I. Introduction

From a U.S. policy perspective, the advanced information infrastructure will be realized, in theory, through the interconnection of various networks operating in an open network environment driven by competitive forces. The challenge will be balancing two seemingly contradictory goals: achieving interoperability among players (cooperation) and the promotion of innovative new entrants (competition). Fairness of the market must be established as a precondition.

We are specifically interested in how local exchange carriers (LECs), which have been regulated historically as natural monopolies, can operate as competitive carriers in an open network environment. In the U.S., the LECs are not spared from mounting competitive pressures, facing competition from at least five different sources: 1) providers of "inside wiring" and "private exchanges, 2) radio providers, replacing copper in the last mile, 3) long distance carriers, reaching down into the LATAs to provide intraLATA toll competition, 4) competitive access providers (CAPs) which are connecting customers directly to long distance carriers, and 5) cable carriers, offering interactive services to the home, on their own and through alliances with radio and CAPs.

In addition to this "bottom up fragmentation" of the underlying physical infrastructure, a "top down diversification" of network applications is also taking place. The popular new network applications, such as on-line services offered by innovative start-up players, use computer networks, which integrates voice, graphics and text. The computer network uses a client/server model and a flatter architecture, as opposed to the hierarchical switch-based architecture of traditional plain old telephone systems (POTs).
The case of the computer industry offers an interesting analogy for telecommunications, particularly since the two industries are becoming increasingly intertwined. In the past few years, the computer industry has undergone a transformation from a collection of a small number of vertically-integrated companies to a crowded industry with firms specializing in the production of hardware, operating systems, and applications over them. In today's computer industry, competition realizes the best benefits to users through rapid innovation and low prices. Stiff competition takes place in each layer, but the relationship between the lower and upper layers is mostly open. In this structure, even when a single player has a large share in one layer, the potential for competition forces the player to supply the best product at the lowest price.

Trends in the telecommunications industry suggest evolution towards a similar structure. In this paper, we introduce the conceptual framework of a three-layered model which separates the network into three horizontal functional layers: transmission, network platform, and application platform. We believe that, like the computer industry, the telecommunications industry is undergoing a metamorphosis from a vertically-integrated industry dominated by giant corporations, to a horizontally-fragmented structure with firms specializing in one or more layers in our model.

In practice, creating a functionally-layered structure in telecommunications requires that the lower and upper layers be unbundled and that interfaces be open. Teece argues that "one of the most exciting ways to accelerate competition in local exchange is unbundling...If implemented, unbundling will reduce entry costs, increase competitive and entrepreneurial opportunities, and stimulate the development of the Information Superhighway."10

We closely examine three leading cases of LECs in the U.S. which are taking initiatives to open their markets by allowing access of their networks to competitors. The three cases are Frontier Corporation, Ameritech and Pacific Bell. What is their motivation? How are they implementing their plans? While regulatory policy can significantly affect the degree of competition in a market, equally significant can be the strategies taken by the incumbent Local Exchange Carriers (LECs), which are likely to maintain their preponderant market position for the short-term future, at least.11

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9While the terminology differ, our model is conceptually similar to Bar's (1990) 3-Layer model. The difference is in that our model makes a more direct link of network attributes (e.g. loops, switches, servers) to the three layers.
11Nationwide, in 1992, the LECs had an installed base of about 135.7 million switched lines. About 77% of LEC lines were operabed by the BOCs. (Geodesic Network, USTA Phone facts)
Such structural adaptations are not likely to be limited to the American market. As Nippon Telephone and Telegraph (NTT) faces divestiture discussions this year, some members of the company have been monitoring closely developments in the U.S. as harbingers of what the telecommunications industry model might be. The notion of creating a horizontally-segmented market with open networks appeals to a portion of NTT's management as one way to stimulate industry competition and growth in general while moving NTT into higher value-added services. But while NTT announced plans to further open its telecommunications network recently, significant barriers to competition, both structural and regulatory, exist in Japan. We conclude with a discussion on the current regulatory framework in Japan which hinder the actual implementation of an open network.

Section II. The Three-Layered Model

A retrospective look at CAPs' activities in New York and at the development of interconnection rules serve as a good starting point for our model. CAPs entered the local access market in the middle 1980s. CAPs offered a less expensive alternative by bypassing the LECs and connecting end users (mostly high-volume business customers) directly with the Interexchange Carriers' (IXCs) points of presence (POPs) with their fiber optic cable. In this new environment, New York became the first state to introduce competition into the "local transport" and has since been a pro-competition leader in the telecommunications industry.

Through actions and counteractions between Nynex Corporation and Teleport Communications, a CAP providing services in metropolitan areas in the Nynex region, interconnection rules developed gradually as illustrated in Figure 1. As early as 1985, the NYPSC approved the connection of customers to CAP's nodes via fiber optic cables (a) in Figure 1). By 1989, the interconnection between CAP's nodes and LEC's local switches (b), for "private access" was approved. The FCC approved such interconnections in 1992. In 1991, the NYPSC allowed the introduction of competition into access lines (d). The following year, in 1992, the interconnection between CAP's nodes and LEC's local switches for "switched access" (c) was approved. FCC approved such interconnections a year after the NYPSC.
Learning from the development of interconnection rules and taking into account the architecture of the computer network, we propose a three-layered model which unbundles the network into: 1) Transmission, 2) Network Platform, and 3) Application Platform. A schematic representation is provided below.

Figure 1. Unbundling Scheme of NYNEX for Interconnection with Teleport

Each layer is explained below:

12Diagram by InfoCom Research, Inc. based on Nynex company information.
1) Transmission Layer:

This layer consists of access lines and link lines. The physical media (e.g. wired or wireless) is irrelevant to the definition of access lines and link lines. The technologies of physical and electrical means should be independent from speed and transmission features. It is likely that many entities will emerge to provide either access or a specific part of transport. But it is not difficult to imagine one entity providing both access and transport if we explicitly allow the entry of companies that own right of ways and fiber optic networks (dark fiber), such as public utilities.\(^\text{14}\)

2) Network Platform:

This layer consists of nodes, office switches for conventional telephone networks and routers in computer networks. In this layer, functions of multi-protocol conversions should be provided. In an environment of heterogeneous networks, a layer which integrates the various kinds of switches becomes necessary. This layer also allows the transformation of the network architecture from a hierarchical structure to a flatter one.

The network platform is comparable to the computer's operating system. The analogy extends to the fact that software, rather than hardware, is playing an increasingly important role in defining the functions of the network (as with the computer). Furthermore, in the same manner that DOS became the \textit{de facto} operating system of personal computers, we believe that network externalities will be realized in this layer. Rather than having a collection of proprietary systems and risking the segmentation of

\(^{13}\)Using AT & T’s unbundling proposal in Figure 3, we illustrate what components actually fall under each layer. The transmission layer includes: 1) distribution, 2) concentration, 3) feeder, 5) operation system, 6) signaling link, and 9) dedicated transport, and 10) common transport. The network platform, includes 4) local switch, 11) tandem switch and 12) POP (point of presence). The application platform layer includes 7) Signaling Transfer point.

\(^{14}\)Hayashi (1993) has coined this category of carriers as “Type 0 carriers” in addition to the Type I and Type II categorization of the Japanese telecommunications companies.
the network, it is more efficient if the most basic infrastructures in this layer is produced in a monopolistic or oligopolistic manner, as DOS was by Microsoft.\textsuperscript{15}

3) Application Platform:

In this layer, a variety of middleware services are provided by server-like functions for conventional telephone services and mainly by client/server software for computer communications. Access to shared database is given either via a signaling network whose components are unbundled from other parts of the network or by appropriate interconnection schemes. This enables operators to promote the provision of integrated wide-area services.

Businesses in the application platform would not be profitable if players in this layer were forced to pay monopoly rent for utilizing network platform. In order to facilitate activities in the application platform layer, rent seeking activities of the monopolist should be restrained by potential competition which can only be secured by an appropriate unbundling scheme.\textsuperscript{16}

To make the unbundled layer scheme work as a competitive industry structure, we believe the following principles should be established:

1) Unbundled pricing of each layer. Prices should be set separately at each layer. This implies that a kind of wholesale/retail scheme between a lower-layer service supplier and an upper-layer service bundler exists (cf. Frontier Corporation). In some cases, one entity may provide two or more layers bundled together (such as transmission tool and network platform, but their accounting should be strictly separate). In this case, a competitor should receive the lower layer services/products on the same conditions as a unit within the same organization providing the upper layer services.

2) Open interoperable technical specifications. The lower-layer service provider should be required to open technical specifications of its service to external parties on a non-discriminatory basis. Also, the specifications themselves should be open to change and those changes should benefit all the parties purchasing the lower-layer services. Standard setting process should be open to the retailers and related equipment manufacturers.

3) Open interface for interconnection. Opening the interface for interconnection is a premise. For the interconnection between providers of the same layer service, fair terms should be set, and basic rules should be agreed globally.

\textsuperscript{15}For further discussion see Oniki (1995).
\textsuperscript{16}Ibid.
While unbundling the network along the three-layered model would help attaining policy goals, such as achieving interoperability and facilitating new entries, does it make business sense for firms to adopt such a scheme? Our case studies indicate that the local exchange companies which were once vertically integrated are motivated to open up their smaller value-added transmission bottlenecks in order to enter the far more value-added domains of businesses, such as the upper layers of our model or long distance services.

The way in which the dominant LECs open up their markets to competition can critically affect the level of competition, infrastructure and market development. If a competitive industry is well established in the transmission layer, an incumbent carrier is open to competition from potential wholesalers and substitute access providers. By establishing points of interconnection at the application platform level, and thereby facilitating the entry of players in the higher levels of the network, new entrants could help develop applications which would in turn increase the demand for the incumbents’ networks\(^\text{17}\). On the other hand, promoting competition through resale of the incumbents’ unbundled components, as opposed to promoting facilities' based competition, could hinder infrastructural development. For example, even if unbundling is in place, if the network components are prohibitively expensive, potential new entrants will be discouraged.

III. Case Studies

A. Frontier Corporation (formerly Rochester Telephone)

The significance of the Frontier Corporation case is that 1) it is the first open market plan to be implemented in the nation; 2) it strategically restructured the local telephone company into a wholesale and a competitive reseller of services; and 3) not being bounded by the Consent Decree which applies to the Regional Bell Operating Companies (RBOCs), the company already offers long distance services, not making provision of long distance services the prime reason for opening up its local market, as it is in the case of the RBOCs.

Background

Rochester Telephone, with sales reaching $1 billion in 1994, serves roughly 1.5 million customers in 32 states. Its operations are divided into telecommunications services (long distance, cellular and paging, and telecommunication equipment sales) and

\(^{17}\) Zoe Piliero, Manager of the Open Market Plan at Frontier Corporation claims that Rochester Tel can provide a "universal network layer for business applications, the whole idea [of the OMP] being that Frontier may get some entrepreneurs coming into this market."
telephone operations (36 local phone companies providing 900 access lines in the Northeast, Midwest and the South.) While sales from telephone operations traditionally had been the major source of revenue, this trend quickly changed in the recent years. In 1992, sales from telephone operations accounted for 71% of revenue and that from telecommunications services 29%. In 1994, these figures were 62% and 38% respectively.

Rochester Telephone Corporation's market in the local exchange business had already been penetrated significantly by CAPs prior to its decision to restructure. Anticipating that CAPs would provide more and more access alternatives for medium and large customers in the Rochester region, Rochester Tel decided to embrace competition rather than ignore or resist it. In February 1993, Rochester Tel filed Corporate Restructuring and Open Market Plan with the New York PSC. Following various public hearings and negotiations among the interested parties, on January 1, 1995, the Open Market Plan was officially implemented in Rochester.

The Open Market Plan

The heart of the Open Market Plan is in that it restructured the local exchange telephone company into two separate and distinct entities, Rochester Telephone, a price regulated network company with its own retail, wholesale and access tariffs, and a competitive retail company called Frontier Communications. Rochester Telephone was freed from the monopoly standard of rate-of-return regulation, now regulated by pure price cap regulation. There is no sharing with rate payers or cap on the company's earning potential.

Frontier Communications is free to price its services according to market conditions. Frontier Communications, as well as other providers, purchase tariffed network services from Rochester Telephone, add value and resell these services to customers on a retail basis. The two companies have strict structural separation, including separate assets, employees, capital structures and boards.  

The plan also establishes a Holding company, Frontier Corporation, which serves as a parent for all subsidiaries. The holding company has the flexibility to issues securities, make acquisitions and enter new lines of business. Figure 4 illustrates the new Frontier Corporation's structure.

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Rochester Telephone Services

The wholesale and network company, Rochester Telephone, 1) provides access of its network to competitors, 2) provides price-regulated local telephone service in the Rochester area, 3) produces White and Yellow Pages directories for the Rochester market, including listings for all customers, irrespective of the customer's local telephone service company and 4) provides 911 services throughout the Rochester area.

Rochester Tel has promised to provide access to its network to any company certified by the New York Public Services Commission. The Joint Stipulation and Agreement issued in May, 1994 called for Rochester Tel to offer all its retail service to resellers at wholesale rates. While the Agreement did not specify the amount of the wholesale discount, Rochester Telephone in testimony stated that it would implement a 5% discount applicable to all services. The competitors claimed that the discount was too small or that it was arbitrary. However, Rochester Tel responded that its requirement to remain in the retail business deprived it from the opportunities to shed costs, not allowing it to offer greater discounts. The administrative judge accepted Rochester Tel's rationale and the discount rate remained at 5%.

In terms of network integration, Rochester Telephone offers reciprocal compensation\(^\text{19}\), equal access to network databases\(^\text{20}\), and number portability\(^\text{21}\).

\(^{19}\)Rochester Tel pays other local service providers for traffic it delivers for termination at a customer served by the other local service provider and vice versa. If the traffic is in balance (within 10% difference) in both directions, no payments would be made by either entity. Carriers would compensate each other only for local switching.

\(^{20}\)In order to avoid charges for Rochester Telephone's business office services, a carrier taking service from Rochester Tel must arrange for direct access into Rochester Tel's customer records, order entry and repair
As part of the Open Market Plan, Rochester Telephone will provide rate cuts summarized in Table 2 over the 7-year life of the plan. Residential customers receive an 11% rate reduction with the elimination of monthly touch-tone service charge on 1/1/95; rate cuts continue over the next 7 years for a total of $21 million, representing a 10% reduction in annual rates; business customers will receive a 30% or more reduction in the cost of a 3-minute peak period local call over the life of the plan.

<table>
<thead>
<tr>
<th>Table 1. Rochester Telephone Monthly Rate Comparisons</th>
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<tr>
<td><strong>12/31/94</strong></td>
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<tr>
<td>Residential Basic</td>
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<td>Residential Touch-tone</td>
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<td>Local Switching</td>
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<td>Local Transport</td>
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source: Frontier Corporation company brochure

Frontier Communications Services

The retail company, Frontier Communications, 1) operates as a competitive reseller of a variety of telecommunications services transferred from Rochester Telephone and 2) integrates services, buying network access from Rochester Telephone or other carriers and packaging these services with their own services and others' product lines. Examples are as follows:

1. Reseller business: Centrex, High Capacity private lines, Telephones

record databases. Rochester Tel will partition these databases to ensure that each carrier has access only to its own customer's information. Rochester Tel will offer, pursuant to tariff, terminals to access Rochester Tel's above databases, including training in their use, to any certified carrier.

21 All certified facilities-based switched local exchange carriers are equally entitled to the assignment of NXX central office codes and inclusion in the Local Exchange Routing Guide as independent carriers.

Two forms of limited number portability is offered: 1) A customer changing resellers without a change of underlying R-Net facilities will retain the Rochester Tel's telephone number; and 2) A customer changing networks but remaining within the same central office boundaries will retain the Rochester Tel number at the election of the new network carrier. Rochester Tel will forward calls to the other network carrier by using either call forwarding or Direct Inward Dialing or other suitable arrangements at Rochester Tel's option.
2. Integrated services: Voice Mail, Data Services, Long Distance, Wireless, Information Services, Entertainment Services

State of Competition

Despite a reduction in local rates, in the first quarter of 1995, Rochester Telephone's revenues improved 4%, and operating income improved nearly 16%. Access lines grew 1.3% since the end of 1994 alone.22

Rochester Telephone's competitors, i.e. facilities-based competitors, include the following: 1) Time Warner eventually hopes to provide telecommunications services to business and residential customers through their own network, but officials aren't yet sure when they will open for business. For now, Time Warner is hand-picking customers to participate in tests of its local service network; 2) ACC Corp. will sell local service to its long distance customers through a combination of its network and Rochester Tel's; 3) MFS Communications Co. is targeting small to medium-sized business. The company plans to use its own switch to provide local service along with equipment and telecommunications consulting within the first six months of 1995.

On the "packager" reselling business, 1) AT & T has "bundled" local and long distance service as of the first week in January. 2) ICS Telecom will resell local service to business customers, packaging it with long distance, telephone equipment, voice mail, cellular and other telecommunication services. 3) Telechoice Network plans offer cheap rates for long distance to downtown businesses, lawyers in particular.

MCI, Sprint, and Cellular One, three companies which are actively seeking opportunities to offer local telephone services, have no immediate plans to sell local telephone service in Rochester.

A competitive market involves a complex arrangement of carriers providing services for different segments of the market. In such a complex carrier system, specialized "system integrators" are necessary to put together packages of services.23

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23The conceptual framework provided by Noam (1995) is useful for understanding the problems facing the telecommunications companies and the regulators in each stage of the network development. The cost of services provided and their utility to the consumer is plotted against network size. In this graph, Noam identifies three distinct regions. In the first region, or early stages of network development, cost is higher than utility, indicating a problem of critical mass. Funds for investment must be garnered by somebody and the principal policy objective is promoting the growth of the system. The middle region, the region of self-sustaining growth, involves a complex arrangement of carriers providing services for different segments of the market. The primary policy issues shifts to promoting competition and mandatory interconnection where warranted. Finally, in the last region, costs are rising and further expansion of the network is not worthwhile. The problem is universal service. Because of competition, the network cannot maintain an internal subsidization scheme. When entry is free, the new competitors first target the users with the largest potential profits, but such a support system vanishes eventually.
Rochester Telephone Company's restructuring effectively captured the new needs of the market by separating the service function (Frontier Communications) from the network carrier function (Rochester Telephone).

However, the wholesale discount provided by Rochester Tel is raising much complaints from the competitors. A five percent discount, they argue, does not leave enough margin for their own profits. The strategy of Rochester Tel to strongly push resell of its own network may eventually have adverse effects on infrastructure development.

B. Ameritech

Background

Ameritech provides telephone services to roughly 10.8 million homes and 1 million businesses in Illinois, Indiana, Michigan, Ohio and Wisconsin. Recently, Ameritech has experienced increased competition and market share loss. Ameritech's share of estimated revenues from intraLATA WATs, MTS and '800' services in seven cities was only 48%. Ameritech is also struggling with fierce competition in the high capacity services market. CAPs with fiber optic networks of high capacity and the freedom to flexibly price its services at a discount rate are the toughest competitors in large cities such as Chicago, Milwaukee and Grand Rapids within Ameritech's services area.

Given such competitive pressures, Ameritech has been proactively trying to change regulations it faces so that it would be able to compete in a more flexible manner. By 1994, the five state utility commissions regulating Ameritech had replaced rate-of-return regulation with price-cap plans without earnings sharing. In order to remove the regulations which imposed social subsidies, rigid average pricing rules and the Modified Final Judgment (MFJ) restrictions which prevents the RBOCs from offering interLATA services, Ameritech first filed the Customer First Plan (CFP) with the Illinois Commerce Commission (ICC) in February 1994.

Rather than relying on a low-growth plain old telephone services (POTs), through the CFP, Ameritech wants to transform itself from a traditional telephone company into a "best packager" providing comprehensive services including intraLATA calls.

Customer First Plan

In its first form, CFP asked for relief in the provision of interLATA services in all of Ameritech's service areas in exchange of opening the local markets to competition. However, the original plan met with much opposition from its competitors as well as
resistance from the ICC, which claimed that it was out of their scope to rule on MFJ restrictions.

Ameritech subsequently revised the plan such that it would be able to seek approval from the Department of Justice to offer interLATA service on a provisional basis from the LATAs in Chicago, Illinois and Grand Rapids, Michigan (the "Temporary Waiver Territory"). Ameritech would be allowed to offer interLATA services only after 1) Ameritech has made arrangements for unbundling, intraLATA toll dialing parity, conditions enabling resale of local services, interconnection, number portability, and nondiscriminatory number assignment, and 2) Ameritech has filed a compliance plan for implementing equal access and separate subsidiary requirements and for withdrawing from interLATA service if necessary.24

A three-stage process must be completed for the plan to go into effect.25 First, the order has to be approved and entered by the District Court after public comment, the recommendation of the Department of Justice and briefing by interested parties. Second, before any interLATA service could actually begin, the Department would have to evaluate competitive conditions in the marketplace. Third, after interLATA service begins, the Department would retain a wide range of supervisory power.

The revised form was approved by the ICC in April, 1995. In the same month, The Revised Proposed Order was presented to the Department of Justice, which has in turn, recommended Ameritech's case to the Court.

The following will be offered if the plan goes into effect:
1. White pages listing, 911 service, deaf-relay services, on an optional basis.
2. Cooperative Engineering, operation, maintenance, and administrative practices on an optional basis.
3. Rights-of-Way: Where sufficient space permits, conduit and pole attachment space on a nondiscriminatory basis to authorized interconnectors.
4. Mutual compensation: arrangements at reciprocal rates for termination of traffic by state-certified alternate exchange providers.
5. Numbering plans: complete NXX codes
6. Local telephone number portability: Portability to the fullest extent permitted by current technology.
7. Usage subscription: Use of Ameritech's loops and local dial tone provision while Ameritech carries all outbound traffic on their networks.

24 Ameritech, "Brief Summary of Ameritech's Revised Proposed Order."
25 Ibid.
Effective May 23, 1995, Ameritech implemented prices and terms of the unbundled network components as in Figure 5.

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**Figure 5 Customers First Plan: Key Unbundled Network Component Prices**

State of the Competition

In the last six months, the Temporary Waiver Area has seen significant competitive developments. In Chicago, two competitive access providers, MFS Communications and Teleport, have been certified to offer local exchange service, and a

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third, MCI Metro has applied to do the same. Chicago is home of two separate tests of
cable-based telephone service. MCI and Jones Lightwave intend to test linking a few
residents in Chicago suburbs to MCI's long distance service. Motorola, Inc., TCI and
Teleport Communications Group are providing local phone service over cable lines on a
test basis in Arlington Heights, Illinois. City Signal, Inc. already provides competitive
local phone services in both Grand Rapids and Detroit.

While long distance companies have generally applauded Ameritech's efforts,
CFP has received criticism from the other RBOCs. The revised plan requires Ameritech
to offer long distance through a separate subsidiary, which is not allowed to use
Ameritech's own facilities, but instead must lease such transport from unaffiliated
carriers. Pacific Telesis Chairman and CEO Phil Quigley commented that "A proposal
like Ameritech's ...[ignores] the efficiencies of using our existing network in the state to
carry long-distance calls." Pacific Bell "expects to use [its] existing facilities to compete
with the long-distance companies to bring prices down."27 Furthermore, some RBOCs
feel that the Ameritech's Revised Order gives too much power to the Department of
Justice, "bad news for consumers since it could easily take the DOJ three to five years to
process requests to provide long distance."28

C. PacBell

Background

The story of California is that of the regulators championing the case of
competition in telecommunications. In a report to the governor issued in November of
199329, the California Public Utilities Commission (CPUC) stated its intent to "open all
markets to competition and aggressively streamline regulation to accelerate the pace of
innovation" by January 1, 1997. The California Assembly subsequently adopted
Assembly Bill 3606, similarly expressing legislative intent to open telecommunications
markets to competition by January 1, 1997.

Since then, steps have been taken towards this end. On September 15, 1994, the
CPUC issued a decision which opened intraLATA toll markets to competition effective
January 1, 1995. On November, 1994, the CPUC solicited comments on the appropriate
process for opening the local exchange markets to competition. The results were
presented the following month, which proposed that rules for competition be developed

28Ray Smith, Chairman and CEO, Bell Atlantic, News Release.
29"Enhancing California's Competitive Strength: A Strategy for Telecommunications Infrastructure"
by formulating three separate subject areas: 1) Open Access and Network Architecture Development (OANAD); 2) local competition; and 3) consumer protections and regulatory streamlining.

The procedural plan called for a parallel-track approach. One track involved the efforts of telecommunications industry participants to undertake negotiations with the goal of achieving an all-party settlement on any or all issues by March 31, 1995. The second track would be undertaken by the Commission's interdivisional team to research and develop interim rules.

The industry participants submitted a joint report on March 31, 1995 indicating that the parties had not reached a settlement. Pacific Bell subsequently submitted a plan to the CPUC titled "Competition to the Core" on April 3, 1995. The plan is outlined below.

While the CPUC has been a definite force in the drive towards competition, PacBell is also very aware of the competition and has responded strategically. PacBell did not hesitate to unveil its desire to be allowed into the long distance market making the resale of basic exchange services contingent upon interLATA relief. PacBell's choice of AT & T as a partner "California First," the $16 billion construction of its broadband network currently underway, has also made AT & T one of its most fierce rivals. By providing the necessary telecom equipment, including switches, hardware and software, AT & T will virtually know the ins and outs of PacBell. AT & T will also become quite familiar with PacBell's personnel and management strategy. If AT & T were allowed to enter into the local market on a facility basis, PacBell would not be at par with AT & T. Confronted with a foreseeable AT & T's entry into PacBell's service area, PacBell has a very strong incentive to offer sophisticated, diversified seamless services unhindered by such arbitrary fragmentation as local and long distance.

PacBell's Competition to the Core

The plan proposes to open all California telecommunications markets and services to competition as early as January 1996. While promising to unbundle networks and ensuring free and open entry of competitors, the plan also calls for reform regulation. In exchange of the elimination of sharing, price indexing and earnings caps and floors, PacBell will cap current basic prices for three years. The plan offers the following to its competitors:

1. Loops: transmission from the central office to the customer's premises will be provided at $10.00 per month plus universal service funding and end user common line charge.
2. Ports: a range of port types are provided starting with a basic port at $4.50/month.
3. Signaling System: the plan calls for access to signaling systems.
4. Rights of way: access to poles, ducts, conduits, and rights of way owned or controlled by Pacific Bell where Pacific Bell has the legal authority to permit such access and where there is capacity available.
4. Support services: White and Yellow Page directory listings, 911, E911 services, directory assistance services, operator call completion services
5. Resale of Basic Services: In response to the new entrants' requests that PacBell offer all its basic services for resale, the plan makes this offer to be implemented at the time that PacBell is permitted to enter the interLATA markets.
6. Number Assignment: continue to act as the NNX custodian until a third party custodian is established.
7. Number Portability: Until long term number portability is developed, it will be provided through remote call forwarding ($3.00/month per line with no usage charges).
8. Network interconnection: the price for interconnection is equal to switched access charges (¢1.4/minute).
9. Mutual compensation: the Plan establishes the capability to exchange local calling between customers of two or more local carriers with reciprocal compensation arrangements between the carriers.

CPUC's Interim Rules

The CPUC issued proposed interim rules as of April 1995. Among the Principles for establishing interim rules, the CPUC claims as its policy that:
- interconnection of networks of competitive local carriers and local exchange carriers should be accomplished in a technically and economically efficient manner;
- LECs shall remain subject to appropriate regulations designed to safeguard against abuse of monopoly power;
- number portability should be accomplished in a technically and economically efficient manner, and
- networks of dominant providers of telecommunications services should be unbundled in such a manner that a carrier does not have to purchase services or functions that it does not want in order to obtain those essential services or functions that it does want.

The interim rules call for unbundling the network into the following six elements by January 1, 1996.

\[30\] PacBell agrees to conduct a permanent number portability trial and invest $5 million for its development if other industry participants match this amount.
1. subscriber loops
2. line side ports
3. signaling links
4. signal transfer points
5. service control points
6. dedicated channel network access connections.

A note reads that no end-user restrictions shall apply to subscriber loops and line side ports. The need for additional unbundling will be determined in the OANAD proceeding.

Pacific Bell criticized the interim rules as "unfair to consumers and to Pacific Bell." While Pacific Bell recognizes that the commission cannot open long distance markets to competition, it "[could] require entrants into local markets to assume the same obligations that incumbents are required to bear," safeguarding universal service, for example. Pacific Bell has highly concentrated revenues from four major metropolitan areas (Los Angeles, San Francisco, San Diego and Sacramento.) The company claims that "if competitors were able to obtain only the top 1% of Pacific Bell business customers, they would obtain 30% of Pacific Bell's business toll revenues."

D. Summary of U.S. Cases

In order to brace the mounting competition, the three U.S. cases have asked for a more flexible price-based regulation as a condition to open their markets. Having this flexibility is a necessary starting point if LECs are to behave as competitive entities. While concerns and complaints remain from the new competitors and the incumbents alike, the regulators have also moved towards pro-competitive regulations.

Unbundling the network allows its flexible use, by adding value to it as a market is perceived. The advantages of the unbundling the network are threefold: 1) the owners of the network can resell excess capacity; 2) "packagers," including the owners of the networks, can purchase network components as needed; while the RBOCs have made their provision of long distance service a "trade off" for opening the local market, the real significance is not the long distance market per se, but its value as a "packaged item" with the local service, and 3) users can benefit from the convenience of obtaining integrated communications services ("one stop shopping").

Section IV. Nippon Telegraph and Telephone

Background

Facing possible divestiture\textsuperscript{32}, the giant NTT has been constantly in the spotlight this year. One of the most heated debates concerned interconnection between NTT and New Common Carriers (NCCs).\textsuperscript{33} The domestic long distance NCCs initially entered the market in 1987 and began telephone service in 1988. Since then, their share of the domestic long distance has grown from 4.3\% in 1988 to 22.4\% in 1991. The NCCs have over 50\% of the market in the most lucrative market between Tokyo-Nagoya-Osaka. In other areas, such as paging and mobile telephone service, the NCCs share has expanded to almost a third\textsuperscript{34}. Even though their presence in the local exchange market is minimal, local NCCs have a fair presence in the regional/local leased circuits market.

The success of the NCCs depends on their ability to interconnect with NTT and to offer competitive rates. Currently, all that the Telecommunication Business Law says about interconnection between carriers is that the Ministry of Posts and Telecommunications (MPT) will advice and mediate upon request when agreement on interconnection cannot be reached between the carriers. NTT and NCC’s have had to start their negotiation upon interconnection from zero, absent rules, guidelines or responsibility of dominant carrier specified in the law.

NTT’s Open Network

\textsuperscript{32}For a comprehensive review of the telecommunications industry and policy in Japan, see, Oniki, Sato and Stevenson (1993).

\textsuperscript{33}The first interconnection problem associated with the identification number (ID) function of NTT’s local exchanges was slowly but finally solved with the attachment of additional ID functions to each of NTT’s analog crossbar switches and crossbar switches gradually replaced by digital switches. The next interconnection problem had to do with the points of interconnection (POI). Under the old interconnection rules agreed upon between NTT and long-distance NCCs, the more POIs an NCC had, the lower it could set prices for its services; the old interconnection charges scheme ordered that customers pay NTT’s actual local end rates in addition to the NCC’s rate. In consequence, the problem of interconnection charges was finally resolved with the introduction of end-to-end pricing structure in April, 1994. The old rule also mandated that NTT and NCC in question share the cost for construction of POI. Naturally NTT had a strong incentive to keep the number of POIs to the minimum (Naoe, 1994). MPT addressed its policy on POI issues in September, 1991. NTT introduced of an independent division system that separated its long distance communications sector, serving inter-prefecture communications, from its regional communication sector, serving intra-prefecture communications. Simultaneously, MPT established that the number of POIs for interconnecting long-distance NCCs and NTT will be one in every prefecture, paralleling the interconnection of NTT’s long distance and regional communications divisions. (Between NTT and Type II carriers there are rules for interconnection set by the Open Network Council. Those rules have been reviewed third times) While establishing only one POI in each prefecture may be an effective means of ensuring fair competition between NTT and long-distance NCCs, this rule does not address the interconnection of NTT with regional NCCs, cable television carriers and competitive access providers.

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\textsuperscript{34}Oniki et al (1993), p. 72.
Responding to heated debates concerning interconnection with the NCCs, NTT announced its plan to further open telecommunication network in April, 1995. As part of the plan, NTT allowed the one-end connection of a leased circuit to its public telephone network, subject to Ministry of Posts and Telecommunications' (MPT) approval.\(^{35}\)

NTT's plan includes the following:

1. Construction of a signaling network for network interconnection
2. Interconnection with CATV operators' networks for telephone services
3. Interconnection with PHS (Personal Handy phone System) networks
4. One-end connection and two-end connection of public network and leased circuits
5. Interconnection of NTT's trunk line and type II carriers' networks
6. Equal access
7. Numbering portability

A schematic representation is provided below.

![Signaling Network Diagram](image)

Fig. 7 Interconnection Configuration of Signaling Network Proposed by NTT

Under the current plan NTT does not unbundle access to its signaling system from the network in the same manner as PacBell does. NTT's existing signaling network, which has critical functions of network control, will be separated from the new signaling network which is designed to enable provision of enhanced services, such as calling line identification services, call transfer etc. Only the latter will be dedicated to interconnection with other carrier's network by way of a signaling gateway which will be

\(^{35}\)In Japan, the interconnection between leased circuits and the public network had long been prohibited by the law attachment decision in 1985.
set up upon requests from the parties. NTT's rationale is that a single company, with a unified centralized system throughout the country, can better respond to times of emergency, such as massive volume of incoming calls. NTT's scheme, they argue, can facilitate the provision of advanced services regardless of distance or region while maintaining the necessary standards of network security, which is in the public interest.

NTT's unbundling scheme is also different from the idea envisioned in New York State in which an independent entity is given the authority to be in charge of operating and maintaining a shared signaling network and giving access to the network on a non-discriminatory bases.

NTT's plan is far from being sufficient to be called open network doctrine. Not a word is referred to unbundling of networks nor resale of local exchange services. This reflects not only less ambitious commitment of NTT to interconnection but also, and more significantly, differences in regulatory environment in the U.S. in Japan which critically affect the implementation of open networks. Japanese telecommunication industry has not given birth to CAPs nor resellers in the local exchange market. The Telecommunications Industry Law distinguishes between carriers on the basis of hardware: those with their own facilities are Type I carriers, while those without are Type II. This dichotomy makes it impossible to increase the potential supply of local-line facilities by various public utilities that own rights of way to lease transmission facilities, which would serve as an effective means to promote competition in the local telecommunications market. Furthermore resale of local exchange services is not permitted in Japan.

The law states that users should not be treated on a discriminatory bases. There is an administrative guidance in Japan which precludes a regional carrier from providing access services for voice communications using its own public network in order for end users to be connected to long-distance carriers' switches. With one ban on the connection of internal private circuits and public networks and another on the resale of voice services, there is virtually no room for by-pass services including CAPs to emerge in Japan.

Another problem is that NTT's interconnection issues, as any issue with regards to competition, is always discussed in the context of divesting NTT. Industrial policy since the reform of the telecommunications regulatory system in 1985 has consisted of measures to divest NTT of its divisions in competition with the new carriers entering the various sub-markets. These movements resulted in the creation of NTT Data (provides data communications services), NTT DoCoMo (provides cellular telecommunications
and pocket pager business operations) and NTT Personal Communications Network (Personal Communications Systems) as separate subsidiaries.

This practice has resulted in NTT’s loss of one after another of its growth divisions. The divestiture discussions currently underway center around divesting NTT of its long-distance division in order to ensure fair competition with long-distance NCCs. Certainly, NTT still maintains its virtual monopoly over the number of subscribers as Table 2 shows. The divestiture of the long distance operations follow AT & T’s divestiture model of 1984. The problem with following AT & T’s model is that it would completely ignore the technology changes which have taken place in the last decade and that it would still leave a monopoly in the local market.

### Table 2  Number of Telephone Subscribers in Japan by Company

<table>
<thead>
<tr>
<th></th>
<th>FY 85</th>
<th>FY 86</th>
<th>FY 87</th>
<th>FY 88</th>
<th>FY 89</th>
<th>FY 90</th>
<th>FY 91</th>
<th>FY 92</th>
<th>FY 93</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTT</td>
<td>46,299</td>
<td>46,772</td>
<td>50,419</td>
<td>50,337</td>
<td>52,408</td>
<td>54,470</td>
<td>56,207</td>
<td>57,609</td>
<td>58,777</td>
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<td></td>
<td>(3.3)</td>
<td>(3.5)</td>
<td>(4.0)</td>
<td>(4.1)</td>
<td>(4.0)</td>
<td>(3.2)</td>
<td>(2.5)</td>
<td>(2.0)</td>
<td></td>
</tr>
<tr>
<td>TTNet</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(50.0)</td>
<td>(66.7)</td>
<td>(60.0)</td>
<td>(12.5)</td>
<td>(11.1)</td>
<td></td>
</tr>
<tr>
<td>JT</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>42</td>
<td>42</td>
<td>44</td>
<td>43</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.0)</td>
<td>(4.8)</td>
<td>(-2.3)</td>
<td>(0.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>46,299</td>
<td>46,772</td>
<td>50,419</td>
<td>50,337</td>
<td>52,453</td>
<td>54,517</td>
<td>56,259</td>
<td>57,661</td>
<td>58,830</td>
</tr>
<tr>
<td></td>
<td>(3.3)</td>
<td>(3.5)</td>
<td>(4.0)</td>
<td>(4.1)</td>
<td>(4.0)</td>
<td>(3.2)</td>
<td>(2.5)</td>
<td>(2.0)</td>
<td></td>
</tr>
</tbody>
</table>

source: InfoCom Research, Inc.
*figures in parenthesis indicate percent growth from previous year.

Rather than divesting NTT of its divisions to "balance" it with its competitors, the issue should be how NTT's network can be opened for effective use by its competitors. If the dominant carrier allows the use of its network on equal terms to an outside player, integrators can effectively compete with the incumbent. At the same time, if competition is in place, a carrier's ability to offer integrated services need not be restricted. The focus should be how the pie can be enlarged by introducing new applications and services, for the new entrants as well as for NTT.

Finally, the main Japanese communications carriers are divided into domestic and international carriers. Being restricted from providing international services, NTT's presence in the international market is extremely small. However, when the market for multimedia communication directed at global corporations is becoming a huge growth sector, how to get international competitiveness is another issue that NTT urgently needs to address.
V. Conclusion

Technology and market forces are rendering the traditional telecommunications regulatory frameworks quickly obsolete. The complexity is that the same physical/electrical transmission facilities can be utilized for both telephony and computer networks which are different in maturity levels. In computer networking, innovative players and activities of resellers are indispensable for the speedy expansion of the user-base. The rigid structure of entry restrictions and tariff authorization currently practiced in telephony regulation should not be applied to computer networking if proper expansion of the market is to take place.

In order to offer the most vital of advanced communications services, there is a big incentive for carriers to have their own "network" that enable them to capitalize upon technological advances and business opportunities freely and without delay. This is why unbundling the network becomes crucially important. This "network" can consist of the carrier's own telephone lines and/or lines leased from other carriers. It is "packagers" who are free from strict regulation and from massive fixed costs that are in the best position to offer integrated services.

The decision of whether to stage a full-scale entry into every sector of the market or to only enter a single niche market is best left to the discretion of the carriers themselves. Carriers currently operating in the various sub-markets should be allowed the freedom to expand their operations over a wider market as "packagers."

This paper shows that some progress has been made in the U.S. in the more liberal regulatory environments of New York, Illinois, and California. Japan, as well as other advanced nations should share the basic concept of the new regulatory framework, which we explained through the three-layered model. The new framework can globally facilitate the realization of a fair and competitive environment. With this global industrial infrastructure in place, the benefits of a technological level of interoperability can be fully exploited.
References


