architecture Plans, CC Docket No. 88-2, Phase I. April 18, 1988, page iii.

[156] New York Public Service Commission (NYPSC). Case 88-C-004, Order Instituting Procedures for the Implementation of Open Network Architecture. September 29, 1988, p.13-14.

interconnection (CEI).[157]

In addition to BSAs and BSEs, ESPs also can purchase a third type of ONA component from the RBHC, the Complementary Network Services. CNSs enable ESPs to provide services, such as Call Transfer, that exploit the local loop. These switch-based features are deployed between the end user and the LEC's network, as opposed to BSEs, whose domain lies between the ESP's office and the LEC's network.

The fourth and final ONA component proposed by the RBHCs was Ancillary Services, or ANSs, to help ESPs administrate their services with such RBHC offerings as billing and collection services. Access to ANSs enables an unaffiliated ESP to offer its customers the same conveniences an RBHC-affiliated ESP can offer.[158]

When the RBHC plans were made public, the ESPs and interconnecting carriers criticized the insufficient amount of unbundling proposed for their network.[159] "The BOCs have unbundled only a fraction of their network functionalities," stated MCI in 1991, after the data was in:

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[157]The New York PSC has granted such collocation (physical unless virtual is offered) for private line interconnection, while leaving switched type collocation for later determination. It should be mentioned parenthetically that collocation makes obsolete the regulatory distinction between CPE--customer premises equipment--and network equipment. It also raises questions of then what exactly a BSA is as distinct from a BSE, if one can get a BSE without the precondition of **a BSA** through collocation.

[158]Marvin H. Kahn, Richard A. Galligan. *An Analysis of ihe Open Network Archiiecrure (ONA) costing and tariff plans filed by the regional Bell Holding Companies* , 1988, p.10.

[159]New York Public Service Commission (NYPSC). Case 88-C-004, Order Instituting ·Procedures for the Implementation of Open Network Architecture. September 29, 1988, p.8-9.

"Of the $40,500,000 of local switching revenue which has been unbundled, 68.36% is in ANI [automatic number identification] and 30.44% is in the Called Directory Number Delivery BSE offered by Ameritech. Unfortunately for the enhanced service providers (ESPs), both of those are trunk-side BSEs primarily used by IXCs. In fact, only $60,750 of local switching revenue requirement has been unbundled into the line-side BSEs primarily used by the ESPs. "[160]

On the other hand, a non-carrier needs must be balanced with the cost to the RBHCs when determining the unbundling of the BSEs and their re-compilation in sets. Quite possibly, no set of BSEs satisfactory to all parties can be identified.[161] The RBHC also argued that any limitations the RBHCs place on ONA components applies to their own enhanced services divisions as well. The NYNEX plan offered "competitive equity" by requiring all users, including the company's own enhanced service operation, to pay identical rates for the same tariffs needed. [162]

ESPs wanted more unbundling. For example, that trunks should be unbundled from trunk-side BSA, so that ESP would be able to connect their own trunks to BOC switches.

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[160]*Telecommunicarions Repons,* 2 December 1991, p.24.

[161]Robert R. Bruce, Jeffrey P. Cunard, Mark D. Director The Telecom Mosaic: Assembline the New International Structure . Butterworths, 1988. p.55.

[162]**New** York Public Service Commission (N.YPSC). Case 88-C-004, Order Instituting Procedures for the Implementation of Open Network Architecture. September 29, 1988, p.7.

Critics said that the BOCs wrongly assume that all access arrangements existing today cannot be divided into their sub-elements, and have attempted to move the unbundling concept from the arena of basic network elements, that include facilities such as loops, as well as switching functions, inter-office transmission, and signaling, to a set of merely software-defined switching features. They advocated that the FCC mandate a more far-reaching form of **ONA,** rather than relying on the voluntary process.[163]

The necessary building blocks and interfaces, it was asserted, are described in standard reference books and professional articles, as well as the major technical references in the architecture of the local network published by Bellcore.[164]

Responding to these charges, the RBHCs offered several reasons for not unbundling BSAs at this time. Foremost among them was the unbundling of BSAs would require immediate and extensive modifications to the public switched network.[165]

The FCC agreed, at least for the time being:

"While more fundamental unbundling could be a socially desirable goal, we do

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[163]Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. 88-2 (Adopted November 17, 1988; release December 22, 1988) (Phase I). p.37. Quoting Hatfield comments at 111.

[165]op. cit., pp. 39-40.

> not believe that it would be in the public interest for this Commission to require such a development at this time. To require the BOCs to provide ONA based on a more disaggregated, and yet unspecified, architecture would be extremely costly and disruptive of the schedule that we have established for ONA implementation. The BSA/BSE concept of the common ONA model, which achieves BSE unbundling through the mechanism of software changes in end-office SPC switches, recognizes the realities of the current architecture, and is more likely to bring new features to ESPs at a faster rate, and with less investment, then would a radical reconfiguration to a more modularized architecture." [166]

The ESPs also criticized the varying nomenclature chosen by the RBHCs for their ESPs. Such divergence, they asserted, would hinder their own structuring of national services, and would lead to divergent technical specifications and tariffing principles. 37 ESP services are going to be offered by all 7 BOCs. The FCC did not think that too serious a problem.

> "Despite the differing names chosen by the BOCs, both BSAs and BSEs are essential basic service building blocks of a truly open network architecture and

[166] **Op. Clt.,** p.42.

thus both are subject to our ONA rules." [167]

When it comes to "Complementary Network Services" the criticism was they are functions available to customers of ESPs, but not necessarily to the ESPs themselves. Thus they are a use restriction. [168]

Some RBHCs argued that they can permit ESPs to use CNSs for their customers only if they have a written authorization from those customers. The reason is to prevent possible technical problems if ESPs asked CNSs to be activated on an enduser's line which could cause service interruptions.[169]

The FCC accepted the CNS category "so long as we can be assured, as in the case of BSAs, that adequate safeguards exist to protect against potential discrimination in the delivery of CNSs to ESP customers." [170]

This left the fourth category, or "Ancilliary Network Services." The BOCs proposed to include a variety of basic and unregulated services in the ANS or "other" service category, including billing and collection and access to operation support systems (OSS) such as BOC

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[167]**op. Cll., p.45**.

[168]Op. C· lt., p.46.

[169]Op. Clt., p.47.

[17°]Ibid.

databases, and systems for controlling diagnostic and maintenance information.[171]

A designation as ANS, with the aim of placing of important services outside ONA regulatory protections, would create problems for ESPs. One company, Telenet, asked for an "essentiality test" to determine whether an offering should be a BSE or an ANS, with the goal of preventing a BOC from offering ANSs to only selected ESPs or offer them at different prices to different ESPs.[172]

The RBHCs, on the other hand, argued that the ESPs want access to the ANSs of the BOCs not because they were essential, but because the ESPs wanted to piggy-back on the BOCs' economies of scale and scope, i.e. to get cheap billing and collection.[173]

The FCC concluded to abolish the ANS category:

> "The other three categories of the common ONA model appear to capture all the differentiation of basic services that is relevant in an ONA context. These three categories have some analytic content and meaningful "eligibility" criteria. ANSs as applied to regulated service have neither. Thus, to minimize confusion about the definition or significance of this category, we

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[171] **op. cit., p.** 51.

[172] Op. Cit., p. 52.

[173] op. cit., p.55.

require that all regulated services now classified in the "ancillary" or "other service" category be reclassified as either BSEs, BSAs, or CNSs."[174]

An evolutionary approach to ONA seems, on the whole, both reasonable and unavoidable. On the other hand, too much of a transition to a new system has its cost, too. Uncertainty lingers, politics beckons, and old ways persist. The test of leadership is to recognize the future and to shape it rather than to wax nostalgic over a lost golden age. LECs and TOs still play a sufficient role that if they become a constructive partner in a future "constitutional convention" of the network of networks, they would be influential in shaping it. In a few years, however, things might be different. A leadership lost is hard to regain. To exercise such leadership it is necessary to have an unsentimental vision. In the past, AT&T resisted change and lost its structural integrity and predominance.

The present state of the ONA

On December 31, 1991, Ameritech became the first BOC to offer ONA services. Its 30 ONA features offered include Automatic Number Identification, call routing, and traffic data collection.

On February 2nd, 1992, ONA services from six RBHCs became available by tariff.

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[174] op. cit., p.57-58.

Switched Access "Basic Service Elen1ents[11] Proposed for Tariffing in BOCs' Initial ONA Filings

BSE Generic Name	Bell Atlantic	SW Bell	Nevada Bell	Pacific Bell	BellSouth	NYNEX	Ameritech	US West
Alternate Routing		Alternate Traffic Routing				V		Alternate Troffic Routing
Answer Supervision with a line-side interface	t/						V	Answer super-vision line-side
Coll Detail Recording Reports							Call Detail Recording	
Call Forwarding-variable								V
Coll Forwarding-Multiple Simultaneous Calls lnterswitch								Coll Forwarding-variable
Called Directory Number Delivery via Direct Inward Dialing								Called Directory Number Delivery
Called Directory Number Delivery via 900NXX							Called Directory Number	
Calling Billing Number Delivery	ANI	ANI	ANI	ANI	ANI	ANI	ANI flexible	ANI
Calling Directory Number Delivery-via ICLID								Caller ID-Number
Calling Directory Number Delivery-via BCLID					BCLID			Caller ID-Bulk
DID Trunk Queuing								t/
faster Signaling on DID					DID/DOD Access with LSBSA			
Hot line						t/		
Line Monitor Service	t/							
Make Busy Key	Make Busy Arr.	Remote Make Busy			Make Busy/ Night Transfer	Night Transfer	Make Busy Arr.	Make Busy
Message Desk (SMDI)	Messaging Services Interface				SMDI	SMDI	Coll History Package Delivery	Message Delivery Service

Telecommunications Reports," November 11, 1991, p. 10.

Messuge Wailing Indicatur-.A.udible	Messaging Service Interface						Remote Acitvotion of Message Waiting	**Message** Delivery **Service**
Message Waiting Indicator-Visual	**Messaging Service Interface**							Message Delivery Service
Multiline Hunt Group	**Hunting** Service Arr.	,/	Hunt Group Arr.	Hunt Group Arr.	Hunt Group Arr	Hunt Group Arr.	***V***	Hunt Group Arr.
Multiline Hunt Group C.O. Announcement		Recorded Announcements		,/	(Queuing Option)	Queuing UCO	**C.O.** Announcements	UCO and Queuing
Multiline Hunt Group-Individual Access to each port in group	Non-hunt Directory #s	Non-hunting Number Arr.	Hunting Service	Non-hunting Number	Non-hunting Number		Non-hunting Number	t-lunt G1u11p Ari.
Multilinu liunt Grauµ Overflow				Hunt Group Overflow			***V***	t·hml Group Arr.
Multiline Hunt Group-UCO with queuing	UCD	Queuing		UCO with Queuing	Qm!uing	Queuing UCO	Queuing	UCO with queuing
Multiline Hunt Group-Uniform Coll Distribution Line Hunting	UCD	UCD Arr.	UCD	UCD Arr.	UCO	Queuing UCO	UCO	UCO
Netwoik Reconligu,ulion				Customer Network Reconfiguration			Ability to Reconfigure	Com111n11d A Link•
Three-way Call Transfer	,/			,/	User Trnnsfer		***V***	Coll Trnnsfer
Three-way Calling	,/					,/		***V***
Traffic Data Reports								TDR Service
Worm Line						,/		
--				Call Denial				
				Service Code Denial				
					Surrogate Client Number			
---					DID/DOD with BSA for use with WALS			

SoURCE: BOC ONA Access Tariff Filings, Nov. 1 (Note: the services listed for Ameritech **were** proposed for tariffing previously.) "BSE Generic NamoS" are listed In "BOC Services Descriptions ONA Services User Gulde,▪ July 31, 1991.

NOTES: ***V*** indicates that the BOC uses the same name for the service as the "BSE Generic **Name."** Where the name used by a BOC for a service differs from the generic name, the name used by the BOC in its tariff is Indicated.

• indicates a service already offered unc.Jer an existing federal tariff, as reported in BOCs' Nov. 1 filings.

All BOCs were told to keep track of ONA transactions in case their prices were found to be unreasonably high.[175]

The FCC let the BOC ONA tariffs go into effect, but gave permission to ESPs to examine parts of the Switching Cost Information System (SCIS) computer model to examine whether BSE tariff rates were appropriate. The FCC observed that the SCIS model "appears to be an undisclosed set of technically complex and variable workpapers which have the capability to alter substantially the BSE rates through variations both obvious and subtle."[176]

The FCC also delayed the deadline when BOC "feature group" access arrangements must be fully replaced by unbundled ONA services one year to July 1, 1993. Until then, feature groups, BSEs and BSAs will be offered simultaneously.[177]

This done, and ONA in place, the FCC removed in June 1992 the requirements that the RBHCs structurally separate their enhanced from their basic services. US West and Bell Atlantic were the first firms to eliminate the structural separation.[178]

The LECs were to make transition from offering bundled BSEs by July, 1993. Also, to prevent discrimination by LEC against competing ESPs, the BOC would have to outline

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[175]*Telecommunications Repons,* 2 March 1992, p.36.

[176]*Telecommunicarions Repons,* 2 February 1992 ,p.33-34]

[177]*Telecommunications Repons,* 18 May 1992 ,p.28.

[178]Telecommunications Repons, 6/15/92,p.29.

the BSEs used by their own enhanced services.

At the same time, there was activity on ONA offerings on the state level. In New York, in order to speed up ONA implementation in New York State, the PSC decided that tariff rates for unbundled services should remain at their previous rates as part of bundled services. Of 51 ONA services, 32 had already been offered under tariff. Tariff filings for the 19 new services, the PSC stated, should be estimated based upon incremental costs.[179]

> a) Carriers must provide to all users, affiliated and unaffiliated, equal terms and conditions for services, including advance notice of technical standards and service availability; similar ordering, provisioning, and repair; equal interconnection opportunities, etc. All ONA service elements, however designated (BSA, BSE, ancillary or complementary), should be treated in a non-discriminatory way.
>
> b) Deployment must follow clearly enunciated policies. LECs should provide detailed schedules for the deployment of specific services (including sufficient technical specifications) to permit timely evaluation of existing or proposed services.

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[179]9New York Public Service Commission (NYPSC). Case 88-C-004, *Order Instituting Procedures for the Implementation of Open Network Architecture.* September 29, 1988, New 'York: NYPSC., p. 3.

ONA services must be offered and deployed independent of LEC plans to provide enhanced services, to the extent such services are technically feasible. LECs may not delay approval or deployment of BSEs to assist their own ESP activities, such as waiting until their own affiliated ESPs are ready to enter that particular service. Nor should departure from national BSE definitions be aimed to give LEC-affiliated ESPs a regional advantage over national services.

c) ONA service elements should be made available to any and all users without discrimination, special classes or limits on use or resale.

d) To the extent that LEC-ESPs have access to exchange carrier data on customers, such data, or the processing of such data, should be made available to all on the same terms and conditions."[180]

For all the intensity of the ONA policy process, there actually has been very little use of the ONA-tariffed services. The ESPs explain the low demand for ONA services:

"First, there is, and likely will continue to be, little demand for unbundled

[180]op. cit., p.15-16.

ONA offerings as currently structured and priced."

"Second, there is precious little difference between Feature Group charges and unbundled BSA rates."

"Third, the pricing flexibility afforded BOCs by the Repc;>n and Order has procured absurd disparities in BSE costing, rate structures and pricing."

"Fourth, there is little, if any, support for the abolition of Feature Group services."[181]

And they demanded that:

"(i) BSAs must be priced in an economically rational manner if the original promise of ONA is to be fulfilled.

(ii) the existing access charge treatment of ESPs must be preserved to avoid serious **adverse impacts** on an emerging industry during a time of rapid transition.

(iii) far **greater** uniformity among the BOCs in the costing, structuring and pricing of

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[181] **Ad Hoc** TelecCilmmunications Users Committee, Sugplementary Comments to the Federal Communications Commission: In The Matter of Amendments of Part 69 of the Commission's **Rules** Relating to the Creation of Access Charge Subelements for Open Network Architecture ·(FCC 89-79), September 30, 1992, pp. ii.

BSEs is critical to the viability of ONA.

(iv) existing Feature Group services should be retained as alternatives to unbundled ONA offerings." [182]

There is also a problem with uniformity in costing, structuring and pricing BSEs. The differentials between the highest and the lowest charges listed by the BOCs for individual BSEs can exceed one thousand percent. [183]

The ESPs conclude in support of keeping non-ONA tariffed services.

"Over the past year, it is the Ad Hoc Committee's understanding that what little support existed for elimination of existing Feature Group services has essentially evaporated and that a general consensus has emerged that these offerings should be retained as alternatives to unbundled ONA services. It has become clear to virtually all interested parties that not only would no purpose be served by abolishing Feature Group services, but that strong arguments exist for retention of these bundled offerings. "[184]

The reason for the problem lies in the differential way in which inter-state and intra-state service elements are tariffed and priced. This will be discussed further below.

That the process of establishing ONA was far from costless was observed somewhat cynically by a senior FCC policy advisor.

1s2Ibid.

[183]op. cit., p. 10.

[184]Op. Cll., p. 14.

"What's happened here, of course, is that the Bell companies and AT&T have now spent considerably more than the combined annual profits of all of the domestic information service providers developing ONA plans. Some 7,000 pages of intensely complicated, jargon-laden ONA plans prepared using tens of thousands of hours of expensive professionals' time have been sent to the FCC. No one really knows what the plans say. And, the likelihood any member of the FCC or, for that matter, any of the agency's senior civil service leadership will actually read these plans is roughly the same as the chance life will be discovered on Pluto."[185]

"But the trade press, the semi-official interpreters of FCC filings and submissions, have dutifully reported that no one is happy. The Bell companies aren't happy; here they've expended all this effort and spent all this money, and nobody seems to appreciate it. The information service vendors aren't happy; they want more flexibility when it comes to buying "basic service elements," and, understandably, want to pay less. The state regulators aren't happy; they don't understand why this particular trip is necessary, and keep asking tiresome questions, like who's going to pay for this? And who's going

[185]Telecommunications Policy Review,, Vol. 7 No.16. Friday 22 April 1988, p.2-4.

to get to process and maintain the files in respect of the requisite tariffs."[186]

Because the lack of the use of ONA-tariffed service elements, some people speak of **ONA** as being "dead." This is a wrong conclusion from the data. The peculiarity of the various tariff elements has artificially skewed demands. But the concepts of unbundling and access are as valid and necessary as they were before. Does expanded interconnection make the open network architecture concept unnecessary? The two are not substitutes, but rather complements.

At the present state of limited local competition, interconnection without access to network functions is competitively and technologically not practical, and it raises the danger of parallel networks with limited interoperability. Conversely, it is not possible in the long term to restrict limit access to software-defined networks only. The logic of ESP access leads therefore also to principle of physical interconnection, and with it to infrastructure competition.

Once local competition is prevalent and no bottlenecks exist, much of the unbundling requirement becomes unnecessary because service elements would be made available by carriers contending for business. But even then it remains a residual responsibility of regulatory policy to get basic rules of the road, much as rules for commercial transactions and legal tender, whose function it is to facilitate transactions.

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[186] **Op. C'lt., p.** 2 4

At this point, collocation is largely for the multiplexing equipment of transport carriers. But the logic of the process leads also to ESP collocation by both the ESP of their hardware, and the collocation of ESP software in the LECs switches and intelligent devices. Thus physical interconnection will require -- again and still -- unbundling and access arrangements of ONA.

Thus while it may be tempting to view extended interconnection as a way to avoid the difficulties of ONA, such leap frogging will not last, because the two approaches are spawned by the same logic, and are dependent on each other.

The FCC's most recent activities on ONA is case 89-79, the pricing of ONA services. (Reply briefs were due October 30, 1992). One issue At issue is the access charge exemption (which the ESPs fight for claiming their rates would have to go up by 500%). Since the 1983 institution of the exemption, the FCC has never liked it, but did not abolish it, either. Another issue is the ESPs' desire to get lower-priced federal BSAs, based on a lower cost allocation on such BSAs. While 12% of total access minutes are interstate, 25% of cost is allocated to them. The ESPs argue for "cost-based" rates, but joint cost allocation in the regulatory field are notoriously fuzzy. If the FCC finds that too much cost is being allocated to federal tariffed BSAs, one might have to charge more to the state position, and within states to residential users rather than business customers. This would make most state commissions quite unhappy.

The use of ONA tariffed service is much more active on the state level.

A List of Basic Service Elements

Circuit Switched:

Alternate Routing
Answer Supervision With A Line Side Interface
Automatic Callback +
Automatic Recall +
Call Detail Recording Reports
Call Forwarding - Busy Line Intraswitch •
Call Forwarding - Busy Line Interswitch •
Call Forwarding - Busy Line or Don't Answer - Customer Control of Act./Deact. #
Call Forwarding - Busy Line or Don't Answer - Customer Control of Forward No. #
Call Forwarding - Don't Answer Intraswitch •
Call Forwarding - Don't Answer Interswitch •
Call Forwarding - Multiple Simultaneous Calls Interswitch #
Call Forwarding - Variable •
Call Forwarding - Variable - Activation without Courtesy Call #
Call Forwarding - Variable - Remote Activation/Control #
Call Waiting - Cancel •
Called Directory Number Delivery via DID
Called Directory Number Delivery via ISDN Q.931
Called Directory Number Delivery via 900NXX
Calling Billing Number Delivery - FG B Protocol
Calling Billing Number Delivery - FG D Protocol
Calling Billing Number Delivery - via ISDN Q.931
Calling Directory Number Delivery - via ICLID
Carrier Selection on Reverse Charge
Customer Originated Trace-
DID Trunk Queuing
Distinctive Ringing #
Distinctive Ringing - Terminating Screening #
Hot Line •
Message Waiting Indicator - Audible •
Message Waiting Indicator - Visible #
Multiline Hunt Group
Multiline Hunt Group - C.O. Announcements
Multiline Hunt Group - Individual Access to Each Port
Multiline Hunt Group - Overflow
Multiline Hunt Grou12 - Uniform Call Distribution Line Hunting
Multiline Hunt Group - UCD with Queuing
Reverse Billing on Circuit Switched Access
Selective Call Forwarding +
Selective Call Rejection +

Shared Speed Calling #
Speed Calling •
Tandem Routing
Three Way Call Transfer
Uniform 7 Digit Access Number - Remote Call Forwarding
Uniform 7 Digit Access Number via Overlay Networking
Warm Line •

Packet Switched Servin Arran ements

Call Detail Recording Repons
Call Redirection
Closed User Groups
Direct Call -•
Fast Select Acceptance
Fast Select Request
Hunt Groups
Menu Access Translator - Gateway
Message Waiting Indicator - Packet Access
Preselection for Data Services
Reverse Charge Acceptance

Dedicated Access Servin Arran ements

Access to Clear Channel Transmission
Access to Operations Support Systems Information
Automatic Protection Switching
Bridging
Conditioning
Derived Channel (Monitoring) •
Extended Superframe Conditioning (SWB only -- BSA other companies)
Secondary Channel Capability
Statistical Multiplexer
Verify Integrity of Subscriber Lines

Dedicated Network Access Link Serving Arrangements

Automatic Circuit and Trunk Monitoring Service
Calling Directory Number Delivery - via BCLID
Forwarding of Addition Dialed Digits (FADD)
Make Busy Key
Message Desk (SMID)
Message Waiting Indicator - Activation (Audible)
Message Waiting Indicator - Activation (Visual)
Network Reconfiguration

Le end

#	CNS -- not offered as BSE
+	BSE. Pacific Bell only, others offering service class as CNS
•	BSE. NYNEX only, others offering service class as CNS
	BSE, BellSouth only, others offering service class as CNS

Source: Borrows, John D. and Robert J. Graniere, *An Open Network Architecture Primer For Stare Regulalors* (NRRI 91-20), National Regulatory Research Institute, November 1991. p. 80.

		!!21 Provided						
: ,	!!£. Name		9A	BS			SWB	
8	CFW/Gall Wait		1					
12	Monitor Barge				1			
14	SMDI Auto							
, a	ESP Notif. Control Act							
29	Suppressed ring	1	1		1	1		
31	Trunk Side w/pwr ring	1					1	1
44	Share ESP Client	1						
50	a-Channel SW/Ded. Access	1	1	3				
51	D-Channel on B Chan					-	1	1
52	Multiple Don B			3				
53	Access to D Chann Sig	1		3				
54	FNSI N			2			1	
55	SCP Data Base	1	1					
57	Future ISDN Fns.	1		1				
59	**Map** ANI to **User** ID		1	2	1		1	3
62	Peak Traffic. Handling		1			1		
64	CCS Access	1				1	1	
65	Dynam Alloc.			1		1		2
66	**Network Statws**	1		1	1	1	1	1
70	Derived Chann. for ISDN	1	2		1	1		2
85	**User Diagnmtics**	1		3	1	3		1
86	**Paa.s BOC Diag to User**	1	1	1	1			1
9 1	**Enable/Disable DTMF**	1	1	1	1	3		1
. ,	**Passive Inband DTMF**	1	1	1	1	3	1	1
.13	**Extend DTMF Tone Set**	1	2	1	1	1	1	2
94	**Tone** to **Digital Translate**	1	1	1	1	2	1	1
97	**User Prog. Pack Fns.**		1		1	1	1	
98	**Remote Menu Builder Packet**	1	3	1	1			1
102	**Net. Control By Customer**				1		1	1
103	**Rea.l T1me** Traffic Data		1				1	2
105	Cust. **Name Address**	2		2	1	2		2
106	**Supp.** Call Fwd Click							
108	Privacy	1	1	1	1		1	1
109	**Traveling** Class Mark	1	1	1	1	1	1	2
110	**User** ID **rather** than Bill *I*	1		1	1	1	1	1
117	**Programed** CF	1	1	1	1		1	1
67	**Rea.l T1me Testing**	1	1	2	1	1	1	1

Fed7ral Communications Commissic;>n, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. 88-2 (Adopted November 11, 1988; released December 22, 1988) (Phase I).

Difficulties linked with ONA

ONA issues are complicated to identify, analyze, and resolve. Some of the issues are:

- Who is in charge of regulation, the federal or state levels of government?
- How to deal with financial implications of ONA-induced bypass of the local network?
- What is the appropriate unbundling?
- What is the appropriate uniformity?
- Who pays, and by what pricing rules?
- How fast and where should services be deployed?
- How does one protect small users, who may get little benefit from ONA, from bearing its costs?
- What happens to existing services?
- How does one protect the level playing field between LECs affiliates and other ESPs?
- Should ONA be required of all local exchange carriers?"
- Is the complexity worth the gain?

Jurisdictional Issues

"We also decided that the preemption of state common carrier regulation enhanced services that we adopted in *Computer II* should not be changed, and affirmed our actions in

the Phase I Order preempting the states from imposing (a) separate subsidiary requirements on the enhanced service operations of AT&T and the BOCs, and (b) state nonstructural safeguards that are inconsistent with our Computer III safeguards. Id. at 3059-60, para. 173."[187]

The Tenth Amendment to the United States Constitution reserves all power not specifically delegated to the federal government to control by the states. The federal power which permits the Federal Communications Commission to regulate communications systems is the Interstate Commerce Clause. This provision allows federal agencies to regulate activities within states, if those activities have any involvement with interstate commerce.

The United States Supreme Court has often been liberal in its definition of what entails "involvement with interstate commerce". In one case involving railroad rate restrictions the court said the federal government could regulate an intra-state railway lines because it was operated by a company which also ran interstate lines and used the same tracks and equipment in both operations. Despite this flexibility, however, the courts have expressed definite limitations to federal regulation of activities that appear to be intra-state in nature. It is in this atmosphere that has left the Federal Communications Commission trying to perform a "high-wire act" by balancing between the need for a nationally consistent regulatory system for telecommunications and the constitutional restrictions that exist on

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[187]Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. 88-2 (Adopted November 17, 1988; release December 22, 1988) (Phase I). p.19.

federal regulation of intrastate commerce.

In telecommunications, what is emerging is a system of great institutional, technical, and legal complexity which may be best described as a network of networks, serving different regions, user types, and software layers. The rules of interconnection of newcomers to the public network become perhaps the most important tool of structural regulation. Whoever controls the rules of interconnection controls the network system itself. Interconnection of hardware and software networks becomes a central issue, and control over interconnection a key element of regulatory supervision. Any squeezing the states out of this area was hence seen as an attempt to deny them participation in the control of future telecommunications structure, and they did not take to it kindly.

Albert Halprin, who had initiated ONA as the FCC's Bureau Chief Common Carrier, acknowledged the "balancing act" faced by the FCC by arguing that any attempt to develop ONA for local exchange services and mandating separation of public switched telephone networks into individual components would likely end up in court with the states, with the commission forced to defend itself against allegations of infringing on state regulation of local services.[188]

At the same time, the jurisdictional problem may manifest itself in reverse in the future, with the FCC forced to prevent states from imposing regulatory requirements that

[188] Albert Halprin, Beyond Traditional Telecommunications Boundaries: Engineering Possibilities and Market Realities, p. 7 (Speech to the ITS - 7th International Conference, date unavailable)

conflict with the Computer III scheme. For instance, An ESP may offer a basic service only within a single state, or within several states, but with no interstate connection. In such a case the state will view it as a "carrier" and regulate it as such, but the FCC may not.[189]

The interstate/intrastate problem of jurisdiction created tremendous problems in developing a fair and consistent pricing structure for ONA services. Most ESPs wanted nationally uniform rules and rates, service definitions, interfaces, installation, even administrative procedures -- at least for "standard" BSEs. This was understandable on the part of ESPs, many of whom are fledgling firms which desire compatibility and portability around the country. Additionally, some LECs insisted that enhanced services would be comprised of a combination of inter- and intrastate transmission -- what they call mixed-use services. Separating the intrastate portion from the interstate would be impossible.

A fully consistent system, however, may require the FCC to preempt state regulatory control over ONA Pricing, which would be unacceptable to them.

Unavoidably, friction develops in the process of developing and implementing the unbundling. A BSE essential to the Manhattan financial community may make no sense for Wyoming. Conversely, e.g., remote meter-reading by utilities may be more important in a rural environment than in a suburban one. To establish uniformity hence burdens those states where demand is low, or retard others where it is high. A compromise may suit

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[189]Robert R. Bruce, Jeffrey P. Cunard, Mark D. Director The Telecom Mosaic: Assembling the new international structure Butterworths 1988, p.61.

neither. To some orderly minds variation from uniformity is heresy. But uniformity has its trade-offs in terms of flexibility and choice. A uniform system, like a convoy, moves at the speed of its slowest or most obstructionist participants. The need for national uniformity in pricing of BSEs and BSAs is not as obvious as e.g., for basic protocol standardization, as long as pricing is not used to manipulate the competitive environment. It is not necessary to have uniform prices or pricing rules across the country without regard to local costs, conditions of demand, alternative offerings, technological state of the network. demographic and economic characteristics, etc.

As a result, because of the two levels of federal and state regulation, ESPs must deal with both intrastate and federal (interstate) tariffs. Also there are some conceptual problems: for example, if an ESP wants to give customers access to a database located in their state, but first must validate their name and password through a centralized database located several states away, is the enhanced service considered interstate or intrastate?

The FCC, having jurisdiction over interstate services, left intrastate services to be regulated by the public utility commissions. It refused to preempt state rules, though it was often called upon to do so.[190]

Some parties agreed that the FCC had exclusive jurisdiction over ONA services because most enhanced services are interstate in nature, at least for a portion of their traffic. But most interested parties support a "dual" tariffing approach. The ESPs argued that federal

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[190]Graniere, Robert J. *Implementation of Open Network Architecture: Developmeru, Tensions, and Strategies.* The National Regulatory Research Institute: September, 1989, p.10.

jurisdiction is essential to of ONA objectives, such as protection against discrimination and anticompetitive activity, or that the BOCs' planned to employ use restrictions. Mostly, the ESPs wanted to avoid what they called an "administrative nightmare" if they provided nationwide service.[191]

The states and several BOCs, on the other hand, argued that most ONA services are local in nature and that the states are in a better position to determine cost, market demand, and demographic factors affecting ONA services.

The FCC, under pressure, attempted to cooperate with the states by creating a Joint Conference under the provisions of the I934 Communications Act Section 2lO(b) consisting of representatives from the FCC and state Public Utility Commissions. Its assignment was to coordinate Federal and State positions on ONA. Topics of discussion for the joint state-federal conference were:

1) deployment of new network technologies

2) delivery of new services, basic and enhanced, to the public

3) ensuring use and cost of BSEs, etc., are efficient and non-discriminatory

4) effect of ONA on national economic development and competitiveness

5) uniformity of names, structures, and costs of tariffed ONA services

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[191]Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. _88-2 (Adopted November 17, 1988; released December 22, 1988) (Phase I). p. 130

6) state-federal cooperative involvement in BOCs' experimental ONA trials[192]

The intent of the joint conference was to permit a pragmatic problem-solving to replace the previous heated rhetoric emanating from the beleaguered states. But the reality was different. The Joint Conference ballooned into an unwieldy structure of mostly state commissioners with a sometimes imprecise subject-matter knowledge. The conference met a few-times, but in time it largely petered out in terms of producti'vity.

One of the recommendations of the federal-state joint conference on ONA was "that state and federal authorities not impose tariffing and entry and exit regulation on carrier and non-carrier provided enhanced services." [193]

The logic that leads to ONA is also the logic of federalism. If diversity is the goal behind the ONA concept -- diversity of services, competitors, and options -- a diversity of policy approaches should be viewed as a source of strength rather than of weakness.

Standardization

As already mentioned ESPs and some others criticized the lack of conformity among the ONA plans. DEC characterized the RBHCs' ONA plans as an inconsistent "hodgepodge." For example, different names were assigned to similar BSEs and BSAs and similar names to different items. Significantly different pricing philosophies were unveiled.

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[192]Graniere, Robert J. *Implementation of Open Network Architecture: Development, Tensions, and Strategies.* The National Regulatory Research Institute: September, 1989, p.17-18.

[193]Telecommunications Reports, May 20, 1991, p. l.

•US West divided BSEs into essential and non-essential services. Essential were those that have no readily available alternative; the would be offered under tariff. Non-essential were the ones that had substitutes and could be priced competitively.

•Southwestern Bell proposed Modular Service Elements--for essential network interconnections-- and Modular Service Options-- for add-on functions.

• **NYNEX** proposed Open Network Serving Arrangements--five network access arrangements.

• Ameritech grouped BSEs into two-- internal network functions and call information.[194]

Similarly, deployment timing was not uniform. ESPs argued that this created operational problems for national services. (This is a problem of ubiquity. as distinguished from that of uniformity). The electronics company Hayes, for example, argued that inconsistent BSE offerings would seriously undermine the efficient operation of the enhanced service and communications hardware and software markets. The newspaper publishers. **IBM,** DEC, Sprint and other advocated increased uniformity in deployment schedules for ONA services. The RBHCs, on the other hand, argued that more innovation would emerge if they would not have to march in lockstep.

How did the FCC Respond? It concluded that there was room for constructive movement toward greater uniformity. However, "while we are committed to the principle of

[194]Robert R. Bruce, Jeffrey P. Cunard, Mark D. Director The Telecom Mosaic: Assembling ·the new international structure Butterworths 1988, p.55

wide-scale uniformity of ONA services, it is neither realistic nor desirable, given existing differences in technology and market conditions among the BOCs, to mandate absolute uniformity. Rather, we require certain short-term and long-term initiatives that, together with marketplace forces, should lead to increased uniformity of ONA services.[11] [195]

In response to these problems the FCC supported the inter-industry Information Industry Liaison Committee (IILC). The IILC was instructed to focus on technical and cross-referencing issues of ONA. Each of its committees was cochaired by a BOC representative, and a representative from an ESP, IXC. or end user. Consensus is necessary for proposed solutions, and IILC reports may contain majority and minority positions where no agreement is reached.[196]

Specific instructions by the FCC to the IILC included cross-referencing and efforts such as the development of a "User's Guide.[11] Additionally, for certain BSEs whose usage often runs across state borders, the FCC wanted the LECs to be technically standardized. The IILC was called upon to resolve specifications for Automatic Number Identification (ANI) and any other ONA services that run across BOC boundaries.

In New York, the PSC provided for ad-hoc industry ONA task forces to deal with

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[195]Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. 88-2 (Adopted November 17, 1988; release December 22, 1988) (Phase I). p.105.

[196]Graniere, Robert J. Implementation of Open Network Architecture: Development, Tensions, and Strategies. The National Regulatory Research Institute: September, 1989. p.17-18.

specific problems as they arose, including standards. While the task force should be able to diverge from national ONA standards in intrastate matters, an effort was to be made to adhere to the standards wherever possible. The following principles were issued to guide such task forces:

> "i) All customers should have comparable physical and technical access to network services, functions, and features.
>
> ii) All customers should be provided equal opportunity and treatment with respect to ordering and provisioning of services, functions, and features.
>
> iii) No undue preference should be given to any party through the pricing of ONA offerings.
>
> iv) Rules for deployment of ONA services should advantage no particular party and should reasonably balance the expected benefits and costs of deploying each service, function, or feature.
>
> v) Service definitions, technical parameters, and availability should, to the extent possible, conform to known national standards and practices.
>
> vi) Account information that LECs or IXCs possess concerning specific customers, including ESPs, should be considered confidential and may only be released by the LEC at the request of the customer.
>
> vii) Marketing and technical information provided for evaluation of a potential

ONA offering should be accorded confidential treatment."[197]

Few would disagree that the costs of new services should be borne by those who cause them. But as applied to the pricing of BSEs by local exchange companies, the costs of implementing ONA and the revenues generated by ONA can be so difficult to define that this principle is not easily operationalized.

It would be helpful to have an estimate of how much ONA interconnection costs, in particular net costs (i.e., those over and beyond costs that would be incurred anyway, such as for the introduction of CCS-7). Revenue measurements can be just as difficult. In a filing to the New York Public Service Commission, NYNEX estimated ONA-related revenues to exceed $1 billion in 1994. But it is not clear, however, if these are "new" revenues, or whether they include previously bundled services.

To evaluate cost allocations throughout the network, the RBHCs developed a computer model called the Switching Cost Information System (SCIS). The model's underlying assumptions, at first kept from the ESPs who would pay for BSEs, were cause for speculation, discussion, and dispute. Even the FCC's Common Carrier Bureau admitted that the SCIS model "appears to be an undisclosed set of technically complex and variable

[197]New York Public Service Commission (NYPSC). Case 88-C-004, *Order Instituting Procedures for the Implementation of Open Network Architecture.* September 29, 1988, p.29, New York: NYPSC.

workpapers which have the capability to alter substantially the BSE rates through variations both obvious and subtle."[198]

But the SCIS was deemed by the FCC in December, 1991, to contain enough sensitive material to preclude inspection by competing ESPs. The Commission decided that close examination of the model and its data could enable the ESPs to discover, through reverse engineering, confidential information such as pricing arrangements between BOCs and switch vendors. Competing ESPs argued that access to the SCIS was necessary in order for them to comment on prices charged by the RBHCs for ONA services.[199]

From the perspective of state public service commissions, tracking and recovery of ONA implementation and ongoing costs is also difficult. The integrated structure of regulated BOCs and BOC-ESPs, together with the complexities of joint and common cost allocation, make it difficult to detect cross-subsidies or unfair competition.

ONA implements a set of non-structural rules that tries to ensure that the local exchange companies, their affiliates, and non- affiliated service providers have equal access to carrier transmission networks on the same terms and conditions. Since equipment, facilities and manpower is shared by the regulated and unregulated BOC operations, it is likely that cost for one may be mistaken for the other. CC Docket 86-111 of the FCC advocates a Joint Cost Procedure that prevents such cross-subsidies between an RBHC and its affiliated ESP.

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[198]8Telecommunications Reports, February 10, 1992, p.33-34.

[1] elecommunications Reports, January 6, 1992, p. 32-33.

The FCC views its accounting rules (Part X) as a major non-structural safeguard against cross-subsidization, and many states are currently involved in establishing such rules for their own jurisdictions. The provision of adequate data is essential for any regulatory regime in **ONA.** It is also necessary to separate the interstate and the intrastate elements of ONA-type services.

Tarification

In November, 1991, the RBHCs submitted tariff rates -- the prices and pricing rules for ONA services -- for BSEs. Their offerings and prices differed markedly from one BOC to the next. The Interexchange Carriers (IXCs) pointed out unexplained variations to the FCC, singling out Automatic Number Identification (ANI) as a good example of BOC inconsistency. The Ameritech rate, they protested, was "50% higher than the next highest BOC and more than 2500% higher than Southwestern Bell Telephone Co.'s ANI charge.[11] The IXCs also pointed out major inconsistencies in the BOC's overhead costs.[200]

Pacific Telesis countered that "Differences among BOCs are inevitable due to different deployment schedules and customer demand for BSEs. The cost of a particular service may vary greatly depending on the type of switch and software used to provide it.[11] NYNEX, for example, attributed its high ANI prices because they used an "average switching investment costing methodology," rather than an incremental costing approach.

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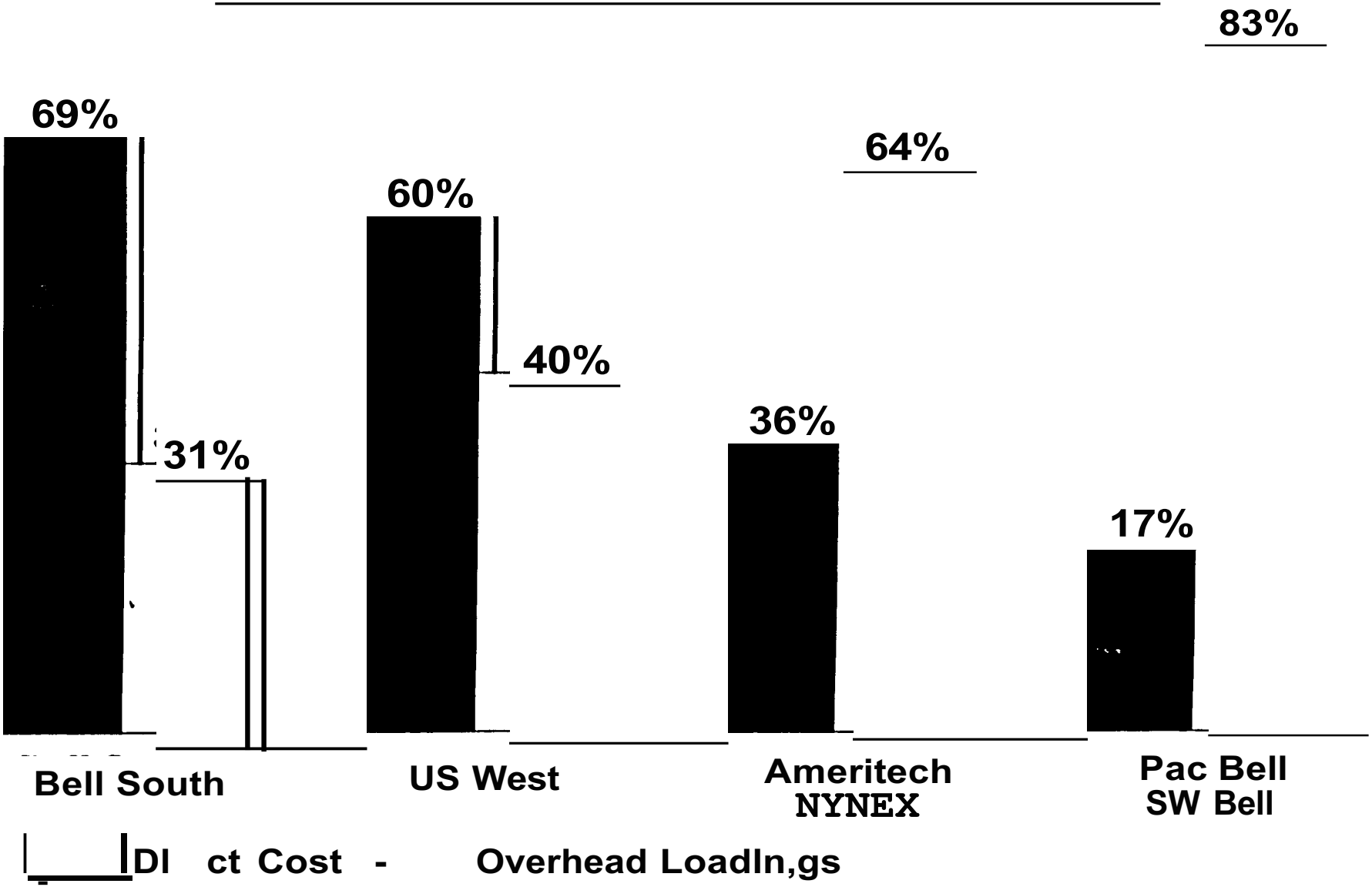
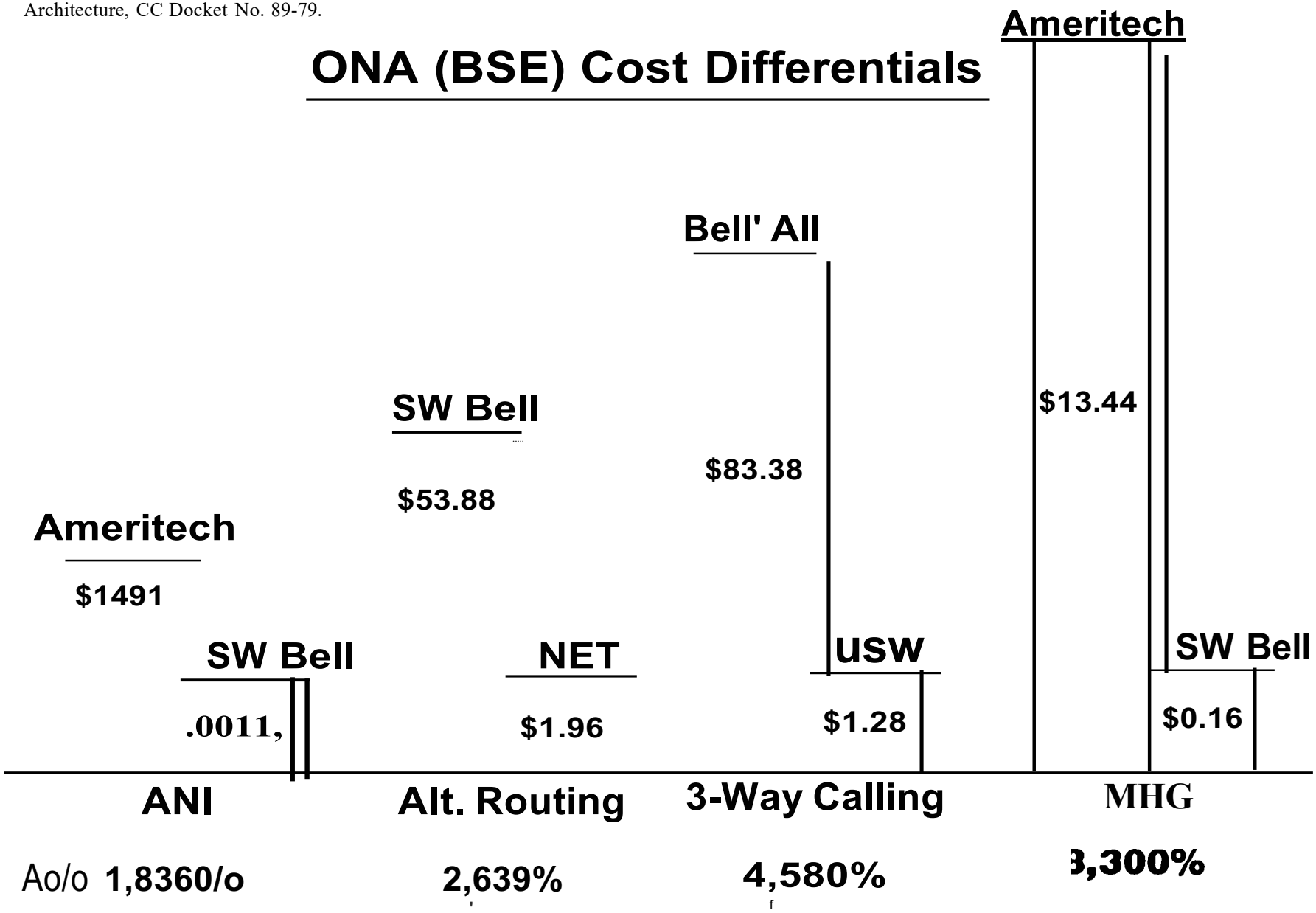
[2]oorelecommunications Reports, December 2, 1991, p.24.

Federal Communications Commission, In The Matter of, Amendments of Part 69 of the Commission's Rules Relating to the Creation of Access Charge Subelements for Open Network Architecture (FCC 89-79), Supplemental Comments of the Ad Hoc Telecommunications Users Committee, Septemher 30, 1992.

ONA Overhead Loading Differentials



Source: Ad Hoc Telecommunications Users Committee, Supplemental Comments of the Ad hoc Telecommunications Users Committee, September 30, 1992, filed before the FCC in the Matter of Amendments of Part 69 of the Commission's Rules Relating to the Creation of Access Charge Supplements for Open Network Architecture, CC Docket No. 89-79.



Source: Ad Hoc Telecommunications Users Committee, Supplemental Comments of the Ad hl.c Telecommunjcatjons Users Committee, September 30, 1992, filed before the FCC in the Matter of Amendments of **Part 69 of** the Commission's Rules Relating to the Creation of Access Charge Supplements for Open Network Architecture, CC Docket No. 89-79.

Many BSEs Contain a •Mark-up• Above and Beyond •indirect Costs· RBOCs: 11/1/91 Initial ONA Tarilf Filings

ft OC	USE	Proposed eo	Total Costs	·Mark-u	
BAIL	Calling Billing Number Delivery	**$0.000400**	$(1000368	$0.000032	8.7%
NEVB	Calling Billing Number Delivery	$0.000253	$0.000159	$0.000094	!J9. I%
SWBT	Make Busv Key	$114.24	$97.70	$16.54	169%
f>ACB	Mulliline Hunt Group (Mt tG)	$2.40	$2.18	$022	9.9%
NEVU q	Mulliine tiunt Group (MliG)	$1.75	$1.33	$0.42	31.6%
swe	Mulliline Hunt Group (MHG)	$0.24	$0.19	$0.05	26.3%
AMk:n	MUG Circular	$21.60	$23.04	($1.44)	- 6.3%
NYI	Ihree Way Calling	$74.76	$9.26	$65.50	707.5%
PACB	Ihree Way Call Transfer	$0.60	$0.67	($0.07)	-· 10.2%
NEVB	MHG UCO Line Uunt	$2_00	$1.79	$(121	117%
SWH	MHG UCO Line Hunt	$0.01U	$0015	$0 OOJ	200%
AMEil	MI IG PreleuetJ	$21.60	$42.60	($21 00)	- 4 LJ%

They insist that they weren't trying to offer high prices in order to make their collection and billing rates look good.[201]

Local costs of ONA services, conditions of demand, alternative offerings, technological states of the network, and demographic and economic characteristics all differ markedly from one RBHC to the next. Therefore one should not expect uniform tariffs among the RBHCs were not likely.

The desire for national tariffing uniformity led to calls for a federal preemption of conflicting state pricing regulation. But such preemption could not be limited to ONA. Federal preemption would establish prices for BSEs or BSAs that are, as likely as not, different from those of comparable services presently tariffed by the states for intrastate use. This creates the potential for arbitrage and conflict. One can therefore have uniformity only if one preempts state tariffing of most services, and not just of BSEs, i.e., if state rate regulation is largely cut off. To do so would be an unprecedented challenge to federalism in U.S. telecommunications regulation. The RBHCs 'themselves seem to accept the prospect of state regulation of ONA pricing (US West advocated state tariffing of virtually all BSEs).

Furthermore, because price determines the quantity of demand, taking pricing out of states' hands also denies them an essential tool for another of their traditional goals, that of assuring universal service. As long as pricing is not used to manipulate the competitive environment, the need for national uniformity in pricing of BSEs and BSAs is not as

[201]Telecommunications Reports, December 16, 1991, p.27.

compelling as, for example, the standardization of basic protocols. Also, to make tariff comparisons among the BOCs easier, the FCC directed the Common Carrier Bureau to help standardize how the BOCs publish their cost allocations.[202]

It has been argued that the FCC compromised the effectiveness of ONA by refusing to adopt a system of cost-based pricing for interstate ONA access lines. The diverse pricing plans of the RBHCs as approved by the FCC reflected variations in monopoly power, regulatory regimes and business strategies. Ameritech and US West stated that their BSEs would be cost-based. NYNEX, Bell South, and Bell Atlantic talked about market pricing, i.e., charging what the market would bear. Taking a related approach, SW Bell and US **West** negotiated rates which permit price differentiation among users. No carrier advocated a classic rate-of-return-based pricing, although some follow pricing for similar services which are based on such a rate-of-return basis.

In addition, Pacific Telesis considered initially subsidizing BSEs in order to promote new services. On the other hand, plans by Southwestern Bell and Bell South implied that some ONA services could be a source of subsidy for the rest of the network. However, ONA users are participants in an industry that has not developed to the point where it can support significant contribution levels for the benefit of other services. Saddling this industry with the burden of contribution might well retard industry growth, depriving the public of the new and enhanced services that ONA promises.

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[202] Killette, Kathleen, "FCC Reinstates ONA; Wants to beef up enhanced-services safeguards," *Communications Week,* December 17, 1990, p. 8.

The net effect of the RBHC tariffs was that ESPs were required to purchase access to ONA lines at base rates which were "two to three times the $50-$75 per month that business users currently pay (on average) for the local lines or PBX trunks that ONA access circuits would replace".[203] Such assess rates were called "huge, economically inefficient costs" that would encourage customers away from ONA services.[204]

In response to FCC guidelines, the RBHCs are willing to charge their own unregulated ESP activities the same as they would unaffiliated ESPs. But this creates a new problem. To make this parity meaningful the RBHCs would have to maintain it even where the BOC-ESP is collocated while its competitors are not. In some circumstances, therefore, the RBHCs could end up paying themselves more than cost would require, in order not to undercut the non-affiliated ESPs. Thus, there are situations of a policy trade-off between competitive parity and economic efficiency.

States are affected by the trade-off, because BOC revenues are. The New York PSC even discussed going one step further in the price parity issue, requiring ESPs which collocate on RBHC premises to contribute, through access charges or interconnection fees, universal service, and to traditional social goals such as lifeline service to the poor, service for the hearing impaired, coin phones at remote locations, and emergency service.

Like the FCC, the Coalition of Open Network Architecture Parties rejected the

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[203]Henry D. Levine The ONA Glass: Half Full or Half Empty - Part 1, Washington Telecom **Week,** p. 11, Sept. 4, 1992.

[204]Ibid.

RBOCs plan to use parity pricing rather than cost-based rates for ONA transmission services. CONAP argued that "price parity is a dangerous and potentially anticompetitive pricing approach" .... (which) "would rob the public of the efficiencies that proper pricing of ONA services could bring."[205]

In its pursuit of economic efficiency, the FCC has not demanded that prices for ONA services be as low as possible. The re-allocation of resources has been done to maximize economic welfare, including welfare derived from non-enhanced services. Also, prices are expected to be at least as high as the marginal cost to produce the last unit of the ONA service.[206]

To address the question of who should bear the cost of ONA implementation, the New York Public Service Commission called for guiding principles to take into account the needs of the RBHCs, the ESPs, enhanced services customers, and the public at large.

> "Ultimately, all users may benefit from ONA services and would therefore appropriately share in its implementation costs," the Commission stated in 1988. "However, to the extent the market will permit, those costs should be initially borne by ONA users (or by the LEC if it should want to support services, during their infancy period, out of its below the line profits). These

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[205]Comments in OQposition, Coalition of Open Network Architecture Parties, p. 4, CC Docket No. 88-2 Phase I (filed with the Federal Communications Commission in the matter of Filing and Review of Open Network Architecture Plans).

[206]Graniere, Robert J. *Implementation of Open Network Architecture: Development, Tensions, and Strategies.* The National Regulatory Research Institute: September, 1989. p.92.

> costs should be borne by non-users only to the extent the Commission sees broad based potential value in them.... In this context the Commission might be willing to support the use of general ratepayer dollars to fund ONA development in the same manner such dollars are used to fund other network development projects. "[207]

More specifically, and to ensure that existing LEC customers who do not use enhanced services will not bear the cost of ONA unbundling, the New York PSC stated that rates charged to the ESP should be high enough to cover administrative and incremental ONA costs. Subsidies for basic service from previously priced BSE or BSA tariffs should be eliminated. The PSC proposes a differentiation in pricing criteria between "existing" and "new" ONA services. "Existing" services would be priced as they were before unbundling . . . "New" services could be priced at either incremental cost (seen as pro-growth and economically rational), or through transitory pricing (several phases en route to fully allocated costs). A transitory pricing scheme could result in incremental pricing for 3 years, common costs added in for three years, and finally the allowance of market forces to take over.[208]

The New York PSC also proposed combining "existing" and "new" services, differentiating only those essential to the promotion of enhanced services as an industry.

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[207]**New** York Public Service Commission (NYPSC). Case 88-C-004, Order Instituting Procedures for the Implementation of Open Network Architecture. September 29, 1988, p.22.

[208]op. cit., p.24.

Another method is more competition-based: "If competition develops for a particular service or set of services, LECs will face a more elastic demand curve for that service, and it would be appropriate to assess less contribution. Where competition in the provision of ONA services does not develop, the demand curve remains relatively inelastic; accordingly, higher levels of contribution could continue to be assessed." Also, demand studies should measure the elasticity of ONA services and their tariffs in order to estimate changes in revenue when an existing service becomes offered as an unbundled ONA service.[209]

A large number of questions need to be resolved in ONA tariffing. Who should bear the risk of developing and introducing BSEs and BSAs. Must each BSE/BSA be priced according to the same principle, or depending on market conditions? Some BSEs/BSAs may face competitive offerings, while others do not. In a dynamic environment, there are no easy answers, and the implementation requires the difficult task of separating cost and revenues of BSEs tariffed under different principles, and of regulated BSEs from various unregulated functions such as billing. Must each BSE/BSA 's revenue cover its own cost, or only in the aggregate? And if not, could there be cross-subsidization that would distort competition? Conversely, could BSEs be defined so finely as to permit undue price discrimination between users? How much flexibility should there be in the rates? Can users be charged according to negotiated rates, making price discrimination possible? Or are such negotiated rates

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[2] ew York Public Service Commission (NYPSC). Case 88-C-004, Order Instituting _Procedures for the Implementation of Open Network Architecture. September 29, 1988, p.25-26.

helpful in ensuring that needs for customized BSEs are met or that later entrants are not overcharged? Similarly, should it be possible for an ESP to obtain exclusivity to a BSE in return for its special development? Which cost definition is used -- average, incremental, fully distributed, etc.? A large number of BSE requests were for voice analog services such as voice-mail. It seems that segments of sophisticated data service usage has already left the public network. Should there be pricing incentives to bring them back?

Another set of questions relates to what happens to existing services. Who is to pay for any "stranded" services? Some will be repriced, or their BSE/BSA aggregate counterpart will lead to a different price than before. This will affect some users negative!y. It is easy to proclaim a principle that no interconnector should be worse off than before, but this is a promise hard to deliver. In a wide-ranging restructuring of rates such as ONA may cause, there are not enough degrees of freedom to keep everybody ahead while avoiding all inconsistencies.

Access Char2es

Perhaps the most critical reason that has delayed the use of ONA tariffs is the federal access charge exemption to ESPs in combination with the present absence of new BSEs, and the need to get a BSA in order to get a BSE. This means that ONA-tariffed services are also available, as before, based on state tariffs. The main reason for using a service under ONA would therefore be a lower cost. But actually, the opposite is the case, and ONA tariffs are much higher. The reason is a feature of past federal regulation that exempted ESPs from

access charges. Normally, a network interconnecting with the local public network must pay an access charge. Thus, for example, companies such as AT&T, MCI, or Teleport pay substantial charges for the use of the local network facilities. End users, on the other hand, pay only a relatively small subscriber line charge.

When this system was set into place in the mid-1980s, the FCC decided not to treat ESPs as a network provider subject to access charges, but as an enduser largely free of such charges. The rationale was to permit the ESPs to develop, and not to be disadvantaged relative to BOC-affiliated ESPs. A few years later the FCC considered abolishing this access charge exemption for ESPs. However, the many "computer hacker" users of packet networks and information services mobilized an effective campaign to save the exemption which provided them with low connection rates. In the face of a blizzard of millions of irate electronic messages, the FCC retreated. The exemption allows an ESP to use local exchange lines tariffed under state rates (and pay the corresponding low flat-rated service fee), even if that line carries enhanced services with interstate components.

When the access charge exemption was first enacted, BOCs structurally separated their enhanced service from their basic service divisions. Therefore, the exemption helped to maintain a level playing field between BOC-affiliated ESPs and unaffiliated ones. With affiliated ESPs now locating their enhanced services units alongside their basic services units, the exemption helped unaffiliated ESPs to keep their prices competitive with those of

affiliated ESPs.[210]

ESPs contend that the exemption is crucial in helping them attract customers. BOCs see the exemption as a loophole which forces them to open their networks at below cost. The FCC is again evaluating the access charge exemption, and its decision is an issue that significantly affects the ESPs.

An example for the workings of the tariffs: under a federal ONA tariff (paying for a Basic Service Arrangement), ESPs could be paying an average of $150 a month per line. But instead, ESPs most often pay about $30 for use of a local business line, subject to the access charge exemption.[211] As a result, the federal ONA-tariffed access arrangements **are** not used, and with it there is no demand for BSEs, because these depend on BSA access.

The ESPs argued to the FCC:

"The reason for the unwillingness of ESPs to migrate their traffic to federally-tariffed ONA offerings becomes clear when the BOCs' unbundled BSA rates are compared to existing Feature Group charges. Set forth on Table 1, following, are comparisons for the various BOCs of (i) bundled Feature Group a ("FGA") charges to line-side BSA rates and (ii) bundled Feature Group D ("FGD") charges to trunk-side BSA rates. The BSA rates are calculated without inclusion of any BSEs. As is readily apparent, the differences

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[210]Graniere, Robert J. *Implemenration of Open Nerwork Architecture: Development, Tensions, and Strategies.* The National Regulatory Research Institute: September, 1989, p.107.

[211]Information and Interactive Services Report, October 23, 1992, p.9.

Comparison of Bundled FGA and FGD Prices to Unbundled ONA BSA Prices

RBOC	FGA LS1	BSA (w/o BSES) LineSide	Difference	FGD LS2	BSA (w/o BSES) Trunkside	Difference
AMERITECH	$0.0282	$0.0274	$0.0007	$0.0282	$0.0275	$0.0007
BELL ATLANTIC	$0.0253	$0.0253	$0.0001	$0.0254	$0.0253	$0.0001
BELL SOUTH	$0.0250	$0.0250	$0.0000	$0.0251	$0.0250	$0.0000
NET	$0.0358	$0.0356	$0.0002	$0.0359	$0.0357	$0.0002
NEVADA BELL	$0.0248	$0.0247	$0.0001	$0.0249	$0.0251	($0.0002)
NYT	$0.0383	$0.0380	$0.0002	$0.0383	$0.0381	$0.0002
PACBELL	$0.0235	$0.0234	$0.0001	$0.0235	$0.0234	$0.0001
SWB	$0.0240	$0.0239	$0.0000	$0.0240	$0.0240	$0.0000
US WEST	$0.0271	$0.0271	$0.0000	$0.0272	$0.0271	$0.0000

Sample Prices are comprised of the following:

One originating CCLC
One local transport charge based upon 5-rniles of transport
One local switching charge (varies as identified above).

Rates in effect as of July 1, 1992

Source: Ad Hoc Telecommunications Users Committee, Supplemental Comments of the Ad hoc Telecommunications Users Committee, September 30, 1992, filed before the FCC in the Maller of Amendments of Part 69 of the Commission's Rules Relating to the Creation of Access Charge Supplements for Open Network Architecture, CC Docket No. 89-79.

between Feature Group charges and BSA rates are minuscule, averaging less than $0.0002 per minute. In other words, for the very same reasons that elimination of the existing access charge treatment of ESPs would be devastating to the enhanced services industry, ESPs cannot avail themselves of federally-tariffed ONA offerings as currently priced and structured."

"If one assumes usage of six thousand minutes per line and calculates a BSA charge based on one originating carrier common line charge ("CCLC"), one five mile local transport charge, one local switching charge and one message unit credit, the monthly cost of ONA access would, as set forth on Table 2, following, range upwards to $179.54. Indeed, the weighted average cost of ONA is more than 200 percent higher than the cost of a locally-tariffed B-1 line, which averages less than $40.00 nationwide. Thus, if an ESP were to migrate its traffic to federally-tariffed ONA offerings, it would experience cost increases ranging from one to two hundred percent to three to four hundred percent...[212]

[212]Ad Hoc Telecommunications Users Committee. Supplementary Comments to the Federal Communications Commission. In The Matter of. Amendments of Part 69 of the Commission's Rules Relating to the Creation of Access Charge Subelements for Open Network Architecture _(FCC 89-79), September 30, 1992, pp. 6-7.

One solution suggested by ESPs was to allow them to use "mixing and matching," whereby they could shop around between the federally-tariffed BSEs and the less expensive state-tariffed access lines without access charges.

The LECs responded by arguing that allowing the ESPs to pick and chose between the federally-tariffed and the state-tariffed lines "would realize all the fears of misaligned costs and revenues and of adverse impact on state policies" that the FCC contemplated when it rejected the idea in 1991. Instead. they argue that the ESPs should be completely barred from using state-tariffed lines as a substitute for federally-tariffed lines. U.S. West asked the FCC to eliminate the ESP exemption in conjunction with a complete overhauling of the network access pricing structure towards a system that would involve a more '"rational' way to 'determine who should pay switched access charges in which contexts.' "[213]

The FCC pricing strategy was additionally problematic because of the definition of ESPs under the ONA design. The FCC, in Computer I, decided to use "a functional approach to determine whether and when a service should be deemed (regulated) communications or (unregulated) data processing". Those services which were determined to be data processing in nature would be deregulated. Those enterprises which combined both types or services would be regulated on a case-by-case basis. Some say these definitions were put into place to avoid discrimination, but the result was that the commission defined ESPs so generally that almost any business that utilizes telephone lines leading into

[213]Information & Interactive Services Report, p. 9, October 23, 1992.

computers qualified.

This problem may get worse if the RBOCs decide to make future features or enhanced network services available only on the "overpriced" ONA lines.

Consumer issues

ONA raises privacy concerns. The position of the ESPs is that for ONA to function properly, competitors must have access to Customer Proprietary Network Information ("CPNI"), such as billing information that can help identify potential customers. They argue that access to CPNI is essential if they are to compete against the RBHCs' affiliated ESPs if the latter receive information about the BRHC consumer base.

Billing functions and Customer Proprietary Network Information (CPNI) is particularly important, given its potential marketing value, and BOC affiliated ESPs have access to it under the *Computer Ill* decision. If CPNI is available to RBHC product developers and marketing managers, they will be able to sift through computerized records in order to develop or market new products. Non-affiliated ESPs, however, would have access to CPNI only with approval of a customer, according to the FCC rules. To level the playing field either means to permit an intrusion to telephone customers' privacy, or to preclude a BOC from otherwise reasonably available information.

Similarly, RBHCs and other LECs would have a competitive advantage if they had access to telephone service credit information.

Additionally, ESPs want to be able to efficiently track how long their customers use

the network. This collides with privacy rights of non-ESP customers, as well as confidential LEC information.[214]

Partly to deal with the competitive problem, Judge Harold Greene imposed in 1988 restraints on the use of CPNI information.

The RBHCs also ESPs to provide supporting marketing information in order to assess demand for a new BSE. Such ESP-provided information could a'tert the RBHCs to potential market opportunities. (Some RBHCs. therefore, to deal with that conflict, have established BSE reviewers separate from their own ESP product managers.)

In implementing the Common ONA Model the FCC rejected the arguments of ESPs and concluded that the public interests involved in limiting access to CPNI outweighed the advantages the ESPs would receive from it. The FCC argued in its ruling that the ESPs "seem to assume that information on a customer's credit history with a telephone company provides a virtually complete profile on the customer's creditworthiness." But this was not the case the FCC argued.

The credit history a BOC possesses is limited to information on customer payments of telephone bills, which may not always accurately reflect a customer's creditworthiness for purchase of enhanced services. (A customer that has a good credit history for basic telephone service may not be a good credit risk for enhanced services since disconnection

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[214] New York Public Service Commission (NYPSC). Case 88-C-004, Order Instituting _Procedures for the Implementation of Open Network Architecture. September 29, 1988, p.19-20

from telephone service for nonpayment of enhanced service bills may not be available and the charges for certain types of enhanced services could be much larger than those for basic services.)

> "Indeed, other, and arguably more useful, indications of creditworthiness are widely available from credit bureaus today. Furthermore, ESPs have credit information on their own current and former customers, which although not nearly as broadly based in terms of numbers of customers as that of the BOCs, is much more sharply focused on purchases of enhanced services.
>
> Moreover, even assuming a BOC derives some utility for its enhanced service marketing from its basic services credit information, we do not think this constitutes and "unfair" or anticompetitive advantage. All firms use their own credit experiences with customers in determining future credit relationships. This is a legitimate business practice, which we do not think should be prohibited for the BOCs. Finally, given the existence of numerous state and federal laws and regulations governing the use of credit information, we see no need for further Commission control of this information at this time."[215]

In 1991 a rule was passed prohibiting access by any ESP (affiliated with a BOC or

[215]Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. 88-2 (Adopted November 17, 1988; released December 22, 1988) (Phase I). p. 216-217

not) to information for large customers (those with more than 20 lines), unless those companies provide an ESP with written permission. The ESPs argued that the only effective means of restricting CPNI access generally is a password/ID security system, and this was indeed adopted by the FCC.

A major consumer issue is the effect of **ONA** on the service prices residential users pay for telephone service. These customers, many of whom have little use for ONA services, could end up paying more, because unbundling and interconnection may reduce revenue that has previously subsidized residential service, or because it could permit local competition that could lead to lower prices, potentially less traffic, and other revenue diversions.

Additionally, greater unbundling may increase the cost of telecommunications operations. And finally, some of the BSEs may not pay for themselves and this increases the risk exposure to regular ratepayers.

On the other hand, the volume of traffic and of revenues could pick up. At present, a residential phone is used only about 25 minutes/day. An increase of usage by only 5 minutes/day could thus increase the revenue-flow from usage-sensitive charges by 20 percent. Furthermore, competitive ESP and local transmission services could make it possible to provide small users with services which in the past may have only been available to large users, and at competitive prices. New and useful services are likely to emerge, and the cost of central office switching could go down as a result of competitive incentives. The idea _behind ONA may help provide consumers with the option of obtaining those enhanced

services they want, and only the services they want. This will produce some savings for customers which do not require, or want all of the services available in a network system. The versatility might also discourage some larger customers (such as private companies) from building their own private networks which might be used to bypass the main facilities. Positive effects, however, are likely to take some time while costs and revenue losses are more immediate. In the meantime, it would be hard to defend rate increases to the general ratepayers that are due to a restructuring of interconnection if their service is not directly and appreciably improved.

A related consumer issue involves the billing and collection for ESPs. Should a user's telephone service be disconnected by the LEC if they do not pay their ESP usage bills? On the whole, it seems better not to hold hostage local service for the non-payment to ESPs and other third-parties, especially where selective blocking technology provides a technical fix to the problem of non-payers. ONA and ESP services should not interfere with the provision of general telephone service. However, the ability to be reached is as much part of universal service as the ability to originate a call. Thus, if access rules result in the opening of the telephone system to more providers of information and services, universal service is positively affected. This is also an argument for a relatively even geographical spread of ONA-capable exchanges.

The emerging systems of systems will make it increasingly difficult to maintain the traditional system of internal transfers from one class of users to another, mostly from large .users to small ones, and from metropolitan to rural ones. But in the future, not only will

such flow erode if its system is not changed, but residential users may end up paying a proportionally higher share than large users, because cost shares in the substantial joint costs end up allocated inverse to demand elasticity -- the Ramsey pricing rule -- and large users have more options and hence greater elasticity. Thus, the trend which at present is described as a "rebalancing" would go beyond a mere "moving price closer toward cost". It would also unavoidably include the deaveraging of prices.[216] Nor can one expect to continue to rely on a system of access charges to provide the source of subsidies, since these charges imply access into "the" network, which will be a meaningless concept where alternative transmission is easily available. But this does not spell the end of transfers to categories of customers, regions, and users one desires to support. There is still ample possibility to subsidize, if one wants to, some categories of service or users for reasons of social policy or regional development, or for the positive benefits that new subscribers provide to existing users. **A new** mechanism to finance desired subsidies and end the primary reliance on the LECs and their customers would be based on a communications tax instead of the traditional internal system of transfers supplemented by access charges. It would be a national in scope, and value-added in operation, in order to be neutral with respect to the extent of integration, the nature of the carrier, and geographic location. This tax would not be an additional burden, since it would replace the present hidden tax inherent in the tariff structure, and would make it accountable. The moneys raised would go to a "universal

[216] A.C.Barrett, The *Telecommunications Infrastructure of the Future,* University of Toledo ·1.aw Revue, vol.23 No.I, Fall 1991, p. 93

service fund" which would be used to support certain network providers, categories of users and carriers. Thus, government is not likely to disappear from this area.

Some competitive pressure is provided by the ability to generalize ONA-type features through customer or ESPs equipment and through the networks CAPs and interexchange carriers.

Next Steps: Modularization.

ONA was believed to be a market-enhancing policy, but it is also triggering the redesign and reconfiguration of earner networks.[217] The FCC's goal is that the BOCs should not use ONA as a way to allow access only to those services which the BOCs do not intend to market themselves:

> **"ONA** is a public policy, not a prescription of a particular network architecture. Indeed, as a public policy, ONA should be "technology-neutral" -- that is, while it is implemented through particular network technologies, its principles do not depend on one or another such implementation. Rather, those principles can be applied to evolving network technologies as they develop. Of course, some technologies may permit the fuller realization of the

[217]Robert R. Bruce, Jeffrey P. Cunard, Mark D. Director The Telecom Mosaic: Assembling the new international structure Butterworths 1988, p.55.

goals of ONA than others." [218]

The RBHC ONA offerings deal almost exclusively with functions access for Enhanced Service Providers, thus permitting an impression that ONA is only about access to software networks, rather than the interconnection of physical carriers. However, the principles of interconnection and unbundling really go much further. The FCC decided that interstate ONA elements, while based on expressed ESP needs, should be available to anyone, not just to ESPs. This includes also a wide array of interconnectors with interstate traffic, such as AT&T, the OCCs, long-distance resellers, facilities bypassers, private networks, independent telcos, cellular operators, RCCs, other BOCs, and even international or foreign carriers.

This has major ramifications. For example, alternative carriers could transport interstate traffic (on their own or on leased lines) to the LEC's exchange, have it switched there, and take at least the interstate part (depending on state rules) of the rearranged traffic to its destination. Similarly, they could use the LECs' subscriber lines and switches as a feeder system for their own trunks to major destinations, including to interexchange companies. The distinction between private fixed networks and public switched ones would blur further. Competitive regional and local exchange companies could rapidly emerge, in particular if states adopt intrastate rules similar to the federal ones. And LECs may start to

[218]Federal Communications Commission, In the Matter of Filing and Review of Open Network Architecture Plans, Memorandum Opinion and Order, FCC 88-381, CC Docket No. ·s8-2 (Adopted November 17, 1988; released December 22, 1988) (Phase I), p.12.

compete with each other for the business of switching the traffic of bypassers, independent telcos, or cellular operators. Interexchange carriers, similarly, could in effect enter local distribution.

And this is not all. The interconnecting collocation discussed so far is only one step in a more complex evolution. The next step will be for an enhanced service providers to ask for the right to introduce of a new application module. The ESP would show up with its own private software, in effect asking for inclusion of its software among the central office software functions as "software collocation." In other words, software by outsiders would be put into the central exchange. Local exchange companies may have a problem with that notion, but it may not be bad commercially, as long as it conforms with standards and protocols, does not displace LEC functions because of limited capacity, does not devalue network control functions, and of course yields revenues. Some of the LECs have been developing a software interface in their Advanced Intelligent Network plans, and plan to sell memory and processing as part of their business strategy. For LECs, software collocation may actually be more advantageous than having an ESP lodge its software functions within its own collocated physical equipment that is somewhere in the LEC's central office, because software collocation should be done antiseptically by electronic communication. And it could make the LECs' central office services such Centrex much more powerful in comparison to PBXs. This could also open up a scenario of very exciting applications, and lead for a more intense R & D involvement by LECs, which is at present fairly low due to a variety of .restrictions.

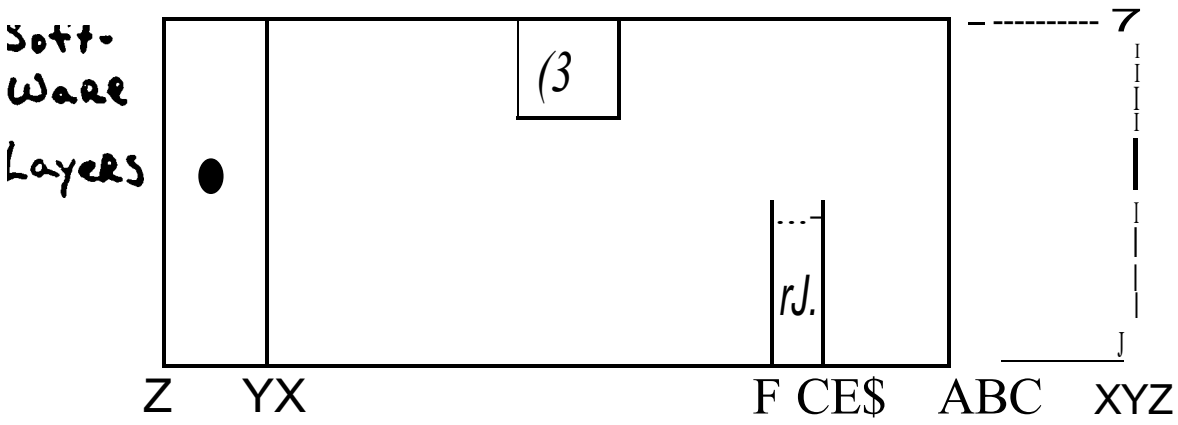
The unbundling issue has been dealt with largely ad hoc. Users wanted certain services, and the local exchange companies set out to offer them some of these elements and not to offer others, in an often inconsistent pattern. The FCC (as well as some states) clarified some of the issues but essentially went along with the proposed filings, while acknowledging that modifications will be needed in the future. This, of course, is a sensible and safe course. The problem with such an approach is, however, that one easily ends up with a system that is not based on any criteria except that of minimizing conflict. Somehow there must be a basis for evaluating the questions whether a service element ought to be provided and how segmented it should be. If one does not have an explicit or implicit model to answer such questions as they come up, and if one proceeds in an ad hoc fashion year-in, year-out, one can easily end up with a national network that is entirely illogical in structure. And to unscramble inconsistencies later is more difficult than to have some basic blueprint to begin with.

It is helpful to think of a network as consisting of hardware and software functions.[219] In software the tendency is toward modularity.[220] An example for modular software is the OSI hierarchy (Open Systems Interconnection), which was adopted in 1986 by the International Standards Organization (ISO). OSI is based on a hierarchy of seven layers, each of which has defined functional responsibilities. An upper level layer is reliant on the lower layers. But they are, in principle, independent modules, and in theory one can rewrite

[219] These can partly substitute for each other.

[220] First for data, and in an ISDN network also for voice service.

MAPPING
the NETWORK



Hardware Segments

the software protocol for any layer, and replace it without having to change any of the other layers. In actuality, some layers are integrated, but this need not effect a conceptual map.221

The other dimension is hardware. Here, it is helpful to think of a network architecture as a sequence of physical segments. For example, the subscriber terminal itself, the inside wiring, or the trunk between local office and tandem switch. In the context of defining ISDN standards, the international standards body CCITI defined the segments close to the user very carefully and separated them with demarkation points known as the R, S, T, U, etc. One can use the same technique to define segments throughout the network. And if one puts together the software and the hardware presentations into a system of coordinates, one can express a network schematically, and each component can be graphed into this map. Element alpha, for example, could be an interoffice transmission trunk. Element beta, similarly, is an applications module. Element gamma is terminal equipment such as a fax machine. Etc.

Almost all of this territory used to be occupied by AT&T, but the development of the last two decades has been for others suppliers to enter, too. (The AT&T divestiture was a vertical splitting of the box.) Alternative carriers and service providers are schematically graphed in the chart. In this case, there are alpha-2 and beta-2 elements that are offered by alternative vendors, in competition with the alpha-1 and beta-1 of the traditional carrier.

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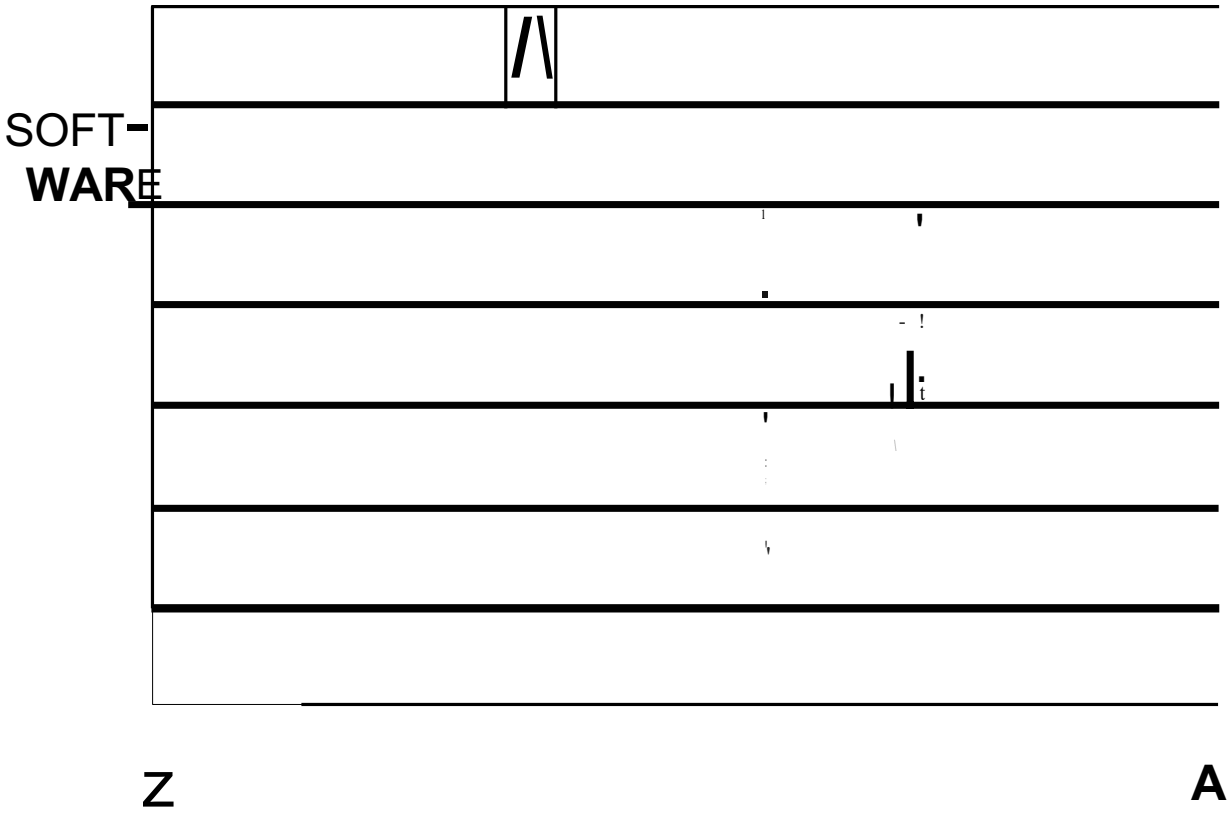
221 One can, similarly use software hierarchies other than OSI.

But, these alternative service blocks usually lack the connecting physical and software elements that are necessary for an end-to-end connection with users, and which the traditional carriers possess. This is why, if one wants to encourage the supply and creation of alternative service elements, one must provide a framework of interconnection with the other elements of the network, in a way shown schematically by the winding path in the graph, so that we could use the alternative alpha-2 and beta-2 and still not be left cut off from the rest. And this is the major rationale for interconnection and access arrangements. Eventually the islands grow larger and may fill the entire map. In the meantime, however, one can establish islands of competition only if one assures the ferry service to them.

A more systematic concept of technical interconnection points is a logical outgrowth of the open network initiative. This would require a definition of interface points and standards on the hardware and software segments. Such an approach -- which would need not entail a greater unbundling would establish a more systematic framework that would permit central office, transmission equipment, and software to be offered by specialized firms, making equipment markets more competitive. It will increase the flexibility, power, and independence of both public and private networks, and lead to innovative software applications.

As the competitive islands grow, they must interoperate in a sensible manner in terms of technical standards, protocols, and boundaries. This is why it is necessary to establish a network blueprint, such as a conceptual grid system. Such a grid would be based on defined .vertical and horizontal coordinates, and the technical standards of interconnection and

A GRID OF NETWORK MODULES



HARDWARE

interface between them. In this fashion it would set out a system of modularity which would make possible an interconnecting modular network system. This is depicted schematically in the graph. Within the modules service providers could do more or less whatever they wanted. And they could connect modules together. But one could replace one module, and it could interact with the others.

This will not mean modules and interface points everywhere, since this would be technologically burdensome. Nor would there have to be more unbundling than before, or that all points would be set at once. Setting the specifics of interfaces is complex, and should not be ahead of demand interface.[222] That is a regulatory policy decision which will have to take into account cost and performance implications.

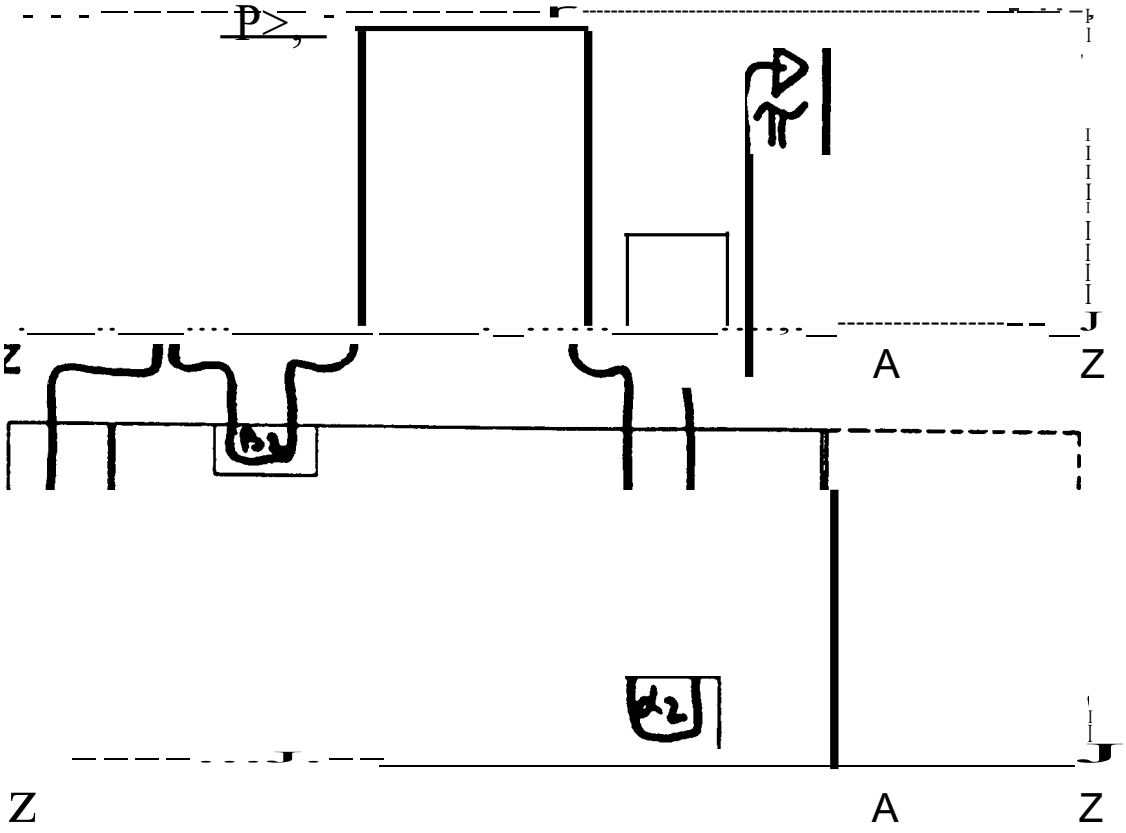
The transfer from one module to the next would not be free. There will be charges, and they can be structured to support traditional concern such as universal service and assure the viability of the core network.

Modularity would enhance competition, and might therefore be viewed negatively by LECs. On the other hand, it would make them much less dependent on any particular equipment manufacturers since there is likely to be more competition to supply any specialized module than to provide an entire big central office switch which is a billion dollar development effort. The modularity of software will make carriers less dependent on the

[222] Some embedded technology today may straddle several modules, and separation may be impractical.

INTERCONNECTING THE COMPETITIVE ISLANDS

TRADITIONAL CARRIERS



N:EWCOMERS

switch manufacturers and their complex multi-million line programs.[223] With modularity, this would not necessarily be the case anymore, and market niches for small hardware suppliers would open. The carriers could also encourage the development of software applications by outside suppliers, just as IBM did by opening software applications for the PC. This would enhance the LECs' flexibility. Right now, changing network capability is a very ponderous process. According to Bellcore's VP for network planning, "If you want to make a change in the network you literally have to change every switch in it. If you have got 2,000 switches, that can take five years or longer."[224]

Today, most computer hardware is designed to accommodate an operating system such as DOS or UNIX with applications programs such as spreadsheets, and wordprocessing. Telephone digital switches, though similar to computers, in effect mix the operating system with the applications, so that it is difficult for telephone companies or independent software companies (as opposed to switch manufacturers), to write the new applications software either because its millions of lines are impenetrable, or because they cannot touch it legally. Modularity would also deal with the inevitably increasing competitive overlap between telecommunications and computer industries, and assure that intelligence does not migrate into the CPE periphery of the network for purely regulatory as proprietary reasons.

This raises the question who might be responsible in the United States for the

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[223] At present, one cannot, for example, upgrade an analog SPC switch by a digital adjunct or overlay; instead, one must replace the entire switch.

[224] Jefferson Grigsby, "Sizzling Scientists," Financial World, April 18, 1989, p. 54.

definition of such a grid. Regulatory agencies could assure (but not set) timely standards, protocols, and definitions, in collaboration with industry. These are enormously complicated matters and there is no reason to expect that government has the expertise to do it. But it could be a catalyst and at times an arbitrator for industry efforts. This may be one of the major governmental telecommunications roles for the future. The main carriers and their competitors have the interest and the expertise that is necessary, and they have worked reasonably well together.[225] But experience, as well as the theoretical economic literature on standard setting and game theory shows that standards do not necessarily evolve optimally, nor smoothly, nor speedily, in a purely voluntary setting.[226] It leads to strategic

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[225] Examples are **ANSI** and its T-1 and X-3 committees, and IILC on ONA issues. A recently formed inter-industry collaboration consortium, called Open Systems Interconnection/Network Management Forum, is devoted to setting open standards for network management, and to overcome purely proprietary systems.

[226] Besen, Stanley M. and Garth Saloner (1988), "Compatibility Standards and the Market for Telecommunications Services." in R.W. Crandall and K. Flamm (eds) Changing the Rules: Technological Chan2e, International Competition, and Regulation in Communications, Washington, D.C.: The Brookings Institution.

David, Paul A. (1987) "Some New Standards for the Economics of Standardization in the Information **Age"** in Partha Dasgupta and Paul Stoneman (eds.), Economics Policy and Technological Performance, Cambridge: Cambridge University Press, Chapter 8.

Farrell, Joseph and Garth Saloner (1985). "Standardization, Compatibility, and Innovation," Rand Journal of Economics 16, Spring. 70-83.

behavior by some competitors that may retard agreements.

The RBHC view of ONA is almost exclusively that of access for Enhanced Service Providers, thus establishing that ONA is only about software networks. But the principles of interconnection and unbundling really go much further. The FCC has already decided that interstate ONA elements, while based on expressed ESP needs, should be available to anyone, not just to ESPs. This could -- now or later -- include also a wide array of interconnectors with interstate traffic. such as AT&T, the OCCs, long-distance re-sellers, facilities bypassers, private networks. independent telcos, cellular operators, RCCs, other BOCs, and even international or foreign carriers.

In New York, the PSC in its ONA proceeding specifically went beyond mere software and encompassed all forms of interconnection and associated unbundling: The extension to basic transport has major ramifications. The distinction between private fixed networks and public switched ones would blur further. Competitive regional and local exchange companies could rapidly emerge, in particular if states adopt intrastate rules similar to the federal ones. And LECs may start to compete with each other for the business of switching the traffic of CAPs, independent telcos, or cellular operators. Interexchange carriers, similarly, could in

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Farrell, Joseph and Garth Saloner (1986), "Installed Base and Compatibility: Innovation, Product Preannouncements and Predation," American Economic Review 76(5), December, 940-955.

Katz, Michael L. and Carl Shapiro (1986), "Technology Adoption in the Presence of Network Externalities," Journal of Political Economy 94(4), 822-841.

effect enter local distribution.

The FCC has begun commission may also require the RBOCs to take steps to encourage network modularity. It has begun a proceeding in that direction.

It is interesting to speculate about the future. It may well be that the inside wire will migrate -- LAN-like -- to a "tele-mailbox" near the user's premises. This avoids the need for duplicate wiring, and permits the interconnection of others communication streams, such as radio-based mobile carriers, second cable companies, second telcos, satellite based transmission systems, and others. A tele-mailbox could serve several users as the interconnection point shifts downstream.

The Future of Interconnectivity: From the Network of Networks to the System of Systems

U.S. telecommunications is coming to resemble the rest of its economic system -- a complex reflection of an underlying pluralist society and economy. Being farthest along in the transformation of its telecommunications system, the US bears the brunt of new telecommunications conflicts, both domestically among the numerous interest groups and participants, and internationally as new US policies affect established global arrangements. Other countries may not repeat the U.S. exvercence in the same way, yet the direction of change will affect them, too. Signs that the ONA approach has a certain inherent logic can

be found in international activities. In 1990 the European Community advocated an "Open Network Provision", and Japan as adopted an "Open Network Doctrine" which is intended to boost competition by forcing its national local telephone company to give competitors access to its network. [227]

In the US, the day is not far off, historically speaking, when entry will be wide open; when fiber is widespread in all stages of most networks; when radio-based carriers fill in the still substantial white spots in the map of telecommunications ubiquity; and when foreign carriers operate freely domestically. Yet diversity can lead to fragmentation, non-compatibility, and inconvenience. ONA is one of the ways in which centrifugalism is made possible and is even encouraged. This does not make it a wrong approach. But it needs to be balanced by pro-integrative policies. From the user perspective, there is a great need for the functional integration of networks. Who will provide such coherence once the traditional networks cease to fulfill that function? There is a tremendous need for integration of the various pieces. There are three ways to integrate.

Mode 1: Integration by End-Users

a. User's do-it-yourself integration. This is basically today's system for American residential users. They arrange for their own long distance company, and for their own terminal equipment, and maintain separate billing and service arrangements. Large users,

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[217] Albert Halprin & Melanie Haratunian, In Defense Of ONA, p. 2

too, often put together networks on their own, by leasing lines, and buying and operating equipment, etc.

b. Terminal-based integration. Under such a system, a user's terminal equipment incorporates some built-in intelligence which can make the right choices among carriers on a real-time basis. The PBXs of large corporate users usually have a so-called "least cost routing" option. On the whole, customer-premises integration, even if done through intelligent devices, still suffers from the associated transaction cost.

Mode 2: Carrier-Based Integration

a. Expansion of facilities providers into end-to-end carriers. This could be done by their entering horizontally into new geographic markets, or entering vertically into new services -- by expansion, merger, or acquisition. Once the local service bottleneck or other monopoly power has gone, there is no competition-related problem with permitting end-to-end service. Absent such competition a user could not be certain that a service provider would offer optimal price-quality combination independent of the underlying technology of the carrier that owns it. Realistically, it is hard to imagine today any company that is big and varied enough to offer all types of facilities and services, and to do it well, locally, domestically, internationally, across services, in telecommunications, computers, enhanced services, and equipment.

b. Joint ventures among carriers. Companies specializing in different market .segments could link up with each other through joint ventures or institutionalized

cooperation, such as under the traditional international regime of a cartel of national monopolies. This is a very likely scenario, and one which is emerging.

Mode 3: Integration by Systems Integrators.

Perhaps the most promising and innovative scenario for the integration of the bits and pieces of networks is systems integration. A new class of 'systems integrators' is emerging. Their role is to provide the end user (corporate, governmental, affinity groups) with access to a variety of services, in a one-stop fashion. These specialized integrators, also known as outsourcers or managed data services providers, assemble packages of services, tariffs, and hardware customizing these packages to the special needs of their customers. To these customers, the identity of the underlying carriers and their technology might be unknown and transparent as transmission becomes a commodity.

Systems integrators might typically put together local, long distance, mobile services, V**ANs,** equipment, etc. They could operate a least-cost-routing system, switching users around as capacity becomes available. They can function as capacity brokers, buying and selling capacity as it becomes available. Likely to emerge is an international market in capacity, consisting of a futures capacity market and a spot market operating in real time.

Systems integrators have always existed. Examples are:

- General contractors in construction projects
- Travel packagers
- Computer service firms, which were probably the direct forerunners of

telecommunications systems integrators

The characteristic of "pure" systems integrators -- for there will obviously be various hybrids -- is that they do not own or operate the various sub-production activities but rather select optimal elements in terms of price and performance, package them together, manage the bundles, and offer it to the customer on a one-stop basis. They relieve customers from the responsibility of integration for which expertise is required, and yet are not captive to recover major investments as carriers are. Systems integrators can be carriers, but the two functions are quite distinct.

Who will be the systems integrators? They are likely to be a variety of participants:

- Local exchange carriers
- Cable television companies
- long-distance carriers
- international carriers
- telecommunications resellers
- computer systems providers
- value-added providers
- - office automation firms
- LAN providers
- high tech firms
- defense contractors seeking diversification
- Corporate networks with excess capacity

Today, systems integrators exist for large customers. They have also begun to be active in establishing group networks, establishing internetworked "tele-communities" that will be discussed further below. They do not serve small users. But tomorrow things may be quite different. The additional step would be for systems integrators to emerge that put together individualized networks for personal use, or *personal* networks.

This means individually tailored network arrangements that fit an individual's communications needs. It does not mean a separate physical system, but mostly a "virtual" system, with bandwidth-on-demand, provided by a whole range of providers and multiple carriers, and packaged together to provide easy access to various voice, data, video, and computer services.

As these personal, group, and inter-organizational networks develop, they access and interconnect into each other, and form a complex interconnected whole, sprawling across carriers, service providers, and national frontiers. The telecommunications environment evolves from the"network of networks", in which carriers interconnect, to the "system of systems", in which systems integrators link up with each other.

Where does such a system of customized networks leave government regulation? Regulation in the US had been essential to the old system, partly to protect the public against monopoly, partly to protect the monopoly itself. In the transition to competition, what was left of regulation was seen as temporary, shrinking reciprocally with the growth of competition.

At that point, could one expect the "system of systems" to be totally self-regulating?

There are several public policy goals underlying regulation. They include universal coverage, affordable rates, free flow of information, restriction of market power, technological progress, etc. To assure these goals, US regulators in the past instituted a variety of policies, such as rate subsidies, univer service obligation, common carriage, interconnection rules, access charges, quality standards, and limited liability for carriers. Government regulation existed to right the imbalance of power between huge monopoly suppliers on the one hand, and small and technologically unsophisticated users on the other hand. But in the future environment, systems integrators will act as the users' representative vis-a-vis the underlying carriers. They could, for example, protect users against carriers' under-performance in quality and price, and make regulatory control over these issues unnecessary. On the other hand, some traditional policy goals are not necessarily resolved that way, such as the maintenance of low rates for low-income and rural users, or the free flow of information across carriers, or the interconnectivity among carriers. This suggests some continuing role for government.

The emerging form of telecommunications as a system of systems works as long as it is competitive in each of its stages, or as long as regulation establishes non-discrimination. However, in an international setting neither one of these conditions is likely to be met. Most countries lag the U.S. in the decentralization of the network. The traditional TOs is almost always dominant, and operating in all stages of communications. In consequence, systems integrators may not be able to truly compete against the semi-official TO in systems integration, except in market niches. Of course, other countries' TOs can play the same

game, and as a result, a new trend of international carrier collaboration has emerged in which major TOs enter into joint ventures of systems integration. Major examples are Syncordia, a BT venture with NIT, and possibly France Telecom and Germany's DBP Telekom, Infonet (a joint operation of MCI with ten major national carriers), Eunetcom (France Telecom and DBP); and Unisource. A combination of Sweden's Televerket and the PTT Telecom Netherlands. [228]

To avoid that these alliances of dominant national carriers restrictive international cartels, one must provide international non- discriminatory access, lease, and interconnection arrangements that are neutral as to the nature or the nationality of the systems integrator. But at the same time, it is also essential to protect the ability of nations to fashion communications policy based on their own particular circumstances.

This may sound familiar. It is, in essence, the same discussion over centralism versus decentralization in U.S. telcommmunications policy, now translated from the interstate into the international realm. This debate is now echoed in Europe, in the disputes of the EC commission in Brussels with the national telecommunication authorities. Thus, the U.S. themes of liberation and the inter-industry and inter-jurisdictional disputes that follow the move away from monopoly have been spreading to the countries. The are less of an ideological **export,** and more part of a historic change in the nature of TC infrastructure and its institutional ramifications.

:a **Aine** NfShuilleabhain, *Strategic Response by Public Network Operators to Privare Networking in Europe.* Columbia University, CITI Working Papers Series 1992, pp. 16-17.

In the 1980s, U.S. telecommunications policy was centered on open entry. But in the 1990s a different emphasis is likely. Now -- exemplified by the unbundling of ONA -- issues of integration of the various network parts come to the forefront. To reconcile the centrifugal pressures, with the needs to inter-operate and inter-communicate -- exemplified by the access and interconnection elements of ONA -- represents the main challenge to US policy makers for the next decade. This means to provide a competitive system with tools of inter-operation where they are not self-generating by market forces.

The openness of the evolving network system will not stop at the national frontiers. This undermines attempts to administratively set rules for prices and service conditions. No country can be truly an island anymore, not even a large nation as the United States, and the international collaboration of its carriers, users, manufacturers and governments with those of other countries will therefore have to be at the center of American telecommunications evolution and policy in corning decades.

ONA Principles: Before the New York

State Public Service Commission

POLICY

1. Shaping the ONA arrangements is an evolutionary and iterative process.
2. It is the policy of the PSC to aid competition and innovation, and to do so through increased and non-discriminatory access to network and central office functions.

AVAILABILITY

3. ONA access should not be use restricted
4. ONA network service elements must be made available to any and all users without discrimination, special classes or limits on use or resale. •

5. BSEs can be resold.

LOCAL SERVICE

6. Use of ONA access to form competitive local service should not be prevented; but requirements to contribute to a universal service pool may be required in return.

7. No physical collocation required (collocation contracts, however, possible; with safeguards against discrimination of others, unless technically unfeasible). But virtual collocation arrangement that provides termination within 1 mile at substantially deaveraged cost.

UNBUNDLING

8. Those network service elements set out by Nynex in its ONA filing to the FCC shall be considered the initial set of ONA services. And, by October 1st, NY Tel shall identify additional service elements that will be offered on an unbundled basis and a schedule for their availability.

9. All local exchange carriers should report annually on efforts to unbundle and offer additional ONA services. Comments by ESPs will be entertained.

10. BSA access arrangements are temporary only. Within 2 years full unbundling.

11. New York will be guided by service element definitions arrived at in a collaborative FCC-State intergovernmental forum. It will not necessarily follow definitions it did not participate in drafting.

12. Service element definitions cannot be unilaterally arrived at by LECs. (LECs will not have sole control of BSE definition).

13. BSEs should include access to the signalling channel (CC7 or whatever interoffice signalling system is used).

14. BSEs should include the billing functions.

15. BSE access does not need to include telco management functions and data bases, except for certain arrangements spelled out further below.

16. BSEs must be unbundled right to a reasonable but not excessive extent. For the sake of discussion purposes, possible criteria might be: service adequately unbundled for a majority of its customer and no major hardship to minority; not-required part of service less than 20% of cost of bundled service; distributed cost of unbundling

exceeds 30% of unbundled cost; or technical feasibility as the only restraint.

17. BSEs should not be finely technically differentiated merely to permit price-differentiation among users.

DUAL FORUMS - INDUSTRY AND GOVERNMENTAL

18. The PSC will establish contacts with other state and regional regulatory bodies in order to communicate and discuss issues relating to implementation of ONA. The PSC shall also begin a dialogue with federal governmental bodies which may have a role with regard to ONA policy, such as the FCC and National Bureau of Standards.

19. Carriers should use a common form and nomenclature for ONA tariff filings, consistent with national standards, to the extent they exist. It shall be a carrier's responsibility to cooperate with other carriers to establish and maintain such standards.

20. Industry discussions on technical coordination, standards, BSE definition should take place in an inter-industry forum with balanced representation with mandatory arbitration.

COSTS AND PRICING

21. Cost of BSE development is borne by its users, over a 7 year period. Second and subsequent entrants may bear in later years a greater burden than the first if the first paid for early development and investment.

22. Deployment of ONA capability in exchange offices should cover 50% of lines in five years, 100% in ten.

23. Users can utilize their own development, subject to LEC specifications, or negotiate with LECs for customized BSEs. Such BSEs can be confidential, where feasible.

24. For customized BSEs, negotiated prices are acceptable.

25. BSE pricing regulation is a state prerogative; coordination with sister states may sometimes be desirable and possible.

26. Pricing principle for new (rather than existing) BSEs or services should evolve in three phases.

Introductory

- Phase 1. PSC would establish a rebuttable presumption that LEC possesses market power and that ESPs require protection. Pricing would be cost-based in the first 3 years of a BSE, based on incremental costs.

Transition

- Phase 2. In the next three years, the rebuttable presumption would be that LEC still **possess** substantial market power and that ESPs are growing in health. In the fourth, fifth and sixth years, an equal component of contribution to fixed costs would be added to the base cost, so that after three years, pricing would be at the level of fully allocated costs.

Maturity

- Phase 3. After six years, the rebuttable presumption would be that there is substantial parity in market power between LECs and ESPs. Market pricing would prevail.

27. On an overall basis LECs may support BSE prices during the first x years; this cost will be recovered from the next y years. Remaining losses will be shared according

to same formula between LECs and those ratepayers 'groups who would have benefited, provided costs prudently incurred. Gains follow the same formula.

28. BSE pricing, beyond an introductory period, cannot be cross-subsidized.

29. Unbundling strands investments - these are considered part of the cost of developing BSEs, and charged accordingly to users.

30. Existing bundled services have no grandfather status; current users cannot be assured unchanged prices after unbundling, except in the first three years.

31. PSC policy should be to apportion a share of risk to non-specific users (future users), but ensure that the majority of the investment cost and risk is borne by direct users.

32. The PSC may have to develop additional accounting rules.

COMPETITIVE EQUITY

33. LEC-owned ESPs must not be given price or technical advantage over their competitors. They can be collocated; but comparably equal interconnection must be

provided to their competitors.

34. Billing for ESP provided service, if part of the telephone bill, need to be itemized separately. Their non-payment cannot be reason for disconnection from basic service.

35. If LEC-ESPs have access to telco data on customers, (CPNI) the telco must perform similar data processing, including mailing, for the BSE upon request and payment. Confidentiality of customer records must be maintained thereby. Customers can request that data not be used.

36. LECs cannot delay approval or deployment BSEs to assist their own ESP activities.