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FACTORS AFFECTING THE DEFINITION OF THE LOCAL CALLING AREA: AN ASSESSMENT OF TRENDS

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Executive Summary

The purpose of this report is to provide a conceptual framework commissions can use to analyze the local calling area and extended area service (EAS) concepts before they design tariffs or set other area-dependent policies.

Traditionally the occasion when state regulatory commissions most explicitly sought to define the local calling area was in the context of a petition for extended area service (EAS). These proceedings tended to be contentious and time-consuming, and ad hoc solutions often had to be fashioned. In this report, EAS petitions are seen as an early warning that a change in some factor or trend is affecting the current commission definition of the local calling area.

Ordinarily the monitoring and deployment activities of the telephone utility are sufficient to assess the need for changes in the local calling area. Utilities develop their own standards or follow commission-approved standards and monitor changes in service quality to determine if new facilities or a reconfiguration of existing service territories may be needed. Commissions then approve or disapprove the proposed changes.

While this traditional model of dealing with changes to the local calling area (LCA) has worked reasonably well, there are three generic types of problems that have arisen, each of which has caused the EAS process to consume more commission resources than otherwise would be necessary. The first is the problem that arises from each of the participants in the LCA definition process having a different perspective on the nature of the public switched network. This report develops a parsimonious framework in chapter two that identifies the tariffed services network that the consumer sees, the usage network that the utility must respond to and facilitate, and the facilities network that affects the ability of the local exchange company (LEC) to provide services. Sole reliance on any one of these three perspectives may result in a suboptimal public switched network and will

diminish the probability of the various stakeholders being able to resolve disputes.

The second generic problem comes from the incremental nature of the decisions about the local calling area. Rarely are local calling areas designed from scratch. Each existing LCA represents the results of decades of decisions that sought to optimize the LCA using existing technology and other constraints. The natural calling area, accordingly, would differ greatly if measured in 1960 versus 1990. Digital switching and glass fiber transmission cables may now allow much larger natural calling areas than would have been economical in the past. Because the decisions were incremental, the definition of the LCA was often ill-defined and poorly understood by the parties. This report, in chapters three and four, identifies and examines the factors that have and will continue to influence the definition of the local calling area, and analyses the impact the definition of the LCA may have on important regulatory issues such as competition. Key factors used to define the local calling area include:

* Cost minimization
* Geographical growth
* Community of interest
* Political boundaries
* Technological change
* Utility modernization and deployment plans
* Utility monitoring and standard assurance procedures
* Network needs
* Boundary marginalism
* Ubiquitous provisioning
* Economic development
* Business needs
* Market considerations

The third problem is the current lack of attention to certain factors that will have a strong impact on the LCA in the future. The emerging factors are those most closely associated with the important changes taking place in telecommunications and in regulatory policy. Competition, modernization, ubiquitous provisioning, and the emergence of an information age economy are trends or factors that will in the future have an increasing impact on the definition of the local calling area. For instance, LCA boundaries formerly tended to follow the expansion of municipal political boundaries. An information age business, say a burglar alarm firm, may find unacceptable the toll charge incurred for the sale of services just outside

of an LCA/Toll boundary coinciding with and primarily justified in relation to an arbitrary political boundary. The commission then might expect appearances by a coalition of the LEC, the burglar alarm firm, the outlying customers, and various state and local economic development agencies requesting relief through an EAS-type tariff. When the boundary in question is clearly arbitrary (versus one more directly derived from engineering and economic cost minimization considerations) the commission's ability to and interest in opposing the request may be low. After all, one arbitrary boundary may be as good as another. This report examines the emergence and impact of these new factors.

Chapter five of the report concludes with an analysis of five policy options that a commission can use in various combinations to define its local calling policy and to deal with EAS requests. The option thought to fit commission needs the best is the approach that establishes the local calling area as a criterion to be considered in other regulatory proceedings, such as intraLATA toll competition, but does not otherwise require the commission to launch a separate LCA proceeding. The chapter concludes with some predictions about future developments in the evolution of the public switched network--assessing its impact on the LCA--from the services, usage, and facilities network concepts developed in chapter two. The central conclusion of this report is that economic development and business needs, impelled by advances in telecommunications technology, will play an increasingly important role in the definition of local calling areas.

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PREFACE

The definition of the local calling is a problem that has persistently appeared before state regulatory commissions, usually most visibly in reference to an extended area service request. Because of changes in the economy, regulation, and telecommunications technology, new factors will affect the commission's definition of the local calling area. This report identifies and analyzes these factors.

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CHAPTER ONE

LOCAL CALLING AREAS AND EXTENDED AREA SERVICE

Introduction

The first telephone tariffs of the old Bell system were designed and implemented without any state commission oversight and contained two distinctions. The first distinguished between local calls and toll calls while the second was between business and residential customers. Both distinctions have stayed with most subsequent telephone tariffs and have fueled disputes over costing and pricing that continue today. Disputes of this kind occur because all users share portions of the same network. Different, legitimate, costing and pricing methods may cause one customer to pay more than another for services that seem reasonably similar.[1]

[1] See Gerald E. Brock, *The Telecommunications Industry: The Dynamics of Market Structure* (Cambridge: Harvard University Press, 1981); David Gabel, "Where Was the Knight When the Competition Needed One?" (New York: Unpublished paper, Department of Economics, Queens College, City University of New York, September 1988); Sandra B. McCray, *State Regulation of Telecommunications: Historical Consequences* (Washington, D.C.: Advisory Commission on Intergovernmental Relations, 1989); Leonard S. Hyman, Richard C. Toole, and Rosemary M. Avellis, *The New Telecommunications Industry: Evolution and Organization* (Arlington, Virginia: Public Utilities Report, Inc., 1987); and Carol L. Weinhaus and Anthony G. Ottinger, *Behind the Telephone Debates* (Abex Publishing Corporation: Norwood, New Jersey, 1988) for a review of the costing and pricing decisions made during the early years of telephone. Few works explicitly focused on EAS. Three exceptions are (1) Tom Gross, John Borrows, Gary Evenson, Ray Lawton, and Bruce Weston, *Extended Area Service Results* (Washington, D.C.: National Association of Regulatory Utility Commissioners, 1989); (2) an article by Gaylord and Scoville, "A Survey and Analysis of State Extended Area Service Policies" in Robert Burns and Douglas Jones, eds., *Telecommunications Papers of the Fifth NARUC Biennial Regulatory Information Conference: A Collection of Twenty-Four* (Columbus, Ohio: The National Regulatory Research Institute, 1988), 135-72, and (3) a chapter in a textbook by John T. Wenders, *The Economics of Telecommunications* (Cambridge, Massachusetts: Ballinger Publishing Co., 1987).

The origin of the local versus toll distinction is in the ideas that rates should reflect costs and that costs are distance-sensitive. Distance-sensitive rates were not considered initially in the local calling area because the smaller switching capacity available produced compact local calling areas, at least by modern standards. Flat rates for local and measured rates for premium toll traffic evolved partly out of value of service considerations and metering costs.

Local calling areas evolved initially on the basis of the isolation of one interconnection point to another. When universal service was still far in the future, customers in one specific area all were connected to one plug-and-cord panel, using an operator. Their local calling area was the area served by the answering operator and her board. Even at this early stage it was the interplay between the calling interests of the connected customers and the physical facilities of the serving company that determined the local calling area. Eventually the numbers of customer and the density of their calling swamped the capability of a single operator. Generally this would not occur simultaneously with the initiation of service in a new area occasioning a new local loop termination site, but rather at an existing location. The expedient solution was simply to add another operator at that switch location. Calls were differentiated as local or long distance principally on the basis of whether or not they left the physical facility in which they were located. Toll calls simply were those that left the operator and were routed to another location where a second operator would intervene to complete the call.

Ultimately, the local availability of service spread house-to-house, to the edge of the community and beyond into the countryside. Where the circuits went continued to depend in part on the interests of potential customers in being connected to certain other customers. Eventually adjacent local areas grew to meet each other. For a brief period local companies competed for customers at the periphery of their established service areas, but by the mid-thirties this was seen as wasteful and service territories were assigned to each company. Customers often were allowed to maintain their choices in the reassigned territories through the creation of exceptions that persist today.

The development of the system within the cities followed a somewhat different course. Here again, however, we can see the interplay between the

interests of customers and the technological capabilities of the era. Prior to the advent of automatic switching, the burden of communicating between people charged with physically making the connections was a dominant concern. Bringing the operators into close proximity, that is into the same room, allowed them to communicate the requested routing off-network. In some offices that communication occurred through intercoms, in others through the actual passing of slips of paper showing the intended connection to be made on an interboard call.[2]

As can be seen from this brief examination, rate structures and local calling areas evolved over time. Commissions traditionally have spent more time on costing, rate design, and quality of service than on elaborating and defining the local calling area. While full consideration of each of these above three principal ratemaking issues could include some analysis of the impact on, or of, the local calling area, this aspect of a commission's analysis tended to be of secondary importance.[3] Typically commissions examined the size of the local calling area when petitions were received for extended area service,[4] and when utility capacity expansions made larger local service areas feasible. Commissions played a largely reactive role in both instances. Utility-initiated requests to expand the local calling area may have had less commission involvement because of their traditional reluctance to intrude into internal utility decision making regarding specific facility siting decisions.

Requests from customers to expand the local calling area to include an outlying area were perhaps the most visible occasion and the instance most

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[2] It is interesting to note that one of the major objectives in the second century of telecommunications is to provide the same kind of off-network signalling through Signal Systems Seven.

[3] Historically, one exception to this came at the end of the "competitive" era in the first part of the century when commissions were involved in interconnection disputes and in the consolidation efforts that produced the old Bell system.

[4] "...extended area service (EAS) means the availability of calling between two exchanges at non-toll rates and the transfer of that traffic (expenses and revenues) from the toll world to the local world. Historically, this has usually meant a non-optional, flat rate service in areas where intra-exchange calling was available at a flat rate. Where intra-exchange service is priced at measured (per minute) or message (per call) rates, the same would normally apply for EAS calls." Gross, et al., *Extended Area Service Results*, 2.

remembered by commissioners and commission staff.[5] In part this was due to the formal hearings that took place and because of the more political nature of the complaint process. For a complaint to surface often meant that a group of customers had been rebuffed initially by the utility. This tended to set the stage for a heated debate between the utility and the particular group of customers, with the commission acting as final arbiter.

Recent developments in the telecommunications industry suggest that additional factors and occasions will affect and be affected by the local calling area boundary. These include:

* The development of intraLATA toll competition
* The unbundling entailed in open network architecture
* Economic development of areas adjacent to large exchanges
* Elimination of barriers to the enhanced services industry
* Development of an information age telecommunications infrastructure on the public switched network

These five factors are relatively new, although elements of each have existed in some embryonic fashion in earlier regulatory forums.[6] Taken together, as will be shown in subsequent sections of the report, their net impact on the future location of the local calling area boundary may exceed the importance of previous factors historically considered.

The Usefulness of the LATA as a Model for Defining Local Calling Areas

The public switched telecommunications market has four sets of boundaries that help structure the industry. These are national and state

[5] Gaylord and Scoville, "A Survey and Analysis of State Extended Area Service Policies", 135.

[6] Commissions have previously considered the need, for example, for lower telephone rates to help rural economic and social development. Commissions have also been responsive to the need to install newer switching in order to lower the billing cost of toll calls made by businesses and by residential customers.

borders and LATA and local calling area boundaries. The first two differ from the third and fourth in that they also serve as boundaries for other than telecommunications purposes. National boundaries delineate the international telecommunications market, and state boundaries mark federal and state telecommunications jurisdictions. LATA and local calling area (LCA) boundaries, however, serve no purpose other than as boundaries for state telecommunications markets.

Given that LCA and LATA boundaries are important structural features of the state telecommunications market, a brief comparison of each may be useful. The features underlying LATAs may serve as a model for state commissions when they consider EAS requests, and in any generic consideration of the optimal configuration of a local calling area.

LATAs and local calling areas are designed from fundamentally different perspectives, although each has some features in common. LATAs were designed in an antitrust proceeding[7] and had as their focal point the disaggregation of the old Bell system into distinct markets, defined both geographically and by service offering.[8] The intent was to create LATAs that had sufficient size to allow for competition to develop, and opportunity for competition by including enough traffic, such as interexchange traffic. LATAs also were designed to reflect factors such as communities of interest and network efficiency.[9]

Another important feature of the LATA is that because of the settlement nature of the antitrust proceeding, the boundaries agreed to (having been open to public comment) were final and are unlikely to be revisited. Local calling area boundaries, on the other hand, are inherently in flux because of the different process used to create them. LCAs have been established by state commissions to reflect local calling patterns, political boundaries,

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[7] United States v. American Telephone and Telegraph Co., 552 F. Supp. 131 (D.D.C. 1982) aff'd sub nom. Maryland v. United States, 460 U.S. 1001 (1983).

[8] Robert W. Crandall and Kenneth Flamm, *Changing the Rules: Technological Change, International Competition, and Regulation in Communications* (Washington, D.C.: The Brookings Institution, 1989).

[9] One major intent of the decree "...is to make the benefits of interexchange competition available to all telephone subscribers ..." (U.S. Department of Justice, *Decision to Divest*, 1,358). Accordingly LATAs were designed to be big enough to permit economical competition for those wishing to offer services between exchanges (Ibid. 1,386).

costs, and available facilities. If switching improvements made it possible to have a larger LCA, then a commission might decide to expand the LCA. If an outlying area, based upon changes in calling practices, petitions the commission successfully, the LCA may be expanded. The LATA boundaries established in the divestiture are not subject to change in the same manner. They are not primarily viewed as short-term evolutionary structures and telcos must adapt their facilities and corporate behaviors to accommodate the restrictions imposed by the LATAs.[10] Said another way, whereas a larger switch, a shift in customers, or a rate policy shift may cause an LCA boundary to change, a LATA boundary will not change without some fundamental change in industry structure.

LATAs may be subject to change if the competitive nature of the telecommunications market changed significantly. This is because the primary purpose of the LATA is grounded in expectations about the type of competition that is to evolve. LCAs are not subject to the same expectations, as furtherance of competition at the local level is not currently a primary objective.[11] As long as state commissions find that local service is less expensive when provided by a monopoly, competition at the local level is unlikely to be an important consideration in the definition of the local calling area.

Despite an apparent number of similarities, such as the consideration of the operating characteristics of network facilities, the LATA does not seem to be a useful model for commissions in their consideration either of EAS requests or in response to issues raised about the optimal size for a local calling area. LATAs are designed to encourage a certain range of

[10] The definition of the LATA boundaries is not necessarily permanent, as subsequent judicial or legislative action may cause the boundaries, or even the existence of, LATAs to change. As of the time of the writing of this report no significant demand had emerged favoring a revisiting of the LATA boundaries. Complaints, of course, do exist regarding this and other elements of the divestiture agreement.

[11] The Idaho Commission's action to affirm GTE Northwest Inc.'s authority to block MCI's "ten triple x" intraLATA traffic that originates and terminates in GTE-NWs LATA, is a recent example of the different purposes served by franchised service territories of monopolists and the intraLATA markets that are open to competition. In this case the monopolist kept a competitor out of its franchised service area. *MCI Telecommunications Corp. v. GTE Northwest, Inc. Case GTE-T-89-1* (Idaho Public Utilities Commission, 1989).

competitive market behaviors, while LCAs are intended for only a certain kind of behavior, namely monopoly provisioning of local telephone service.[12]

Organization of the Report

The objective of the report is to analyze the local calling area concept. This is accomplished by developing an analytical framework that allows an examination of key regulatory issues affected by the definition of the local calling area. Special attention is paid to the problems associated with extended area service.[13] The intent is to provide concepts

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[12] Another possibly relevant geographical unit is the Standard Metropolitan Statistical Areas (SMSA). The standards used by the U.S. Census Bureau to define the SMSA are reviewed and revised every ten years. The standards are complex, but primarily depend on size, population, density, and on distance and commuting measures. In certain instances the wishes of the residents will be considered when the resulting SMSA does not conform to existing standards. The intent of the SMSA is to provide a counting unit that matches the population distribution of a metropolitan area rather than any predetermined political boundaries. The SMSA has explicit criteria and a timetable for revision. Its usefulness as a model for LCA breaks down because its purpose is simple--the establishment of boundaries for tabulation purposes--whereas LCA serve a more complex set of purposes: cost minimization, community of interest, and economic development.

Another interesting parallel with the local calling area concept is that SMSAs are protected by a grandfather clause and may not lose their original designation due to population loss or changes in standards. U. S. Office of Budget and Management, "Notice of Intent to Revise the Standards Used to Define Metropolitan Statistical Areas," *Federal Register 53*, no. 224, (20 December 1988), 51175-51181.

[13] The report does not focus on cost-of-service methods or the choice of alternative pricing principles or tariffs. The analysis of EAS and local calling area boundary issues found in subsequent chapters in the report work equally well with any consistently applied costing and pricing principles. One exception to this necessarily occurs when a commission has to consider the effect of switching from toll rates for an EAS area to the flat rate structure in effect for the base local calling area. Similarly, changes in access charges and separations would not necessarily affect the basic analysis of local calling areas. More detailed information on the variety of EAS tariffs used can be found in a NARUC report that identified over 20 different forms of EAS tariffs in addition to traditional two-way, nonoptional, flat-rate

(Footnote continues on next page)

and an analytical framework that a commission can use to clarify its regulatory objectives before making LCA or EAS tariff design decisions. The analytical framework is developed in chapter two and is applied to relevant local calling area issues in chapters three and four. Regulatory policy options are compared in chapter five.

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service. Seventeen states indicated either that experimental service offerings are taking place or that new offerings have been proposed.

Because EAS alternatives necessarily involve some form of rate design the boundary between EAS and rate design is fuzzy. A shift to an all-flat or all-measured rate for an area could eliminate the need for distinctions between local, EAS, and toll. Accordingly, this report focuses on understanding the local calling area and EAS concepts as a necessary step before rate design issues are raised. Gross et al., *Extended Area Service Results*.

CHAPTER TWO

THE IMPACT OF PLANNING AND DEPLOYMENT ACTIVITIES UNDERTAKEN FOR THE PUBLIC SWITCHED TELEPHONE NETWORK ON THE LOCAL CALLING AREA AND EXTENDED AREA SERVICE

The Public Switched Network

The public switched telephone network is a large and complex communications system that provides various telecommunications services, usually on a tariffed basis, to all who request it within a given geographical area. The public network is regulated by a commission and is connected with (and acts as a common carrier for) private, governmental, and other regulated telecommunications networks. While the corporate structure, pricing policies, and other important aspects of a telecommunications utility providing public service are determined by a regulatory authority, other significant portions of the network are thought to be largely determined on the basis of cost minimization, service reliability, and service-providing principles.[1]

The public switched network has been designed according to the above principles and, accordingly, has known characteristics and attributes that have affected and that have been affected by the definition of the local calling area. For instance, a particular existing line and switch configuration that minimizes cost, is reliable, and provides requested services may not have been chosen if a different size local calling area were substituted. This chapter will examine how the planning, deployment, and other activities have affected the definition of the local calling area

[1] Commissions, utilities, various customer classes, other network-based competitors, and enhanced service providers may (and often do) differ on the correct application of these principles.

from a regulatory perspective.[2] It will also illustrate how the tensions caused by three differenct network perspectives can partially explain the difficulty the various parties have in agreeing on a common definition of the local calling area and on how to resolve requests for extended area service.

The public switched network is made up of three components: the transmission paths, the points of switching transmission paths, and the intelligence that directs the switching.[3] In varying degrees these components are interchangeable. A given level of service might be provided by (1) a path-intensive system with limited switching and intelligence, or (2) a system with fewer paths and increased switching, or (3) a system with switching requirements reduced by improved intelligence.

Two types of paths exist, those that connect switches at each end, and those that have one terminus on a switch and the other at a customer's facility. The latter are referred to as "loops." Paths are not necessarily separate physical entities. A fiber optic cable, for example, is one physical entity that provides many hundreds of paths. Even loop paths are not necessarily separate. Through a carrier technology such as multiplexing, one pair of copper wires may provide a signal path for several customer loops.

A measure of the quality of information that may be passed through a connection during a period is the "bandwidth" of the connection. For the currently deployed public switched network, the bandwidth for basic service is that necessary for voice communication. There are applications where advantages exist for broader bandwidth, switched capabilities. High-speed data transfer between computers is an example, and there may be application for switched video capability. The importance of bandwidth is that,

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[2] See R.F. Rey, *Engineering and Operations in the Bell System* (Murray Hill, New Jersey: AT&T Bell Laboratories, 1983), 81-97 for an engineering perspective.

[3] The public switched telephone network does not include all of the facilities of the regulated local exchange carriers. Most notably, it does not include the transmission paths dedicated to one customer: the private lines that are not switched and do not provide access to a switch. It does, however, include the local loop lines devoted to a single customer and having some of the attributes of the private lines. They remain under local exchange company control.

provided there is sufficient traffic to fill the available bandwidth, it is generally cheaper to provide broad bandwidth paths than to provide physically separate narrow bandwidth paths. Multiplexing technology provides one means of combining the narrow bandwidth needs of several users into one broad bandwidth package using one broad-band channel to provide a path for the multiplexed messages, sorting them at the receiving end.

The components of the network provide three classes of functionality, which in turn provide the specific services to the customers. Traditionally the equipment functions have been described as "transmission" and "switching." Intelligence was subsumed in the description of the switch. The intelligence of the network operates through the switches, but to an increasing extent is not necessarily co-located with the switch. The network intelligence has become an independent variable affecting the overall fabric of the network. Other functions remain subsumed in the three basic components.

Facilities, Services, and Usage Network Concepts

The public switched telephone network is simultaneously the physical facilities comprising the network, its availability to provide services to users, and the traffic patterns that result from usage. A building, by analogy, may also be described simultaneously as the concrete, steel, and glass of its physical structure; the description of its capability to serve, in terms of retail and office space availability; and its utilization as depicted on the basis of details of actual occupancy, such as numbers of tenants. Each of the concepts of a building or a network is influenced (and to a degree controlled) by the others. And yet each concept exists and functions somewhat independently of the others.

Viewed from one perspective, local calling area is simply a service purchased by a local user. It defines the terms and conditions of the performance of the network services the consumer uses. The clearest example of this occurs when a twenty-five-cent coin is deposited in an airport pay telephone. The caller has purchased (in a jurisdiction with flat, unmeasured, and/or unmetered rates) the ability to make one "local" telephone call: the geographical area is defined and may include one or more

areas that were formerly toll calls, but which are now included as a local call under some EAS arrangement. The local caller does not use a separate and unique physical network for local calls, but a common network providing scores of services for many different types of customers, each with a unique geographical profile of incoming and outgoing communications.

A twenty-five-cent airport call to the caller's home may use a switch that is simultaneously routing a long-distance toll call from the airport to a home just a few feet outside the "local" calling area, handling an outward high-speed data transfer from an airport branch bank to its home bank's data processing center in another LATA over leased lines, and processing an inward-toll call from another state to a business operating at the airport. The twenty-five-cent local caller and the other users do not know--or need to know--about the other traffic on the network. All the local caller knows is that twenty-five cents has purchased a service: the ability to make one call of unlimited duration anywhere within the local calling area. An interstate interLATA user purchases a different service from the public network.

The combination of all available services--the service network--influences the facilities network through the efforts of the network designer to optimize a facility deployment configuration that is best able to handle the different existing types of network services. For example, a switch-over to a digital switch may be delayed if forecasted business demand does not materialize for a particular set of tariffed services. The services network may influence traffic by encouraging or discouraging specific uses of the network. The selection of a rate structure and rate level will influence the usage pattern; therefore, it would be expected that the conversion of former toll calls into less expensive local calls should result in traffic stimulation.

Using a services network concept the regulatory questions that arise for local calling area include:

1) Does the description of the service suit the requirements of the customers? That is, do most customers want a local calling area of the current size, or would a larger or smaller one be preferred?

2) Do the services meet the other requirements placed upon the portion of the network supporting the service, such as meeting the established revenue requirement, or contributing to societal benefit?

From a facilities network concept, the local calling area definition raises regulatory queries such as:

1) Are the facilities deployed capable of supporting the defined local calling areas? A large and diverse local calling area may have several tandem, trunking offices handling local calls in a manner otherwise similar to the toll trunking centers providing toll service between several smaller but distinct local calling areas. A growing local calling area may, for example, require more trunking facilities.

2) What influence will the local calling area definition have on the future deployment of facilities? Within certain constraints, local calling patterns will follow the metropolitan area's growth patterns. An optimal deployment plan should reflect the forecasted growth of the area.

The usage network concept raises questions about the utilization of the network based on the local calling area definition chosen. The inclusion of a suburban industrial park, for example, via an extended area service (EAS) plan into a local calling area will result in a different pattern of network use and congestion than the inclusion of a suburban residential community or a rural vacation area. Typical questions raised include:

1) What is the pattern and distribution of calls by customer class? A calling area expansion justified on the basis of 911-type concerns--that is, the need to be able to make fire, police, and medical emergency calls on a local call basis--differs from one justified mostly on the basis of suburban expansion. The three network concepts can be usefully integrated as shown in figure 2-1.

2) Do individual services differ in their pattern of use? A burglar alarm and a high-speed data transmission service have different patterns and make different demands upon network facilities.

The simple model integrating the concepts in figure 2-1 has several important features. The first is that the network can be described from three different perspectives--that is, the services, consumer, and facilities network perspectives--but cannot be fully described from any one perspective alone. The underlying physical reality of the network is captured in the facilities perspective where the network is seen as being the sum of its components. This definition is particularly relevant because the costs of the network are easily described in terms of the costs of the components. Further, many important decisions, such as the rate of the deployment within the network, can best be seen in reference to specific pieces or components.[4]

The services network perspective is the second way to view the network. Here the network is viewed as the sum of all the service offerings made available to the users. Services are authorized, described, and sold through tariffs that detail the prices, features, terms, and conditions under which the services can be used. The third perspective is the usage network where the network is seen as the sum of all of the usage or traffic on the network. Usage may be described by location, piece of equipment, time period, customer class, service, and various service quality and congestion measures.

The public switched network concept is greater than the sum of its parts. Reliance on any one of the three perspectives will result in a description of the network that is insufficient for regulatory decision-making. If, for example, a switch is replaced in a particular location, it is unknown what services it will provide or the actual utilization rate that will occur when viewed strictly from a facilities perspective. On the other hand, the type of services offered and important usage depend on characteristics of the available facilities.

[4] Cost allocations assigned to specific components may be arbitrary (that is, not based on cost) and may differ depending on the costing theory and allocation factors used.

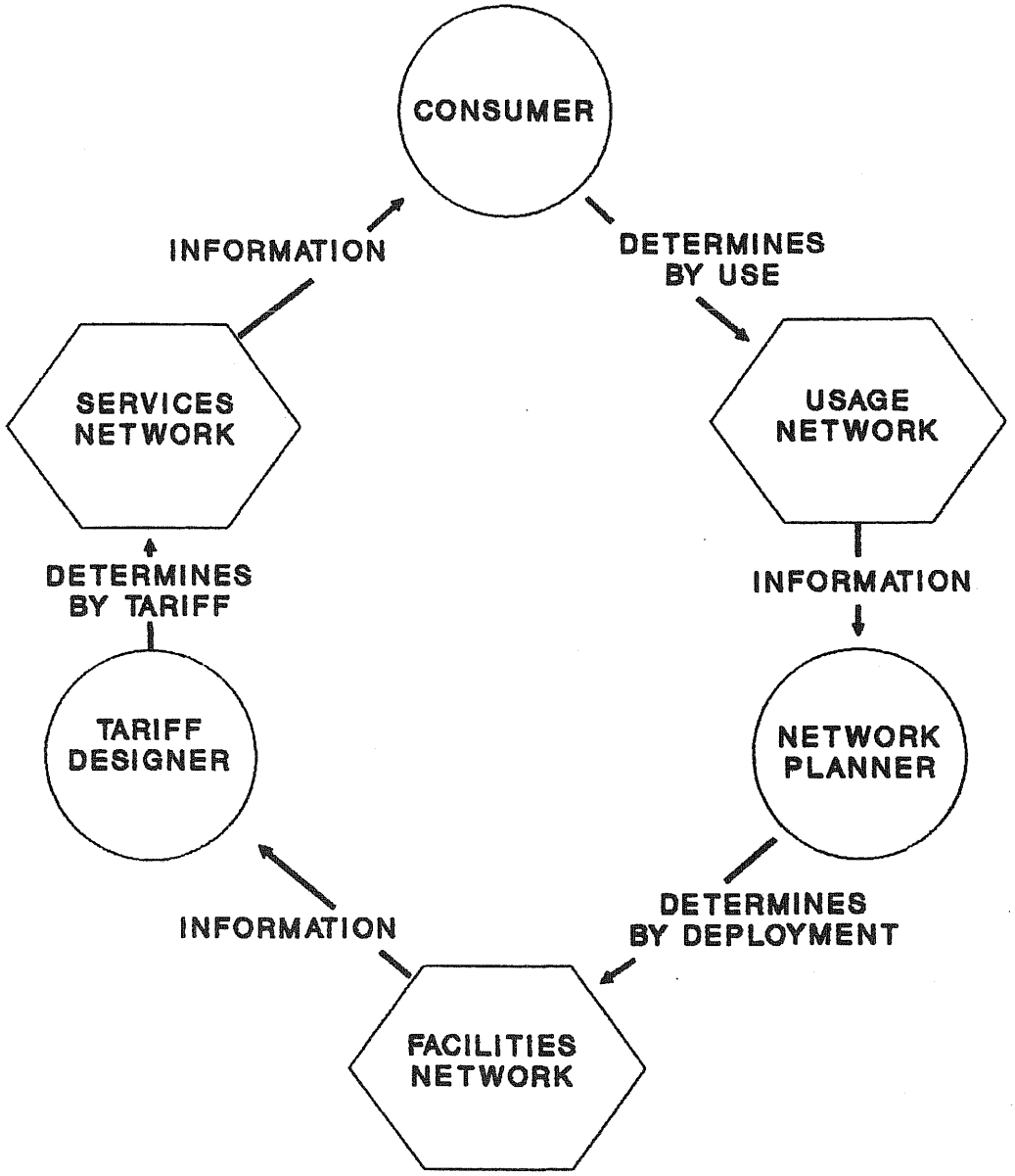

Fig. 2-1. The interrelationship of three perspectives describing the public switch network.

Source: Author's construct.

The second important feature of the network model is the role played by the agents, each of whom defines a specific network. No single agent is ordinarily able to act in all three roles.[5] The agents depicted represent clusters of consumers, technicians, or decision makers who act generally according to certain norms. The actions and decisions taken by all the agents collectively define the network, even though each agent has a direct effect on the network from only one perspective.

As shown in figure 2-1, the agent receives information and then acts. By this action, one of the three features of the network is maintained or changed. This information is given to the next agent. The first agent is the network planner who interprets the status of the network from usage information. The network planner makes the facilities deployment decisions that result in the facilities network.

The second agent is the tariff designer who takes the information about the capability of the facilities network and defines its functionality through the specifications contained in tariffs. As services are not ordinarily possible without tariffs, the services network is the sum of all of the available tariffs.[6] The third agent is the consumer who takes the tariff information about the available services and makes decisions that result in the usage or traffic on the network.

The third, and perhaps the most important part of the model, is that each agent has separate and distinct needs. Indeed, some of the origins of the regulatory problems associated with the definition of the local calling area find their roots in the different perspectives of the public network. While these are described in detail later, one simple example is the divergent views possible between the customers, network planner, and tariff

[5] While a commission retains oversight over the work of the network planner and designs tariffs, it does not determine usage. Only customers can finally determine usage. Further, on a practical level most utility network planning activities are traditionally not accompanied by detailed involvement by commission staff.

[6] The commission performs this role for regulated services and an unregulated telephone company does it for nonregulated services. Thus, under an ONA regulatory regime, an ESP would decide which services are to be offered for sale from the wide range of services made possible by the underlying facilities-based features of the available public switch network and would set its own tariffs.

designer in responding to an extended area services petition. Each agent assumes he should prevail. In actuality, however, each can only affect certain parts of the network.

The service--the ability to make local calls--is what the local user buys and is aware of. The decision to expand or contract the local calling area through various EAS tariffs will result in a new service provided by the network. The new service network will affect and in turn be affected by the underlying facilities network and traffic pattern. If traffic volume in the network is already at the quality-of-service limits established by the commission, new facilities may need to be added, or quality-of-service standards may have to be lowered to expand the local calling area to include a growing suburb. Commissions and the utilities recognize the need for modifications through monitoring and work out a set of network services to meet expressed needs. Commissions, utilities, and customers then may differ as to the correct weight to be applied to each of these three perspectives of the publicly switched network.

It is posited in this report that local calling area definition and the future development of the public switched network can occur most successfully when the roles of all three agents are understood and integrated from a public policy perspective. The information needs and objectives of the agents are shown below in table 2-1.

The physical capabilities of and the engineering principles supporting the expansion, operation, or maintenance of the public switched network are important in defining the local calling area and in resolving extended area service requests. The facilities portion of the public switched network is affected by the type of market structure, the dispersion of network intelligence, interest in current versus future cost minimization, and the nature of utility monitoring, planning, and deployment cycles. Each of these factors influences the development of the facilities network, which in turn effects the definition of the local calling area. Each of these factors is examined below in reference to their influence on the impact of the facilities network on the definition of the local calling area.

CHARACTERISTICS	TYPE OF AGENT: TARIFF DESIGNER	CONSUMER	NETWORK PLANNER
INPUT NETWORK	Facilities	Services	Useage
ACTION NETWORK	Services	Useage	Facilities
ACTION FORM	Tariffs	Use of services	Deployment
CONSTRAINTS	• Capability of facilities network. • Corporate policy. • Regulatory mandates. • Ability to convert functions to useful tariffs.	• Tariffed offerings. • Understanding of tariffs.	• State of technology. • Current state of facilities network. • Corporate policy. • Quality of service standards.
INFLUENCES	• Revenue objectives. • Expected future of telephone system.	• Communication needs. • Availability of alternatives. • Prior commitments to alternatives. • Prices. • Expected future of telephone system.	• Cost. • Expected future of telephone system.

Table 2-1. Illustrative Characteristics of three different network agents.

Facilities Planning and Deployment

The public switched telephone network as it exists is the result of innumerable individual construction decisions made over several decades.[7] The facilities network of the local exchange has never been optimized in the sense of having been started from scratch. While it is reasonable to presume that each decision that shaped the network was made in good faith by technically competent specialists, problems faced in the current network configuration and industry structure occur because some of today's objectives were not considered at the time earlier optimization and construction decisions were made.[8]

Network deployment tends to proceed incrementally in the telephone industry. Even when a decision is made to incorporate newer technology or to create the ubiquitous offering of newer services, the actual installations are made in increments.[9] Of current significance is the movement toward converting the publicly switched network to digital facilities and converting the transmission medium from copper wire to glass fiber. Backward compatibility (that is, the need for the new technology or service to interface successfully with the equipment being displaced) is a

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[7] See American Telephone and Telegraph Company, *Engineering Economy: A Manager's Guide to Economic Decision Making* (New York: McGraw-Hill Book Company, 1977), 253-345 for a description of the kind of economic and engineering analyses followed by network planners in making equipment retirement, replacement, or modernization decisions.

[8] The impact of the expansion of local calling area boundaries on intraLATA competition is an example of a factor not considered by planners only a decade ago.

[9] There are alternative ways of obtaining needed facilities once the need is recognized by the network planner. In this report and in most responses by utility planners, the response path will be based upon the telecommunications utility buying, installing, and maintaining the new equipment or facility. Other paths are possible, and might be chosen on least-cost-planning (LCP) principles. In essence, the LCP reasoning is that prior to any purchasing decision, a utility should first determine if it can lease or purchase needed high-quality switching and transmission equipment and facilities from other telecommunications firms at a net price lower than the utility would have to pay itself. Unlike the situation a decade ago, there now exist a number of telephone companies and nontraditional providers with utility-equivalent facilities and excess capacity, such that it may be cheaper to use these sources. Utilities, however, traditionally have been reluctant to use equipment or facilities not exclusively under their control.

significant requirement for the public switched network. To some extent, it is both the cause and the effect of the gradualism evident even in network-wide transitions.

The switched network consists of the transmission paths, the switches, and the intelligence to direct the switching. Advances can be made in the technology of any of the three elements, and can affect simultaneously the optimization of the mix of the three. An advance in technology is a "supply push" on the network configuration. The ways in which the network is used and the amount of use cause "demand pull" on the network configuration.

It is the complex interplay of these three factors--backward compatibility,[10] technology-based supply push,[11] and market-determined demand pull--that shapes the future of the public switched network. The utility managers of the network interpret the evidence that is available to them, and deploy capital for network facilities construction. The role of regulators may expand to require that some specific functionality be provided. More commonly, however, the regulatory influence is in the area of structuring a reward system--incentives--to provide public policy guidance to managers.[12] Existing local calling areas are one result of these interactions and decisions.

Network capability is determined by the need to maintain compatibility with the previously deployed facilities, supply capability and cost of new technology, demand for services, and behavior of the network managers in reaching their deployment decisions.

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[10] Rey, *Engineering and Operations in the Bell System*, 734-7.

[11] As Hyman reports, "The overall capability for lightwave systems has been doubling yearly ... In experiments, Bell Labs has multiplexed signals to transmit 20 billion bits per second over 42 miles of fiber over one tiny fiber optic strand, the equivalent of 20 private lines, to each of 10,000 customers, with capacity left over." This increase in supply is due to technological improvements. Hyman et al., *The New Telecommunications Industry: Evolution and Organization*, 56.

[12] The open network architecture (ONA) regulatory initiative, for instance, does not specify the services to be provided. Regulatory ONA policy, instead, provides incentives through the procedures and pricing parameters used.

Deployment in a Monopoly Environment

Two distinct network deployment activities are constantly pursued. The first is the ubiquitous deployment of the equipment and techniques that will be available to fulfill the general requirements of the public switched network. The second is the choice of the equipment best suited to serve a specific requirement within the network. A glass fiber cable could be installed, for instance, to serve a single suburban user with a need for high-speed data transmission, whereas the rest of the calling area may still be served by copper cable.

In a monopoly environment, the utility decision makers retain significant control over the definitions of service objectives and requirements. In a market-driven environment, the customer, either by using a service or choosing an alternative, has a greater effect on these key definitional activities.

Through regulatory oversight, the state commission can influence the telephone companies' understanding of and response to specific service requirements. An example of one such commission impact was the requirement that multiparty service be upgraded on a commission-prescribed schedule. The degree to which state commissions have exercised the opportunity to influence service definitions has varied in the past and may continue to vary in the future. Some may choose to take no actions to prescribe further expectations, rather relying (where appropriate) on rising competitive pressures. Examining the performance of utilities in a monopoly environment can be instructive and can guide a commission in gauging the need to impose requirements in specific local circumstances.

The assumptions underlying this superficial examination is that the utility is competent, somewhat risk-averse, unchallenged by competition, and not actively influenced in its network deployment choices by the regulatory commission. So long as the equipment of the utility is meeting minimum standards and the offered traffic is being adequately handled, the utility need not do anything to change its network. Traffic growth is the likely trigger for change in equipment or techniques. When this occurs there will be a finite set of alternatives available. The equipment suppliers' offerings typically will include means to upgrade the utility's equipment using the vintage of technology for that equipment. They will

have the latest technology available, with a variety of added features for the utility to choose among. The competent, risk-averse utility will choose some form of analysis of these alternatives that evaluates the discounted cost of meeting expected service requirements and will select the one that minimizes costs.

Crucial to the analysis are the expected service requirements. If these are defined by extrapolation from experience, they will not necessarily include new services that the customers might find valuable or new uses of the existing services which the current customers have yet to discover. The resulting utility decision will accomplish a form of cost minimization for the continued provision of the existing services, but it may forgo customer advantages from new services, and even may forgo revenue contributions that new services may be able to provide. This is not to suggest that new services will not be introduced by a utility following the decision scenario described. Rather, those opportunities may occur when the new capabilities are incidental to the best choice for providing existing services. The pace of deployment of expanded network capabilities will be slowed by the requirement that each increment be justified as the most economically means of sustaining existing services.

Gaining insight into the underlying objectives served by the practices of the utilities in making network deployment decisions serves two purposes. It helps explain the current state and predict a likely pattern of evolution of the underlying facilities. Just as important, it may help explain the positions adopted by those same utilities in a broader set of issues than equipment selection decisions. Both have implications for the definition of local calling areas.

Network Intelligence

The state of the deployment of the intelligence in the network is of particular importance because the services offered may depend on the network intelligence available. Also, the amount of traffic that can be carried through the switches and through the existing paths depends on the intelligence available to control the network.

Network intelligence is required, for example, to differentiate billing. In some configurations it may be necessary actually to provide a path for traffic to handle it at a location where the appropriate intelligence is available to capture call parameters for billing, even though a shorter path through the network may be available if only a communication path was needed.

The cost of intelligence has always affected the billing structure of the network. Indeed, the sophistication of the rate schedules for all types of utility service has been affected by the cost of billing. In the electric industry, for example, customers initially were billed for connection to the service. That was the most economically feasible measurement of service utilization then available. Soon thereafter rate structures emerged where the charge depended upon a physical count of the light bulbs installed by the customer. When economically justifiable watt-hour meters became available, the industry shifted to charges based upon the kilowatt-hours of consumption. Peak metering capability preceded demand billing techniques and time-of-day rates were introduced on a widespread basis after the capability to record time differentiated use on an economical basis emerged.

In the telephone industry, when all calls were switched by an operator, rate structures that charged on the basis of use were feasible. When the overhead associated with an operator recording the billing information exceeded the charges for the calls, per-call charging schemes were abandoned and flat rates were instituted. The stimulation in local intraswitch traffic resulting from flat local rates made sense when the net cost of expanded facilities was less than the net cost of providing operator oversight.

Current Versus Future Cost Minimization

Recently, telephone utilities feel the need to provide some services under actual or perceived pressure from unregulated competitors. This has caused them to reconsider their traditional lowest-minimal-cost criterion and to consider a future-oriented cost-minimization criterion that depends

on future demand for new services to justify the investment in new facilities.

As can be seen in table 2-2, a focus on current users is a conservative, risk-minimizing strategy; it rejects high initial costs and unproven demand. A focus on future service needs tends to accept more costs and more uncertainty in the expectation that traffic stimulation will occur. The tradition-oriented approach is demand-driven. The future-oriented approach is supply driven and assumes (as has occurred in some services in the past) that consumers will buy new services when a ready and inexpensive supply of the services exists.

TABLE 2-2

A COMPARISON OF COST-MINIMIZATION OBJECTIVES AND ALTERNATIVE EQUIPMENT INVESTMENT CHOICES

Cost Minimization Evaluated In Terms of:	Characteristics of Alternative Equipment Investments			
	High Initial Costs	Low Initial Costs	Unproven Demand	Proven Demand
Current and Traditional Service Users	Reject	Accept	Reject	Accept
Future and New Service Users	Accept (within limits)	Accept	Accept (within limits)	Accept

Source: Author's construct

The confidence some utilities have in the more advanced technologies and a future-oriented investment strategy is evidenced by their acceptance of potential penalties for that deployment as compared to the cost of the traditional technology. These utilities may adopt analysis techniques favoring newer technology and thus may place limits on the number of alternatives that are considered. For example, it may be an a priori corporate decision that all remote switching will be optical-compatible.

Planning and Deployment Triggers

Deploying of physical facilities in the local exchange network is an incremental process. Additional facilities are added to work in conjunction with established facilities. The first step in the planning/deployment cycle is some trigger observed by the network planner that causes a review of the adequacy of the current facilities at specific locations in the network. The triggers may vary from local exchange company to local exchange company, but will fall into three general classifications:

1) Changes in the utilization of the existing services, thus giving rise to a concern about the ability to maintain adequate quality.

2) Changes in the economics of available technology, thus prompting consideration of efficiency gains possible through an upgrading of facilities.

3) Changes in the standards of adequacy of service; either additional service requirements or higher standards for existing services.

Monitoring Cycle

The planning/deployment cycle (as partially depicted in figure 2-1) is triggered by the monitoring system of the local exchange company. The monitoring is more or less a continuous activity with three principal foci: service quality, customer needs, and technology.

Service quality is measured against established standards of performance. The individual company service standards are measured in relation to specific items of equipment. While relevant to the customer's perception of service quality, the correspondence usually will be indirect. For example, the LEC network may be designed to avoid a specific level of blocked calls due to inadequate facilities. For the purposes of monitoring, the blockage occurring at specific equipment will be measured. To achieve

the overall network performance, the standard for individual equipment will need to be as good as that for the entire network.

Other examples of service quality standards include the availability of vacant paths for connecting new customers. A local exchange company may express such a standard in the form of an ability to fulfill a service order for a given number of circuits of a specified grade within twenty days of receipt of an order. A company may have a standard for equipment reliability that monitors equipment to identify individual facilities that consume an unreasonable amount of maintenance expense.

By monitoring service quality the company will identify segments of the network that should be reviewed for upgrade on the basis of actual or avoided degradations of service quality alone. The planning/deployment cycle can be triggered not only for modernization purposes but also through service quality monitoring aimed at individual pieces of equipment and/or specific routes or services.

The planning/deployment cycle also can be triggered through a revision in service quality standards. This requires the local exchange company to engage in an assessment of the needs of the customers with an objective of maintaining adequate standards of network performance. As customer needs evolve, service quality that had been adequate may become inadequate. By remaining attuned to customer expectations, the company will be able to assure that the service quality standards are appropriate for the customers actually served by the local facilities. Customer usage needs may change and customers may enter an area with needs different from the embedded customer base. This latter occurrence is particularly relevant to a local calling area definition as metropolitan areas expand into previously rural regions.

One example of the utilization of customer monitoring to trigger a planning/deployment cycle is the institution of an extended area service requirement by a regulatory commission. The previous standards of adequacy--which did not include the provision of interexchange service at local rates--are changed by the commission's granting of an extended area service request. The change triggers, first, a review of network performance using the existing facilities, and second, an analysis of whether the additional service can be provided at an acceptable level with

those facilities. If the analysis indicates that new facilities are necessary, then the planning and deployment cycle can be triggered.

Finally, planning/deployment can be triggered by the emergence or maturation of a new technology. All but the smallest local exchange companies generally keep themselves apprised of advances in equipment and techniques for providing services. In doing this they may expect the active support of vendors anxious to sell the latest improvements. As new generations of technology are introduced they will have certain advantages over previous technologies, either by providing new services or by providing present capabilities more cheaply, or both. Occasionally new equipment or techniques will be so advantageous that replacing existing equipment will be justified even though the existing facilities provide satisfactory service.

Significance of the Ad Hoc EAS Complaint Process to the Monitoring Cycle

The ad hoc complaint process is a procedure that changes the service standard that the network is expected to meet. Depending upon the detail of the preconditions that are necessary for a complainant to prevail, the imposition of a changed standard is generally not predictable by the network planner. Furthermore, the ad hoc complaint process is unlikely to be sufficiently predictable to justify prepositioning network facilities before the demand for a service actually occurs to accommodate commission-decreed changes in the local calling area. The complaint process interrupts the monitoring cycle and has the potential of triggering network reconfiguration in a way not previously contemplated by the network designers.

The complaint process is a procedure that allows a group of customers or the utility itself to petition the commission to change one or more services and/or standards.[13] If the petition succeeds, the previous utility monitoring may no longer be useful and new evaluations of traffic data may be needed. The advantage of a standard is that it provides a benchmark utility planners can use for monitoring purposes. The complaint process

[13] While both utilities and ratepayers generally have the ability to initiate an EAS request, the preponderance of requests originate with ratepayers or their representative. Gross et. al., *Extended Area Service Results*, 22.

seeks to change the benchmarks and the results of previous monitoring efforts.

The complaint process does present an avenue for customer desires to be heard. Certainly it is more apt to result in customer satisfaction than a regulatory process that fails to provide any established means for a dissatisfied customer's desires to be considered. Any complaint process places a relatively heavy burden on the complainant. Individual customers may not be well suited to meet it. After all, the regulatory process is generally foreign to them and they may feel intimidated by the process itself and by the expertise apparent in those who oppose them. If the evidentiary nature of the process established by the commission for hearing these complaints is beyond the expertise of the complainant, such as technical cost information, there is a chance that not only will the complainants fail in their undertaking, but that they will be disillusioned by the process.

The regulatory cost of complaints may be relatively high. Since complaints can originate any time, the commission cannot manage the work load occasioned by complaint processing as it might manage other approaches where it retains control of initiation. Complainants tend to be individual or small groups of customers. A commission recognizing the difficulties these customers face within the process is likely to devote significant resources to assisting them and assuring that they are not unreasonably hampered by a lack of familiarity with the process.

Impact of Facilities Deployment on the Local Calling Area

The deployment of facilities and new equipment using new technologies will influence the definition of the local calling area, as well as any expansion or contraction of the calling area. Deployment will affect the calling area definition in three ways. The first is through the impact on the services network. The second is through the distance-insensitive nature of some of the new facilities, and the third is through the impact on the usage or traffic characteristics of the network.

In the first situation, new technologies allow enhanced-service providers (ESP) to develop and sell new telecommunications services. In

general, most of the new services developed will be business-based and available first in core urban and suburban areas. Irrespective of the type of local rate structure, it should always cost the ESP more to provide service to a customer outside the existing calling area than for a customer within the calling area.[14] This occurs in large part because local exchange company rate structures include a distance component of some kind that effectively charges more for an "out of area" call than for an otherwise equivalent local call.

For an ESP facing an elastic or uncertain demand, competition, and/or a steep declining cost curve based on increased sales, the price increase it must face for sales of its services outside the local calling area is likely to be viewed as unacceptable both by the ESP and its potential outlying customers. It can easily be imagined that an effective campaign (based on an ESP and customer coalition) to include an outlying area in a local calling area could be based on the argument that "It is unfair that burglar alarm protection for ABC Village should cost more simply because it is outside an arbitrarily drawn local calling area boundary."

It is easy to imagine that the economic development concerns of ABC Village ("How can we attract new business to our Village when it lacks a basic, or soon-to-become basic, necessity such as a home burglar alarm system for the two-wage-earner family?"); the ESP ("We've got to grow, people want the service, and it will help lower our unit costs to our customers in the existing metro area"); state and local economic development agencies ("New jobs will be created for the ESP, and it will help us lure new firms into the area and retain the existing ESP and other area firms"); and the commission and telecommunications utility ("Increased utilization of the network will make it possible to lower unit costs to all customer classes and for all services, thus stimulating even higher utilization levels") would override any concern about the incremental cost of adding ABC Village to the local, metropolitan-based, calling area.

Accordingly, it seems reasonable to expect the deployment of new technology will add a new service-based demand to the extension of local

[14] The economic rationale for an LCA would be lost if intraLCA calls were not (when properly compared) priced less than calls having either an origination or termination point outside of the LCA.

calling areas as long as the price charged by the local exchange company for out-of-area calls is more than local calls. Cable TV, burglar alarm, data processing, and shopping/consumer services (such as Prodigy) are examples of services that outlying areas could desire and that would experience a lower demand if a long distance toll surcharge were "added on." To the consumer in the outlying area, the problem would be viewed from an LEC network-services perspective. As such, the potential customer would desire access to the service at the same price as customers in the existing calling area. From the service network perspective the toll facilities necessary to support the service are transparent to the user. Thus, a customer in ABC Village wants to pay the XYZ Burglar Alarm Company the same monthly rate that its customers in the existing local calling area pay.

The second way that the deployment of new technologies may affect the definition of the local calling area lies in the ability of some new equipment, particularly digital switching embedded in a glass fiber network, to be relatively insensitive to distance, volume, or type of traffic. This means under some circumstances that it may not cost a telephone company any more to complete a local call than a call to an adjacent outlying area. At some point, however, based on distance or calling volume, including additional outlying areas may require the construction of new facilities.[15]

It is the underlying physical facilities network that makes it possible to provide new services and existing services at reduced rates or at higher quality-of-service levels. For example, if the deployment of glass fiber cable is limited to a metropolitan local calling area, then an outlying area may not (using its existing copper wire) be able to avail itself of a broad-band service, such as video conferencing.

Any deployment is based upon assumptions regarding the size of the territory to be serviced and the traffic characteristics expected. A deployment plan will differ if only a central local calling area is served versus one where outlying areas are included in the deployment decision-making process. This tension regarding the advantages and disadvantages of local calling area initial deployment versus wider deployment likely will not be initially visible to consumers. It is only when new services are

[15] Rey, *Engineering and Operations in the Bell System*, 169-179.

desired in an area not served by the new technologies that the differences in the two types of deployment strategy will be visible. The problem then may become one of a suboptimal deployment in order to add a new geographical area. On the other hand, a deployment originally intended to serve outlying areas is optimal only when traffic develops geographically as forecasted.

Viewed from a facilities perspective, an investment must be made before a service can be provided. Optimal deployment is affected by area and traffic assumptions, and can result in an outlying area not having a service that is available to subscribers in the base local calling area, or having to pay more. This may show up in an EAS hearing, where the issue may be, "Could the total network deployment costs have been lower if the outlying area had been included initially?"

A third way that new technology affects the definition of the local calling area can be seen by viewing the modernization issue from a usage perspective. As noted previously, telephone utilities install equipment based on forecasted demand characteristics and the rated, traffic-handling capabilities of the equipment. These installations are made ahead of the projected occurrence of the actual demand. A fill rate is calculated that expresses either how soon or the rate at which the new facility will reach its capacity.

When the actual growth in traffic is slower than the estimated fill rate and the absolute level of traffic is less than the rated capacity (and within commission-established quality of service standards), then the incremental cost of adding outlying areas will seem to be low. Furthermore, the additional traffic stimulated may contribute to the reduction of prices charged by the network. In this instance the usage network perspective is dominant in the decision about whether or not to extend a particular local calling boundary.

To the extent that it is the distance from the central office to the subscriber that determines the density of central offices, and new technologies extend that distance, then the local calling area--defined here for illustrative purposes as the area served from a single central office--will increase. On the other hand, declining costs for the establishment of central offices would suggest that the geographic areas may be broken into smaller pieces. Advances in transmission technologies may also lower costs in ways that discourage the addition of central offices.

Conclusion

The local exchange network is a complex structure similar in many respects to the main point of the classic story about ten blind men holding on to a different part of an elephant. Each user of a virtual network service is blind to the use of the network by other users. The user buys a service without clearly realizing that even if he just plans to use the elephant's trunk, he must pay for some portion of the whole elephant. Not only that but the provider of the elephant must maintain and provide a whole working elephant (the physical part) to sell a customer the use of the trunk. Changing the definition of the local calling area means that the use to which the trunk is put has been changed. A larger elephant, or one with a longer trunk may be needed. The state regulatory commission enters this process because the parties cannot reach agreement on the type of elephant (that is, the facility) needed to support the new use, or the correct tariff to charge.

This occurs, in part, because each party has a different network perspective. A commission sees this most clearly when an EAS petitioner, who is generally unaware of the demands placed on the network by other traffic uses, does not understand why the commission cannot simply modify the existing toll tariff to give the petitioner EAS service. Engineering expertise alone, however, is not sufficient to solve this problem; otherwise commissions would likely have given this duty to the utility.

The problem of defining a boundary for a local calling area is larger than what a mid-level utility planning and deployment expert--even one armed with state-of-the-art computer software--can handle. As will be shown in chapters three and four, the definition of the local calling area affects a number of important regulatory issues. Use of the facilities-services-usage network concepts provides a parsimonious framework from which the impact of LCA boundaries on other key regulatory issues can begin to be assessed.

CHAPTER THREE

DEFINING THE LOCAL CALLING AREA

Introduction

While a local calling area can be defined operationally by reference to a local services tariff, this does not satisfactorily explain what is meant by a local calling area. Because of the changes in telecommunications technology, regulatory regimes, and business communications practices, each of these components--"local", "calling", and "area"--has become commensurately more difficult to define conceptually. Technological changes often blur the distinction between local and some long distance calls and have made possible a wide range of new telecommunications services. Changes in regulatory regimes ranging from deregulation to open network architecture have affected what kinds of telecommunications services firms may sell and where. And business firms, particularly the medium and large-sized firms, have incorporated the use of multiple communications service vendors into their standard operating procedures, using both the various private and the public switched networks for intra- and interfirm communications.

"Local" calls of individuals and firms may use the local network, portions of private networks, or access "800" and WATS-like services in ways that may physically transport calls beyond the geographical boundaries of the tariffed local exchange. "Calls" are still predominantly voice, but now telephone companies see the fastest growing (and perhaps the most lucrative) opportunities in the nonvoice services.[1] Nonvoice traffic, such as data transmission, may combine information resident in several different locations into one coherent service. These calls may neither adhere to

[1] Thomas J. Housel and William E. Darden III, *Introduction to Telecommunications Markets: A Guide for Regulators* (Cincinnati, Ohio: Southwestern Publishing Co., 1988).

regulatory boundaries nor to previous regulatory distinctions between enhanced and basic services. "Area" is an even more elusive concept, one perhaps directly analogous to those encountered when economists attempt to define "markets." Area has loosely been equated with community of interest, with the regulatory intent being that the local calling area should correspond to the calling community of interest to local subscribers.

In the remainder of the chapter, alternative concepts that have been used to define the local calling area are examined. A working definition of a local calling area is derived and presented.

Appropriateness of a Facilities-Based Definition of a Local Calling Area

An important consideration in defining the LCA is the physical configuration or network topology supporting the provision of local telephone services. A second important consideration is the range of services technically possible from a particular set of facilities. Taken together, the two considerations mean that each type of telecommunication service desired requires certain kinds of facilities. Local service is traditionally provided using certain kinds of local central offices, tandem switching (where needed), and transmission facilities. Switching and transmission facilities, however owned, are a necessary condition for the provision of telecommunications services.

Given the importance of physical facilities, would it be possible to construct a valid definition of a natural local calling area based on the physical facilities serving an area?

Examining the deployed physical plant can provide some direct evidence of the functioning of the network and the calling patterns of customers. This occurs because each individual piece of equipment has been deployed by utility engineers using some kind of optimal provisioning systems.

Assuming no regulatory constraints and no countervailing corporate objective, the existence of a direct trunk between two offices is a sign that the utility's engineering standards regarding the type of facilities required to support the communications demands of customers have indicated

the need for such a direct route.[2] The utility, in this instance, has decided to construct a trunk based on one or more of the following reasons: (1) the calling patterns between the two offices, (2) network traffic routing considerations, (3) forecasted future use, (4) changes associated with modernization, and (5) changes in quality-of-service standards.

To illustrate this, consider the physical configuration of trunking between the three central offices in figure 3-1.[3] Here the existence of trunk AB could be due to (1) the high traffic volume between central offices A and B, (2) the need for network designers to establish a backup route for primary calling route CB in order to achieve its quality-of-service standards, (3) a forecast that AB traffic will increase in the future (and within the utility's planning horizon), and (4) the justification of a new switch in central office A on the basis of its ability to process a higher volume of traffic than the old switch, thus making it cost effective to construct the AB direct trunk link. Without the AB trunk, the network in figure 3-1 can handle traffic between the two central offices by routing all traffic through central office C. Absent any of the above generic-type needs, no direct trunk link between A and B would necessarily have to be constructed.

On the other hand, the physical existence of a direct trunk link between A and B indicates an attempt by the utility to meet at least one of the four above generic needs. The common thread through all of these needs is the interest the utility has in ensuring that direct and indirect routing of all traffic occurs efficiently and within specified quality of service standards.

Any piece of equipment or any part of a facility may, in principle, be used for a variety of services for different customer classes. Trunk AB may handle a portion of an interstate telephone call. It may serve as a backup for the peak traffic that occurs between C and B. It may also be needed for the high volume of local AB traffic that was formerly routed through C. In each of the above instances it is the nature of its actual traffic flow that indicates why the AB link was constructed.

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[2] Rey, *Engineering and Operations in the Bell System*, 169-179.

[3] In order to present a simple example, the central offices depicted in fig. 3-1 are shown as directly connected with each other.

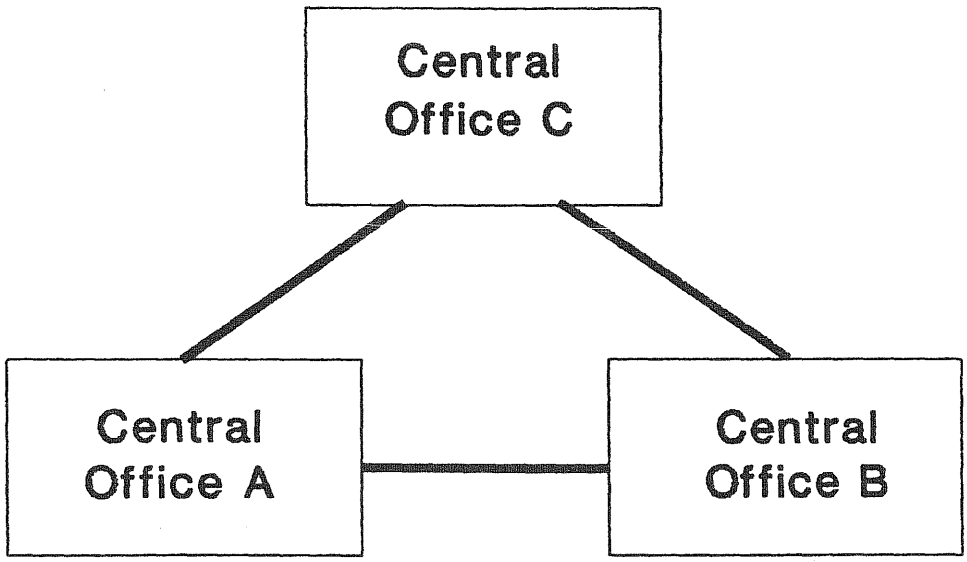

Figure 3-1: Trunk routing between three central offices

Accurately classifying traffic patterns is both difficult and important. For instance, using figure 3-1, there may be different ways the traffic pattern could be interpreted. For instance, the majority of the customers attached to central office A may not have a common community of interest with the customers served by office B and yet it may represent a high level of common interests for a small number of customers. These customers may not generate sufficient traffic to justify the trunk route. Their call volume, when combined with other network routing needs, may provide the economic incentive and cost minimization necessary to justify the construction of the AB trunk. Given the multiuser and multiservice nature of the network, a piece of equipment is often justified on the basis of its ability to serve several needs.

If it is unclear whether ABC constitutes a natural local calling area because of the several different needs served, a more reliable alternative definition of a local calling area would be to define each central office as a natural calling area. While defining a natural calling area as the area served by one central office is appealing, it has several drawbacks. First, imagine a situation where there are only three types of central office switches: a 1,000-line switch, a 10,000-line switch, and a 25,000-line switch. The natural calling area for a single-switch central office, based on switch capacity alone, would then be a function of the installed switch capacity and not, necessarily, the calling preferences of the customers. A city with 100,000 lines using a single-switch central office as the LCA indicator could have as few as four and as many as one hundred local calling areas within the city.[4] Having even as few as four LCA in a city of 100,000 lines would more than likely be considered inappropriate and inefficient by most telecommunications norms.

A second drawback occurs because as LECs provide many different services and have optimal routing procedures, the size of the switch in an office is generally larger than would be needed for LCA service alone. Knowledge of the portion of the switch allocated for the LCA would allow the

[4] Central offices, of course, may have more than one switch and each switch may have alternative ways it can be expanded to handle an increase in traffic or numbers of lines. Even with the single-switch central office constraint relaxed, the above critique is still applicable.

optimum size for an LCA to be calculated; however, this calculation would not necessarily be based on customer preferences, but rather on switching capacity. Third, central offices may have more than one switch, and (unless constrained by space or engineering difficulties) may have to be able to make incremental capacity expansions to existing switches and install new (replacement) switches of any size. Thus, the LCA defined by the capacity of its central office could have a different "natural" calling area at two different times based on equipment changes alone.

And last, modern telephone utilities have traffic design and equipment deployment procedures that are intended to minimize blocking and service degradation due to traffic volume. Wherever practical, alternative switching and routing paths will be considered so that a customer is not denied service due to a problem in a particular central office or trunk line. This redundancy makes it even more difficult to define an LCA. Given traditional LEC practices where several local central offices are linked by tandem office facilities and are simultaneously furnishing several different services, the determination of an equipment-capacity-based-LCA may be unduly arbitrary at best.[5]

When Signal System Seven (SS7) is installed, multiple independent communication signaling paths will be installed that should further optimize the traffic routing and efficiency of operation of the LEC networks. SS7 deployment may make it even more difficult to segregate the incremental costs of switching an adjacent area from short-route toll to an EAS rate because of the technical ability of SS7 to use virtually any part of the LEC network (if necessary) to complete any specific call. The impact of their equipment-based or facilities-dependent definitions of the local calling area seem attractive because of our ability to measure economic and engineering features. However, because a local calling area is also based on other important factors, such as community of interest, a facilities-based definition alone must necessarily be regarded as being insufficient.

[5] Of course, portions of all facilities can be assigned administratively and an optimal LCA can be defined. However, the affect of the arbitrary nature of the resulting LCA can be seen by making minor changes in the percentage of each facility allocated to each service.

Usefulness of the Community-of-Interest Concept in Defining the Local Calling Area

Once local calling areas became bigger than the area able to be served by one central office, criteria other than equipment capacity had to be used to determine size. These criteria were not well defined and included community of interest,[6] network needs, cost minimization, modernization needs, and preparation for future growth.[7]

The community of interest (COI) is the hardest of these criteria to define. Network needs, cost minimization, universal service, modernization needs, and preparation for future growth are all criteria that can and have been used by utilities and commissions to define local calling areas, as well as to adjudicate EAS requests. The utility planning and deployment cycle can provide data against which these criteria can be explicitly operationalized, defined, and applied. Disputes occur because some combination of the EAS petitioners, the base-calling area ratepayers, the utility, and the commission disagree with the application of the criteria but not on its measurement.

Community of interest is not easily conceptualized or measured. Three common themes occur in COI discussions. The first is the perceived need for LCA boundaries to coincide with political boundaries. The idea is that just as metropolitan areas tend to expand over time moving municipal boundaries outward from the original metropolitan core, so too should LCA boundaries grow. While not necessarily mandated by law, it seems to be a norm that all the residents of a city, town, or village should be able to reach all other residents via a local call. A large local calling area in a metropolis

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[6] Gross, et al., *Extended Service Area Results*, report that cost and community of interest are the most frequently mentioned (thirty-nine states) criteria employed in determining when EAS should be granted.

[7] The community of interest can be defined stipulatively. Oregon, for example, has defined the community of interest in terms of three standards: (1) proposed EAS exchanges must have common geographic boundaries, (2) average calling volume between exchanges must be at least four calls per month per line, and (3) one-third of the customers must make at least one call per month to the neighboring exchange. Oregon Public Utility Commission, *New Policies for Extended Area Service*, press release, Order 89-815, Case UM-189, (June 19, 1989), 1-5.

might be served by, say, ten central offices, with each linked by tandem facilities. A small city might be served by one office. Customers in either city could pay nearly the same monthly rate for local service, yet each local area would have a very different traffic pattern and network topology.

Adding another small city to the above one-city, one-central-office example may look no different, in principle, from the kind of tandem structure needed to serve the ten-central-office city. This kind of situation--where engineering and facilities siting principles do not necessarily prevail--occurs because of the belief that callers should have to make only a local call to reach city hall. It is seemingly always the case that when a suburban or rural area is annexed to a city, the local calling area boundaries are amended to include the new area. One difficulty with this incremental approach to specifying LCA boundaries is that only additions are questioned and not the economic logic of the existing calling area.[8]

Determining the correct political boundary, of course, is a problem. A suburb may have a COI with the core city in the area, but have a significant portion of its municipal services provided by the county government. City residents may be included in a one-county or multicounty park system and feel, based on past application of the local-call local-vote principle, they should be able to reach their tax-supported park offices with a local call.[9]

It seems prudent to conclude that determining the correct political boundaries to be included in an LCA has been and will continue to be the result of a political process. The fact that there may be many city halls in a large LCA, along with many county and regional agencies, means it will be less clear where LCA boundaries should be drawn based on political criteria alone.

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[8] Two states, Iowa and Minnesota, do have explicit rules that govern the removal of existing EAS. Gross, et al., *Extended Area Service Results*, 18.

[9] The Tennessee Public Service Commission used a political boundary larger than a municipality when it instituted a program to establish two-way toll-free county-seat exchange calling for all customers. Tennessee Public Service Commission, "Significant Decisions: Events in Tennessee Since the Last NARUC Convention" (Nashville, Tennessee, 1989), 1.

The second theme in community-of-interest definitions is that of a natural calling area that can be derived from a careful examination of calls made to friends, relatives, neighbors, places of employment, businesses, emergency services, and governmental agencies. The analytical perspective is that customers within an LCA should have a homogeneous calling pattern more akin to their fellow LCA residents than to those residing outside the LCA boundary. Ideally, this kind of analysis would show that city residents predominantly call city residents and that rural residents tend to call rural residents. This kind of pattern would allow two distinct LCAs to be designed based on the common calling patterns observed. In practice, however, such clear patterns do not always occur. Some suburbanites may communicate as frequently with their rural neighbors as they do with their city cousins.

Determining natural calling areas is further fraught with difficulty because of a chicken-and-egg-type problem. Since at any one time a utility customer is faced with an existing tariffed rate structure and a given facilities network, truly "natural" calling patterns may not be determinable. While this initially may seem too strict an interpretation, consider the difference in the "natural" calling area that tends to occur when less expensive local service at (T+1) is substituted for the existing and more expensive toll service at T+0. In general, traffic stimulation occurs and this apparently is a direct result of the change in rates. The natural calling area, in this case, is changed by and may be an artifact of the tariff, rather than the set of natural calling desires.

It is, accordingly, rarely clear at any given time whether calls are made exclusively because they need to be made or because the cost and institutional incentives make some calls more attractive. Customers may ration calls to their child's school when it is a toll call and rely on written notes. When the call is a local call, the customer will no longer have the same rationing incentives.

The two main ways used to identify natural calling areas do not eliminate this bias. Large LECs generally possess the ability to record all originating and terminating calls made for each subscriber. Using this information it is possible to construct a map of the calling area for any one subscriber or group of subscribers. However precise the statistical clustering method employed, the results from this method for any single

point in time are biased or affected by the existing rate structure and physical facilities available.

The second way to gather data, and one often used by EAS petitioners, is to use a questionnaire to determine the current and desired calling area. This approach has a number of difficulties, the most important of which is whether respondents can validly indicate their true preference without knowing precisely the price they would pay under a new tariff.[10]

A third theme is the use of business and/or commuting patterns in a way similar to the U.S. Census Bureau's definition of a Standard Metropolitan Statistical Area (SMSA). The criteria used to determine a business or commuting-based EAS are often ad hoc. An EAS derived this way reflects the economic dimension of a local calling area and intends that just as neighbors can call each other at local rates, so too should the local calling area be constructed to include local area business patterns.

A natural calling pattern is an elusive concept difficult to measure. Viewed from both the political and natural calling area perspectives, the community-of-interest criterion seems likely to continue to be employed by parties to an EAS proceeding or any other proceeding examining the expansion or contraction of LCA boundaries. As noted above, political judgments will continually be made about which political boundaries to include in base local calling or EAS areas. Natural calling areas are difficult to define and any evidence submitted should be regarded merely as a statement of unknown accuracy of the petitioner's preferences.

[10] It can easily happen that the petitioner's forward-looking (and unconstrained) questionnaire clashes with the utility's forecast because the utility forecast is extrapolated from past calling practices. Thus, if a commission asked the utility if it had data on whether the new reputed calling area was needed, the answer it would receive could be "no data exists to support this, and our network is not currently deployed or scheduled in the near-term to be deployed to accommodate the claimed new traffic pattern." Here a rational utility--one saying "no demand, no new facilities"--would have institutional incentives for discounting an EAS petition. The commission then could be confronted with a technologically unsophisticated EAS petitioner claiming demand for a different service than it now receives versus a competent utility stating that no such demand exists. This situation becomes even more complex because hypothesized demand may fall below the thresholds contained in the planning and monitoring routines of the utility.

Definition of a Natural Boundary

In many ways the situation regarding EAS and other boundary modification requests stems from the arbitrary nature of any boundary and the cost-minimization objectives of adjacent customers. Rivers and mountain ranges are, for example, considered obvious natural boundaries well suited in establishing political boundaries between states. However, political geographers have shown that the people living on either side of a river or a mountain range boundary are often more similar socially and economically to each other than they are to the other inhabitants of their respective states. [11]

All boundaries are arbitrary. Local calling areas are no exception. The facilities topology of any given local calling area has been affected both by local calling patterns and by network needs. Local calling patterns and the needs of the network have changed over time, as have the boundaries between areas served by local and toll services. The continual reoptimization of underlying facilities due to changes in technology and economic and societal forces is evidence of the long-term instability of local calling area boundaries.

It is human behavior that customers just across the boundary from a calling area or service delivery area will seek to be included in the less expensive base calling area. If, for example, washing machines are delivered for free by a retailer within the city boundary and otherwise incur a delivery surcharge, the retailer can count on customers who are "just across" the city line to argue that the cost to the retailer of serving them truly is no different than their adjacent city neighbors and, therefore, the surcharge should be waived. Unless it can be shown that the cost of providing washing machine delivery services and telecommunications services have discrete increases (absent any regulatory prescription) that happen to coincide exactly with political boundaries, immediately adjacent

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[11] Martin Ira Glassner and Harm J. de Blij, *Systematic Political Geography* 3rd edition (New York: John Wiley and Sons, 1980), 83; Jean Gottmann, ed., *Centre and Periphery: Spatial Variation in Politics* (Beverly Hills, California: Sage Publications, 1980); and Charles Severin Matzke, *A Comparison Analysis of the Correlates, Consequences, and Policy Implications of Urban Primacy* (unpublished PhD Dissertation: Northwestern University, 1985).

customers are likely to be right in assuming that they are the victim of arbitrary, noncost-based pricing.

Boundary marginalism occurs in part because the underlying topology of the network does not match the local calling area boundary and because adjacent customers wish to minimize their telecommunications costs. In such situations the utility or commission may find itself defending the rationality of an arbitrary boundary for the LEC portion of the facilities network. This defense taken alone (particularly if the commission provides the petitioner with needed technical advice and because of its arbitrary nature) may not withstand the petitioner's cost-minimization interests and the commission's general interest in assuring fair outcomes.

Is it possible, however, to look directly at the equipment in place and determine an optimal calling area? The answer is, yes. Within certain constraints, it is possible to use optimization criteria and to identify the best or correct calling area, but only for a specified network topology and technology. All telecommunications equipment purchased by an LEC is designed and rated to handle a maximum volume of traffic. In general, the equipment has a known tradeoff between longevity and volume. An LEC can choose to operate a piece of equipment at its maximum rated capacity or at some lower level. Once this tradeoff point is chosen for each piece of equipment, it becomes possible to conduct a variety of optimization analyses to determine incremental investments that best minimize costs and additions needed to handle changes in traffic patterns. All major telephone companies routinely conduct this type of analysis and have in-house computer models and standardized procedures to ensure the outcomes have a high degree of technical uniformity.

Alternative local calling areas can and have been examined using LEC computer models.[12] However, the underlying logic of these analyses is

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[12] Clark A. Mount-Campbell and Hisham Choueiki, *A Method to Estimate Long-Run Marginal Cost of Switching for Basic Telephone Service Customers* (Columbus, Ohio: The National Regulatory Research Institute, 1987) describes how a particular proprietary BOC computerized capacity expansion model can be used to identify the marginal cost of switching for local POTS customers. Their method is applicable to other customer classes and services, and provides the

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affected by the topology or technology that are included.

Imagine two different scenarios. In the first, the analysis uses an existing hybrid collection of analog and digital switches (at their current locations) and copper and glass fiber cable. In the second, the LEC uses an all-digital, all-glass network with no switch location constraints. The natural local calling area resulting from each analytical scenario would be quite different and would have distinctly different cost characteristics. Furthermore, the all-digital, all-glass network would have a significantly superior ability to handle congestion and to reroute traffic. Also, such a system may be largely distance-insensitive because of its handling characteristics capacity.

A second way to investigate empirically whether a natural boundary existed (based on various optimization criteria) is to examine the operating characteristics of one or a set of telephone utilities. Armed with sufficient data on traffic, investment, routing, equipment parameters, and operating costs, it would seem to be possible to identify the optimally sized local calling area. One researcher conducted this type of analysis using data from telephone companies in New York.[13] He was able to draw conclusions about the optimal size of local calling areas for different types of companies. His conclusions are, however, necessarily dependent upon the vintage and type of technology used by relatively small telephone companies serving a certain mix of rural, suburban, and urban regions in New York. If the study was redone using digital, glass, and microwave technology in a more competitive environment, or using different tariffs, the natural or optimum local calling areas necessarily would change.

(Footnote continued from previous page)
reader with a good conceptual basis from which the workings of an LEC capacity expansion model can be understood in EAS situations. See also Bridger M. Mitchell, *Incremental Capital Costs of Telephone Access and Local Use* (The Rand Corporation: Santa Monica, California, 1989), 6-7 for a brief comparison of the engineering planning models with other analytical approaches.

[13] Jean-Michel Guldmann, "Disaggregate Capital and Operating Cost Functions for Local Exchange Companies," paper presented at the Telecommunications Costing in a Dynamic Environment Conference, San Diego, California, April 5-7, 1989.

This type of study is well suited to examining alternative boundaries using current technology and operating characteristics if cost minimization is the primary objective. In generalizing the specific results to other utilities, the analyst must use caution. The optimization analytical method itself is transferable and could be applicable for use in any service territory. A commission could then use the optimal area boundaries initially identified, adjusting these as needed to meet other regulatory objectives.

Equipment and facilities-based analyses (such as the type noted above) are useful only to the extent that the decision about the LCA is based on site-specific economic and engineering constraints imposed directly by the equipment. If political boundaries, the encouragement of modernization, the promotion of rural economic development, or the sustainability of intraLATA toll competition are important regulatory objectives, then the ability of an optimization model to provide definitive boundaries is greatly weakened.[14]

In addition, in two other types of situations, an equipment-based analysis will be of limited usefulness. In the first, if the LEC network has significant excess capacity, it may be difficult to determine the optimum size of the calling area. Second, because the cost of portions of the network is determined by regulatory and utility fiat, the cost allocations used in the analysis may not be cost-based, resulting in a nonoptimal local calling area.

The Local Calling Area as a Market

One important aspect of a local calling area is its ability to function as a market. In economics, markets generally are defined as having both a

[14] Cost-benefit and optimization analyses are generally not directly suited for use in actual public policy decision making as they do not include the full range of variables or factors that decision makers consider when setting public policy. These types of analyses depend on reducing all information to a common dimension, such as economic cost data, in order to allow certain powerful statistical analysis techniques to be employed. If political boundaries are one criterion, for example, no standard cost-benefit or optimization routine would fit public policy needs.

geographical basis and a service or product basis. The LCA market consists of a geographical area and the set of local services described in a commission-approved local tariff.

The structure and geographical boundaries of the telephone utilities included in the public switched network have been determined by law, commission policy, and court cases.[15] One outcome has been the establishment of local calling areas. Within the constraints of its basic legislation and court-activated administrative discretion, a commission can establish the geographical boundary and the service or services to be included in the local calling area. Thus, a commission can retain, expand, or contract existing geographical boundaries and the type of local services provided. This authority is the basis for both the original franchise agreement, and establishing and amending tariffs.

A local calling area is what the commission says it is. A state commission may have a reactive or proactive policy stance in regard to defining an LCA. A reactive policy might rely on EAS requests and other petitions to consider changes in LCA boundaries or services. A proactive policy could include EAS freezes, quality-of-service changes, and policies favoring competition.

If the definition of the LCA is strictly stipulative,[16] it is analytically difficult to consider the LCA as a natural market. This is because simple regulatory fiat can establish an LCA market, expand it, contract it, or abolish it altogether. In any short time period it is not

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[15] The Oregon Commission, for example, states its goal is "to improve service and minimize the cost of calls between exchanges with a community of interest." Oregon Public Service Commission, *New Policies for Extended Area Service,* press release, Order 89-815, Case UM.189 (June 19, 1989), 1-5.

[16] Because of a stipulative definition, French champagne firms are able to argue that champagne is a term that applies only to a certain type of wine coming from certain provinces in France. All other "champagnes" are sparkling wine, they argue, based upon the stipulated definition found in French law. As local calling areas have not grown purely on the basis of the natural outcome of the interaction between the supply of and demand for local telephone services, they may be accurately characterized as markets established by stipulation, or regulatory fiat. Accordingly, just as certain American champagnes may be rated more highly than some French champagnes, so too may some LCA configurations, other than existing ones, better meet the needs of the users of local telephone services. EAS requests are one illustration of this potential.

possible to determine the "naturalness" of any particular LCA.[17] Indeed, under the current regulatory regime it neither may be necessary nor possible to identify a wholly natural market for local calling services.

Knowledge that the local calling area is not a natural market but one established by court-sanctioned regulatory rules does not mean that a market does not exist, only that its features are determined administratively.[18] Because of the long tradition of local calling areas, residential, business, and other customer classes appear to have internalized and accepted the distinction between local and nonlocal calling areas.[19] Widespread acceptance of this distinction has reinforced the continued use of the LCA concept by state regulatory commissions.

Three features of the LCA market are of particular importance in analyzing LCA boundaries and EAS requests. The first is the monopoly structure of the market, a feature that appears to be enduring as long as monopoly franchises exist and are enforced, and/or technological or economic

[17] Even if a new exchange is built from scratch and is subject to no regulatory constraints, the choices made by the utility regarding its service network (that is, selecting costing and pricing principles needed to design tariffs and deciding which services to cluster together) and its decisions about the physical facilities network will provide incentives and constraints that will directly influence the short-term usage pattern. In the long-term and if a competitive local market develops, then alternatives may be available such that a true natural calling area can be empirically established, but it will still be prejudiced by the initial deployment choices.

[18] These principles would apply equally well for a telephone company in any market other than a competitive market. As long as some regulatory rules exist for, say, intraLATA competition it will not be possible to identify the natural intraLATA market. An example of the transition rules that a telco may face can be drawn from the six consumer protections the New York Commission states must be observed: (1) an undiminished commitment to universal service, (2) maintenance of high-quality service, (3) continuation of adequate forums for resolving customer concerns, (4) avoidance of deregulation as the first step toward unregulated or near-monopoly operations, (5) maintenance of the ability to reregulate if any of the above conditions are not met, and (6) avoidance of rate shock to individual customer classes or groups. New York Public Service Commission, *Regulatory Response to Competition* (Opinion 89-112, Case 29469, May 16, 1989).

[19] This acceptance is apparently unaffected by the choice of pricing principles used by the commission to design local tariffs.

changes do not permit a net lower provisioning cost for universal local service than that possible from an LEC monopoly.[20] While some cream-

[20] The monopoly nature of the local exchange can be viewed from three conceptual perspectives. First, the bottleneck test established in the MFJ and applied by Judge Green in the triennial review further illustrate the monopoly characteristics of the local market. *United States v. American Telephone and Telegraph Co.*, 552 F. Supp. 31, 185 (D.D.C. 1982), *off'd sub. mon. Maryland v. United States, 460 U.S. 1001 (1983)* and *United States v. Western Electric Company, Inc. et al.*, U.S. District Court, 82-0192, September 10, 1987. Judge Green concluded, and Dr. Huber acknowledged, that a geodesic network permitting significant bypass of the monopoly control of the local loop does not exist. John S. Horning et al., *Evaluating Competitiveness of Telecommunications Markets: A Guide for Regulators* (Columbus, Ohio: The National Regulatory Research Institute, 1988), 113. Second, Pryor elaborates on the monopoly nature of the LEC that arises from the physical interconnection of its distribution network. Physical interconnection is most apparent at the local level and progressively less so at the intraLATA, interLATA, interstate, and international markets. LEC local calling areas are, thus, widely thought to be monopoly markets by regulators. Timothy M. Pryor, "The Technological Basis of Natural Monopoly and Its Implications for Telecommunications Industry Pricing," in Burns and Jones, eds., *Papers of the Fifth NARUC Biennial Regulatory Information Conference: A Collection of Twenty-Four*, 479-84. Third, Jones, in an assessment of the reevaluation by economists of the "natural monopoly" concept, also concludes that the local loop remains a natural monopoly. Douglas N. Jones, "Regulatory Concepts, Propositions, and Doctrines: Casualties and Survivors," *Journal of Economic Issues* XVII no. 4, (December, 1988): 1095.

Five recent empirical studies have concluded that the local market is a monopoly. The first report issued by the Texas Public Utility Commission found no evidence of competition in local exchange. Texas Public Utility Commission, *Status of Competition in Long Distance and Local Telecommunications Markets in Texas* (January 15, 1989), 42. In a second study Edythe Miller reports that using the concept of a minimum efficient market share (MEMS) that the intraexchange market appears to be a monopoly with a MEM score of 100 percent. The MEM for intraLATA markets, was estimated to be from 80 percent to 100 percent. Edythe Miller, "Market Structure and Pricing Issues in Local Service Telecommunications Markets," paper presented at the Symposium on Competition and the Regulation of Telecommunications Services in the District of Columbia, (October 6, 1988), 13. The third study was a survey of 371 experts conducted by the California Public Utilities Commission revealing a strong consensus that there was no competition in the local arena in 1986 or likely to be any by 1991. California Public Utilities Commission, Policy and Planning Division, *Competition in Local Telecommunications: A Report to the Legislature* (May, 1987), 48. The fourth comes from comments filed in FCC Docket 87-313, by the U.S. Department of Justice that "The Department sees no evidence at present that local exchange telecommunications is not a natural monopoly." "Saying LECs Are 'Virtual Monopolists', Justice

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skimming has occurred in the local market, most of this has been for services that do not require universal access through the public switched network.

The LCA market's monopoly structure permits changing the LCA boundaries in a way that may not be possible in a competitive market. When an EAS request is accepted by a commission, the LEC is ordered to change the service (tariff), a change that may or may not require significant changes in the facilities network. The LEC is generally held harmless in implementing the commission order as it recovers incurred compliance costs. The costs are recovered in commission-approved tariffs that generally either spread compliance and implementation costs over the entire local service territory or permit cost recovery through the traffic stimulation brought on by (effectively) lower rates.[21] In a competitive telecommunications market, a significant number of customers may not want the ability to call an EAS area and would switch to a telephone company offering a lower price because it did not include EAS service in its basic price. In a monopoly situation, the LEC is largely protected from this type of risk, whereas in a competitive market such decisions entail some degree of risk.

The second feature, which is discussed in more detail elsewhere in this report, is the impact the definition of the LCA boundary has on the development and sustainability of intraLATA toll competition. Said simply, each call or potential call converted for intraLATA toll to local service by

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Antitrust Division Advises FCC to Scrap LEC Price Proposal; Department Believes Current ROR Regulation Should be Modified," *Telecommunications Reports* (July 24, 1989): 5. The fifth study concludes that while there are resellers of local exchange company services, that except for certain specialized services"...the local exchange company remains the only provider of switched local exchange service." Florida Public Service Commission, *Competition in the Telecommunications Industry in Florida* (Tallahassee, Florida, 1989).

Wenders offers a counter view and argues that local service can be deregulated if entry prohibitions are dropped and cost-based pricing prevails. John T. Wenders, *The Economics of Telecommunications* (Cambridge, Massachusetts: Ballinger Publishing Co., 1987), 231.

[21] Other cost-recovery methods exist and include adjustments to the allowed rate of return, changes in depreciation rates, accelerated deregulation of services requested to be deregulated by the LEC, and modifications to other regulated tariffs.

an EAS-modified LCA is one less call available for non-LEC telephone companies offering intraLATA toll service. The third feature is the different interests the plain-old telephone service (POTS), "plain-vanilla" customers of a LEC may have versus the "feature-rich" needs of the customers of enhanced services providers. By definition, a POTS customer is not as dependent upon telecommunications services as a "high-tech" customer or the ESP provider. POTS customers traditionally (and no publicly available evidence exists to support a change in this) make mostly local calls and accept paying a premium rate for their less frequently made toll calls.[22] For an ESP, however, the addition of a distance-sensitive distinction between local and toll calls means that the service it wishes to sell to adjacent regions is more expensive than would otherwise be the case. This "added" expense translates, they feel, into higher prices in a developing ESP market that has a relatively elastic and/or uncertain demand.

For both features two and three, a wide array of standard regulatory and economic concepts and techniques exist to examine the issues raised. This occurs, in part, because the competitive and market-structure issues therein have been examined in other contexts using these tools. Unfortunately, a clear and unambiguous consensus does not exist regarding the "correct" answer to be derived from the proper application of these tools. Said another way, one regulator's view of the evidence needed to conclude that competition exists is likely to differ significantly from another regulator's view. The important point, however, is that LCA markets are strong and sustainable in the near-to medium-term time period and that the structure, function, and behavior of the LCA market will influence the development of other telecommunications markets.

An understanding of the LCA market can be gained by using the services, facilities, and usage network concepts developed earlier to examine the sustainability of the LCA as a market. The local calling area can be modified by the following actions:

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[22] It is reported that POTS calling nationally represents approximately 90 percent of the total number of telephone calls made by subscribers. National Telecommunications and Information Administration, *NTIA Telecom 2000: Charting the Course for a New Century*, (U.S. Department of Commerce: Washington, D.C., 1988), 204.

* The service network can be changed by the commission to include a larger or smaller area or set of service components.

* The physical facilities could be changed by the utility to include, for instance, switching capable of handling more customers at a lower unit cost than the previous switch, thus making the expansion of the existing LCA service area cost-justified.

* Due to faster than expected demographic shifts or changes in local economic development, LCA calling patterns may shift to include areas just outside the LCA boundary, thus causing changes in the usage network.

In the first instance the LCA market is changed by the commission acting according to its statutory powers and established rules and procedures. This perspective reaffirms the principle that the LCA market is defined by the commission. In the second example, the change in facilities is the traditional domain of the utility. Commissions, of course, retain oversight and determine cost recovery for investments and expenses but tend to let the utility decide specific facilities deployment instances. However, in this example, a more efficient technology allows (or requires) the utility to seek an expansion of the LCA--that is, it asks the commission to redefine the LCA--to recover its costs and to offer its customers the cost-saving benefits accruing from its investment in upgraded facilities.

The third instance initially is in the domain of the customer, but is activated in one of two ways. The first is the utility's monitoring of actual and forecasted shifts in calling patterns and the utility's decision about how to respond to the shifts. The response could range from continued monitoring to changing facilities deployment schedules to seeking permission from the commission to offer new services. The second alternative response is the petitioning of the commission by customers seeking a new service. In either case the spark or motive for a change may be with the commission, or

the utility, or the ratepayer. But changing the LCA market boundary can only be done administratively by the commission.

Unlike unregulated markets that are determined by measuring the net pattern of individual buying and selling decisions, the LCA market is clearly determined by the government, in this case represented by the commission. The commission presumably seeks to identify the best boundary for the LCA, but often must do so on the basis of something other than the observed calling patterns, such as the use of a political boundary. An LCA market may not be economically sustainable (if deregulated and competition occurs) if the observations were faulty or the constraints faced by the commission were unrepresentative of the local calling needs of ratepayers. Under regulation and monopoly provisioning of local telecommunications services, however, it would appear that LCA markets are sustainable.[23]

But just as the LCA market has been created by the commission it can also be eliminated or modified by a commission. If a commission decides, for example, that sufficient competition could exist at the local level it may, as allowed in its rules, eliminate the monopoly franchise. If no transition rules were established, it is unknown whether customers would choose the same LCA boundaries if given a choice by competing telephone companies. Unlike other economic markets derived from observed behavior, LCAs are artificial markets and may not be sustainable absent regulatory enforcement. Given the low probability of LCA market deregulation in the near future, the lesson here is that the LCA market is a real and sustainable market.

Conclusion

The difficulties presented above do not mean that local calling area boundaries are defined as a result of an arbitrary or capricious process. State commissions across all issues they address act in a quasijudicial

[23] Regulators in the current era of deregulation have continued to support the provisioning of local service by LEC monopolies in large part because of the natural monopoly characteristics of the local loop portion of the public switched network.

manner where the administrative discretion they exercise is bounded by state laws, court decisions, and other publicly available rules adopted by the commission. It is not unusual for a utility or other party before a commission to seek judicial relief from any commission action thought to exceed these constraints. Awareness of this avenue of relief affects the scope and substance of commission decisions, particularly when it involves an issue area such as setting the boundaries, terms, and conditions for local calling service.

Instead, the process by which commissions reach LCA decisions is best described as a qualitative decision-making process that tries to draw LCA boundaries in a way that optimizes the achievement of a number of potentially conflicting regulatory objectives. Thus, a simple optimization statistical model, such as the facilities-driven model examined previously, is not powerful enough to identify optimal boundaries by itself because of the model's inability to handle discrete and noncontinuous variables.[24] The qualitative decision-making process, however, easily fits in the basic quasijudicial mode of commission decision-making. The qualitative aspect means that a wider range of objectives is considered than is generally possible using current statistical methods.[25] It also means that the importance of each objective (or variable used to measure the objective) may change in different situations. Thus a commission may distinguish between LCA competition and intraLATA competition and deny an EAS request because of its negative impact on the intraLATA market. In another situation, the importance of protecting its monopoly LEC from competition may prevail.

The community-of-interest concept contains a cluster of objectives that commissions seek to maximize qualitatively. The problem with using the COI concept occurs because it is so broad and encompassing a concept that it does not permit easy measurement by means of, say, a turnkey computer model.

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[24] Examples of discrete and/or noncontinuous variables include political variables, 911-type concerns, economic development, and technological change.

[25] It is theoretically possible that a computer-based expert decision system could be constructed that used the same set of variables as commissioners and applied the same decision rules. Such an expert system has not yet been designed and the likelihood of such a system being implemented is extremely low in the near-to medium-term. Robert G. Bowerman and David E. Glover, *Putting Expert Systems in Place* (New York: Van Nostrand Reinhold Company, 1988).

Some commissions have, however, established decision rules or standards about calling volumes and patterns of calling that can be used to determine local calling area boundaries. But these measures do not cover the same wide range of objectives--such as economic development--as may be included in the community-of-interest concept. Chapter four presents a framework that examines a wide range of factors that affect the definition of and future changes in the LCA. It also analyzes the impact that the LCA definition has on other telecommunications regulatory issues, such as the LEC revenue requirement.

CHAPTER FOUR

FACTORS AFFECTING THE DEFINITION OF THE LOCAL CALLING AREA

Introduction

To the casual observer the definition of the correct local calling area is an issue that seems only to appear on the regulatory docket when a petition for extended area service occurs. This perception has some clear underlying validity, as little direct coverage on LCAs occurs in regulatory texts, other than as part of the ongoing separations debate.[1] In actuality, the local calling area concept has exerted a persistent and pervasive effect on most telecommunications regulatory issues and has been affected, in turn, by the resolution of other regulatory issues.[2]

In figure 4-1, the factors and policies that affect and are affected by the definition of the local calling area are depicted in an institutional setting.[3] The primary emphasis of the analysis contained in this chapter is on the factors and policies depicted in figure 4-1. The institutional

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[1] Even examination of the territorial franchise agreement is typically focused on terms and conditions of service, rather than on an explication of the concepts and procedures used to assign service territories. Franchise border assignments tend to be of longer duration than local calling area boundaries and, so, may not furnish useful analogies to assist in analysis of LCA.

[2] Just as the Bell System and LEC tariffs made distinctions between local and toll rates, so too did network designers, cost accountants, lawmakers, and regulators. As the public switch network is at its heart a shared-use network, and as the local portion constituted the largest single component, nearly all economic, engineering, and regulatory decision-making incorporated the needs and features of the local system into their activities. The local calling area concept was a central feature that was included either explicitly or implicitly in the above analyses and regulatory policy-making processes.

[3] Only the most salient factors and variables associated with the local calling area concept are depicted.

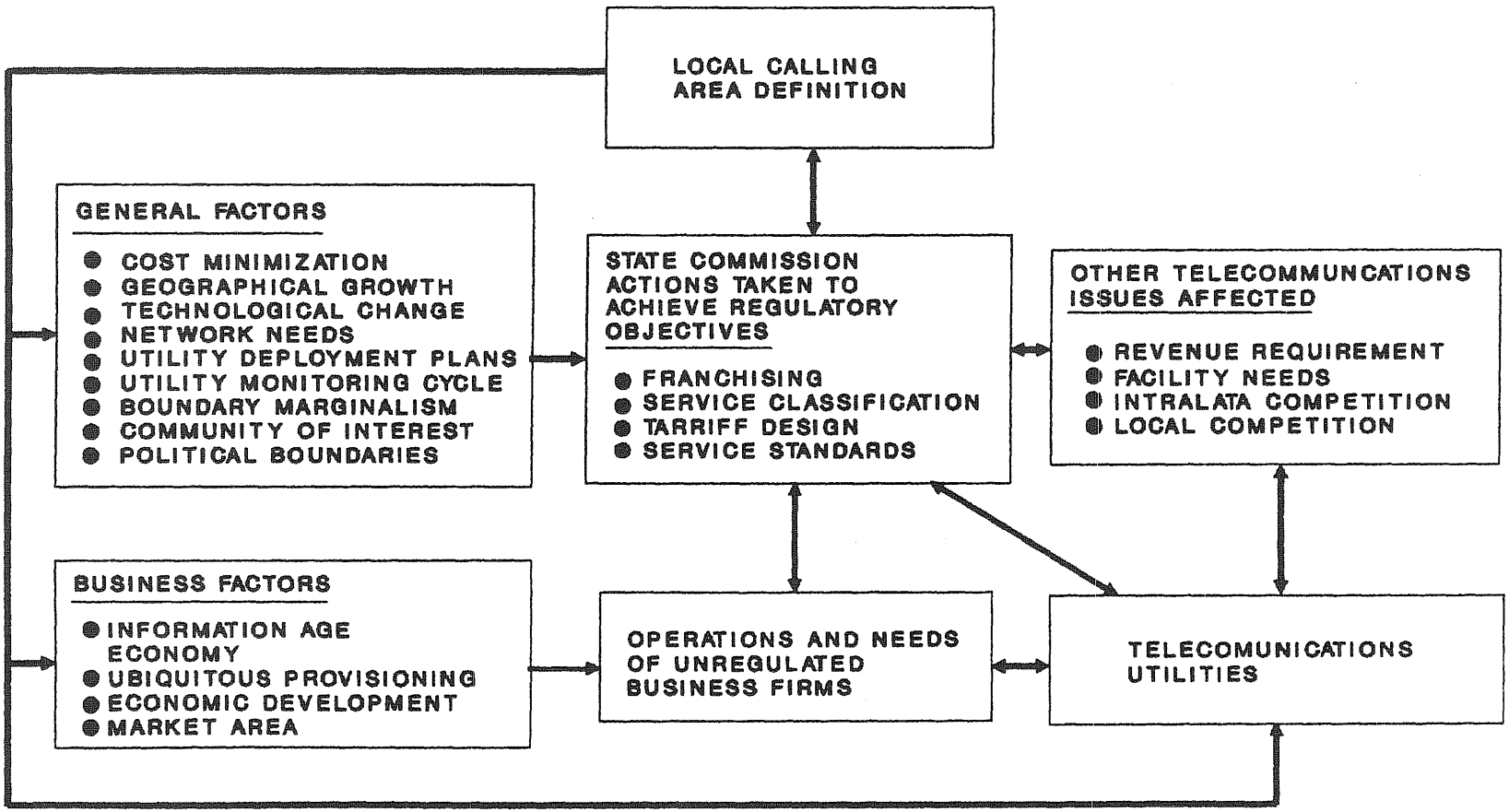

Fig. 4-1. Illustration of factors affecting and being affected by the definition of the local calling area

context--the actions by the commission, business firms, and the local telecommunications utility--will be examined only secondarily as the focus of the chapter is on defining the LCA concept.

Another point to note is that most of the relationships are shown as interactive, or two-way. For example, state commissions both define the LCA and are affected in their subsequent decision making by the definitions they have chosen. The interactive and unidirectional changes shown are a graphical affirmation of the change over time that has occurred (and may continue to occur) in the definition of the local calling area.

Factors Affecting the Local Calling Area Concept

The first set of factors shown in figure 4-1 are general factors that affect the definition of the local calling area. In this category no distinctions are needed between residential and business users of the public network. These factors are traditionally used in a commission's qualitative decision-making process. The weight or importance of each of these general factors has changed over time. Unlike business factors, these general factors are shown as having a direct impact on commission actions. Thus, when a commission is provided with information about changes in geographical growth it acts (say, via a tariff change) to ensure that its regulatory objectives are met. The actual transmission of information to the commission may be undertaken by the utility, ratepayers, consultants, or by commission staff. The information may or may not initially be part of a formal hearing; however, if used to modify an LCA, this will necessarily occur in a formal regulatory proceeding.

The second set is comprised of business factors that just affect businesses, which then petition the commission for favorable action. Because business services are such an important revenue stream for local operating companies, business firms and LECs directly interact with each other in a buyer and seller relationship. The economic development needs of an area adjacent to an LCA and with which a significant number of firms conduct business, may cause a coalition of business firms to seek a redefinition of the LCA. Whereas a utility traditionally may have tended to oppose these requests because profitable short-haul toll routes were lost,

LECs may now increasingly view the opportunity to sell additional (and often wholly or partially deregulated) business services as outweighing potential short-term losses. A business and LEC coalition, then, could be expected to appear before the commission.

General Factors

Nine general factors are shown in figure 4-1 and are described below. Each factor reflects either a general social, political, or economic trend, or an action by a telephone utility. Unlike other needs of the LECs (represented elsewhere in figure 4-1), these utility operational needs are technical and incremental in nature, such as ensuring that quality of service needs are met.

Cost Minimization

The economic and engineering heart of the local calling area concept is the idea that local services have a different cost configuration than other services, and that a geographical boundary exists (at least in principle) that once identified, where the cost of service within the LCA boundary is less than it would otherwise be if one more geographical increment were added. Calculating the boundary is difficult because of the problems associated with the validity of cost data available, the fill factor used, the vintage of the equipment available, and the use of noneconomic and nonengineering concepts--such as community of interest--to define LCA boundaries. The validity of the cost data is an element affecting all cost calculations and is not discussed any further other than as a precaution that different cost allocations would necessarily result in different LCA boundaries. The calculation of a cost-minimization boundary is influenced by the analyst's treatment of the fill factor. Normally new equipment is installed before the traffic volume has reached some rated capacity. The planner uses a forecast to ascertain how many years it will take for traffic volume to reach the rated capacity for the specific piece of equipment. This calculation becomes important when costs are assigned and revenue requirements are determined. If a longer fill period is chosen, then the

contribution to the cost of local service will be lower and will help cause the LCA boundary to be drawn differently than if a shorter fill period is used.

As will be examined below in more detail, the vintage of the facilities and the use of, say, stipulated political boundaries will directly affect the calculation of the optimal cost-minimization boundary. Both are powerful factors influencing a commission's definition of the LCA. An additional consideration for commissions is the fact that changes in technology, supply, and demand occur with regularity and allow opportunities for new cost-minimizing LCA boundaries.

Geographical Growth, Community of Interest, and Political Boundaries

Unlike state boundaries and LATA boundaries, local calling area boundaries have a history of change. State boundaries do not change because they serve a constitutional purpose larger than telecommunications regulation. LATA boundaries have stability because no easy mechanism exists for changing them and because no significant demand has arisen across the various stakeholders for their comprehensive adjustment.[4]

LCA boundaries, as already noted, have generally expanded over time to accommodate geographical growth, changes in community of interest, and modifications in political boundaries. LCA boundaries have and will continue to change as commissions design local boundaries that minimize cost and maximize the achievement of other regulatory goals. Expanding an LCA to meet regional emergency service access needs is an example of a commission's response to a community-of-interest factor.

[4] It is interesting to note that 24 respondents to the NARUC EAS survey indicated some concern about the current boundaries of LATAs with respect to EAS. Gross, et al., *Extended Area Service Results*, 46.

Expansion has been, in part, a function of America's growing urbanization.[5] As cities and their increasingly urbanized peripheries expanded, so too did the local calling area. The continued expansion of LCA boundaries due to urbanization may be slowing as some parts of the country become completely urbanized.[6] Political boundaries and other community-of-interest elements function as benchmarks a commission can employ in deciding on the need to change LCA boundaries.

Technological Change, Utility Deployment Plans, and the Utility Monitoring Cycle

Changes in switching and transmission technology and in the power and location of intelligence in the network may cause commissions to consider changes in the LCA. Most often the need for these types of changes is brought forward by the LEC for the commission's approval or disapproval. Changes in telecommunications technology are investigated by the LEC and if appropriate are included in the LEC modernization plan. As LECs "prove-in" equipment site by site, the utility develops a deployment plan based on its forecast of changes in demand. LECs use their monitoring cycle to ascertain if sites are ready and to assure service quality standards throughout the network. For this cluster of factors the utility proposes or makes changes. The commission in various ways ratifies or rejects the changes by accepting or denying inclusion of an expense into revenue requirement calculations.

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[5] Because local calling areas tend to follow the expansion of metropolitan urban areas, it should be expected that LCAs will continue to grow in the future. While no good measures are easily available to gauge LCA growth, one measure of metropolitan growth is readily available. SMSAs increased from 1970 to 1980 with 69 new SMSAs and the expansion of 101 of the 247 SMSAs in existance in 1970. Taken together, these data point to the continuing urbanization of more and more geographical areas and to the growth in most existing metropolitan areas. U.S. Bureau of Census, n.d. p. 45 and Carl Haub, "The Last Metro Definition? *Population Today* 13 no. 11, (November, 1988): 6-8.

[6] Future technological changes may make it economically feasible to combine large adjacent urban areas into one large local exchange. The discussion here is centered only on the impetus due to urbanization. Other factors such as technology should be expected to influence the impact of the urbanization factor.

Modernization

New technology is introduced first in the areas of highest traffic volume.[7] The highest areas of concentration are high-volume toll routes and high-volume metropolitan calling areas. Modernization allows current services to be provided at a lower unit cost, and/or new services to be furnished that previously were unavailable due to limitations in the older technology.[8] Due to the incremental nature of the deployment cycle (where each installation has to be justified individually) and the greater cost savings possible on high-volume routes or areas, toll routes and large metropolitan calling areas are usually the first to receive modernized facilities.[9] Not surprisingly, in an area served by one large metropolitan calling area and several adjacent smaller local calling areas, subscribers in the larger area tend to be able to purchase new services before subscribers in the outlying areas.[10]

The difference in deployment and the higher price paid by adjacent customers to access services available in the larger local calling area may be the basis of a request of an EAS petitioner. Here, utility and commission-approved planning, modernization, and deployment criteria are seen by the EAS petitioner as insufficient to meet the service needs and

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[7] One significant exception to this occurs in small, nonurban telephone utilities that are recipients of Rural Electrification Administration (REA) low-cost loans. These utilities are usually required by REA to invest in state-of-the-art facilities. Thus, small telephone companies may have 100 percent digital switching (for their only switch), when RBHCs may be served by a hybrid combination analog and digital switching.

[8] See Raymond Lawton, *Telecommunications Modernization: Issues and Approaches for Regulators* (Columbus, Ohio: The National Regulatory Research Institute, 1988); J.W. Wilson and Associates, *Who Pays for Sunk Costs?* (Columbus, Ohio: The National Regulatory Research Institute, 1988); and Nancy J. Wheatly et al., *Telecommunications Modernization: Who Pays?* (Columbus, Ohio: The National Regulatory Research Institute, 1988) for an in-depth analysis of the problem modernization poses for local exchange companies in their regulated and unregulated operations.

[9] Bolter describes the changes that have occurred in switching and transmission, showing that new technologies for switching tend to be installed first locally, before toll switching. Walter Bolter et al., *Telecommunications Policy for the 1980s* (Englewood Cliffs, New Jersey: Prentice Hall, 1982), 245-8.

[10] Private line, WATS, and regular toll options are otherwise available to access services in areas other than the base calling area.

cost-minimization interests of customers in outlying areas. As the digital switches and glass cable may be less distance-sensitive the difficulty in setting service standards may increase as more facilities are modernized.

New technologies may make it even more difficult to segregate local calling areas from other geographical areas.[11] For example, Tich [12] notes that LECs using Signal System Seven (SS7) may extend central office-based services, particularly Centrex, to more than one exchange area within a LATA. ESPs and customers that desired these or other similar feature-rich services may be opposed to distance charges in general and may tend to oppose distance charges that seem unduly arbitrary, such as those based on political boundaries.

Indeed, much of the logic underlying the geodesic telecommunications network envisioned by Huber has at its core the idea of using the lowest tier of the traditional telecommunications structure to decentralize switching functions away from LECs to any other switch owner.[13] These switch owners, assuming they offer themselves as public or common carriers, may not have the interest, incentive, or ability to maintain traditional LCA boundary distinctions.

Diffusion of Intelligence

The diffusion of intelligence in the network (especially among users) directly affects the pattern of traffic use. In figure 4-2 a simple network is illustrated. This network has a pair of central offices, two traffic concentrators, one ESP, and two customers. In a hierarchical network based

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[11] For a comprehensive review of the impact of fiber optic technologies on the local network see Bethesda Research Institute, *Fiber Optic Technologies* (Bethesda, Maryland: Bethesda Research Institute, December 30, 1988); and also Jeffrey Rohlfs et al., "Miles to Go: The Need for Additional Reforms in Capital Recovery Methods," paper presented at The National Economic Research Associates, Inc. Telecommunications in a Competitive Environment, Scottsdale, Arizona, April 12-15, 1989.

[12] Steven Tich, "The Pipe and the Protocol," *Communications Week* (June 6, 1988): 7.

[13] Peter W. Huber, *The Geodesic Network: 1987 Report on Competition in the Telephone Industry* (U.S. Department of Justice: Washington, D.C., U.S. Government Printing Office, January, 1987).

on LECs, the path for a call from D to G would traditionally be DCBEFG. If the right kind of intelligence exists at customer D's location, a new path could be DCFG. This decentralized, geodesic-type path could contribute to stranding some of the LEC investment in central offices B and E. The DCFG path is likely to be attractive only if the cost of the unused portion of the B and E central offices is not assigned to the CF path. An LEC, armed with the correct software, also could act to provide the DCFG short route.

The underlying physical facilities network directly affects the choices available to customers D and G. If link CF does not exist, or if concentrators C and F lack the requisite ability to perform complex switching, or if fewer concentrators are used, then the switching intelligence of customer D will be underutilized and may not have a significant impact on the public switched network.

Imagine in figure 4-2 that each local calling area had one central office. Should a call routed along DCFG pay the LEC the same price as a DCBEFG-routed call? What would occur if customer G wanted to purchase services from the ESP? Traditionally the routing would be ABEFG. However, two interesting tensions immediately appear.

First, customer D is able (assuming some form of toll charge exists) to obtain an apparently identical service from the ESP at a lower monthly rate than customer G. Second, the LEC owning central office B may decide to offer a better rate for an ABCFG path, thus offering cost savings to A and G and stranding some of the other LEC's investment in office E. To the ESP and customer G the better rate helps reduce the difference between what customers D and G pay; customer D is no worse off and even may benefit from the cost contribution made by the increased use of office B's network facilities.[14]

The diffusion of intelligence increases the opportunity for all switch owners and users (under certain conditions) to develop their own local calling areas. Continuation of this trend will make the definition of a local calling area even more difficult and arbitrary than under the traditional, hierarchical telecommunications network.

[14] Barring any regulatory or institutional impediments, one would expect such an arrangement to be short-term as central office E would demand more compensation for its F concentrator.

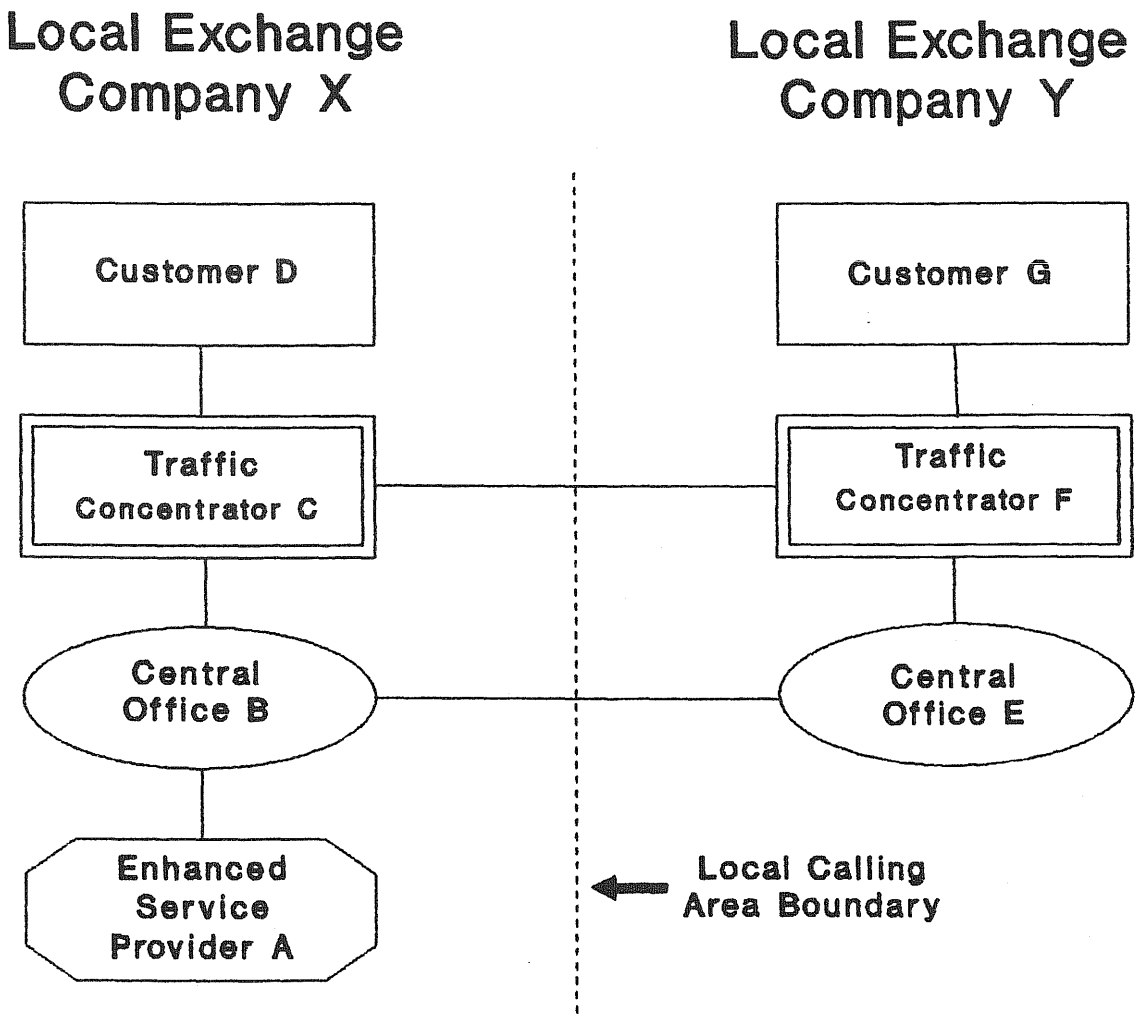

Fig. 4-2. Illustration of impact of intelligence upon traffic routing.

The cost of decentralized switching,[15] for example, may change the underlying cost of serving an outlying area such that excluding the outlying area from the base LCA is not economically justified, and/or it might be economically efficient to remove an area from the current LCA and combine it with the outlying area. The empirical issue that needs to be settled on a case-by-case basis, of course, is whether nonutility switching is cheaper and as reliable as LEC switching, and if this difference would affect the definition of a particular calling area. However, it should be expected that the issue will arise in the future.

A second factor related to the decentralization of network intelligence is the concern that absent any regulatory constraints or preexisting boundaries, consumers might choose a combination of services and geographical locations different from those currently available. If a significant number of customers migrate to a different LCA, then the price of LCA service and the boundaries of the original LCA may no longer be sustainable.

A third cost factor is the traditional change over time that has resulted in larger capacity and in lower adjusted unit costs for telecommunications services. Taken as a whole, the telecommunications industry is an industry with a declining cost over time.[16] Accordingly it should be expected that the addition of a switch and transmission system that can serve more customers at lower cost should cause the underlying economics of the LCA to change in a way that encourages the expansion of LCA boundaries.[17] In this situation the utility, rather than the outlying customers, may be expected to take the lead in urging a redefinition of the

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[15] Huber, *The Geodesic Network*.

[16] It is much like its two counterpart industrial sectors--the electronics industry and the computer industry--in that costs consistently decline over time, and features available increase over time. The declining cost curve in all three industries may be masked by the consumer's purchase of more expensive "optional" features.

[17] Robert W. Crandall and Kenneth Flamm, "Technological Advance and Costs: Computers versus Communications," in *Changing the Rules: Technological Change, International Competition, and Regulation in Communications*, 13-62.

LCA.[18] Typically these tendencies may be masked by the utilities interest in other related objectives such as general tariff restructuring or other marketing goals.

Network Needs

As discussed in detail in chapter two, the public switched network's predominant characteristic is the shared use of network facilities. Engineering quality of service and traffic routing standards have developed that make this shared use transparent to customers, and minimize any degradation in service that might otherwise occur through shared use.

Accordingly, facilities in an LCA and in an adjacent area are bigger than needed for local service and short-haul toll calls alone because of the use by other services due to the cost savings that occur through the use of shared facilities. Using a facilities-based optimization analysis and ignoring the percentage allocation of all facilities in the area, the LEC boundary could be expanded as extra capacity would now be available. Similarly, changing the allocation factors for each service also will affect the location of LCA boundaries.

On the other hand, the cost of providing local service is lower than it would otherwise be because of the cost contribution made by each of the services that shares the use of local facilities. Because of the effect facilities sharing and cost contributions can have on drawing an LCA boundary, the impact of the network on the LCA has to be determined empirically and on a case-by-case basis. Analysis may reveal that an alternative tariff may result in a traffic flow that better utilizes existing facilities in a way that might either make a greater cost contribution to local services through increased use, or allow an expansion of the LCA to include adjacent areas through the cost consequences from traffic stimulation.

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[18] This should be even more pronounced if the cost per switching function and cost per channel-mile of transmission continue their rapid decline. Huber, *The Geodesic Network* and National Telecommunications and Information Administration, *NTIA Telecom 2000: Charting the Course for a New Century*.

As described in chapter two, LEC customers living just outside the LCA have an economic incentive to lower the cost of their telecommunications service by migrating from their current LCA and short-route toll service to the less expensive adjacent, larger area. When the EAS request is based upon an arbitrary boundary delineation such as the use of a political boundary rather than a cost-based or facilities-based boundary, a commission may be hard-pressed to deny the relief sought by the EAS petitioners. Indeed, it could be hypothesized that when the boundary in question is arbitrary (that is, when it is derived from a community-of-interest perspective) a commission is more likely to revise the boundary to accommodate an EAS request. In part, this may occur because the commission recognizes the political cost of defending an arbitrary boundary. It may also occur because of the recognition that the facilities used are essentially similar. Further, it reveals that the incentive provided by the economic gain to the petitioners is greater than the gain to the commission in defending an arbitrary boundary.

Business Factors

A cluster of factors is identified in figure 4-2 that affects the operations and needs of business firms. As telecommunications services have become more important to a growing number of firms, these factors will have a greater influence on the cost of producing the firm's products. To minimize these costs and to ensure needed communications features, firms have increased their interaction with the utility and the commission. Each of the factors is described below.

Transition to an Information Age Economy

If the United States economy is about to enter the information age,[19] then EAS and local calling area definitions may change significantly and qualitatively.[20] Currently, the dominant use of the public switched network is voice traffic for business and nonbusiness purposes. In an information age economy the volume and extent of communications will increase and the transmissions will include a significant increase in data and video.

An inspection of the literature on new telecommunications services actually available or expected to be available to consumers reveals a continuation of the historical pattern of a business-led and dominated service deployment. By way of example, table 4-1 illustrates that the users of telephone services can be characterized as being either the initiators or the recipients of communications from the public switched network and are a residential, business, or government user. Each dyad is assigned a number that then is used in table 4-2.

Characterizing future demand by initiator and recipient allows the nature of the communication relationship to be examined. Business applications occur in dyads 2, 4, 5, 6, and 8. In dyad 2, a residential user calls a business and, for example, electronically transfers funds. In

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[19] A number of articles have been written describing the characteristics of an information age economy such as "Looking Ahead", *Fortune* (July 1988); and National Telecommunications and Information Administration, *NTIA Telecom 2000*. See also Thomas J. Housel and William E. Darden III, *Introduction to Telecommunications: The Business Perspective* (Cincinnati, Ohio: Southwestern Publishing Co., 1988); Bell Atlantic, *Delivering the Promise: A Vision of Tomorrow's Communications Customers* (1989); and Richard M. Cyert and David C. Mowery, eds. *Technology and Employment: Innovation and Growth in the U.S. Economy* (Washington, D.C.: National Academy Press, 1987) for descriptions of some of the characteristics of an information age economy.

[20] Sobczak outlines how both large and small firms can achieve competitive advantages by integrating telecommunications technology into the firm's production efforts in order to improve customer value or lower product cost in an emerging information age economy. James T. Sobczak, "Competition Advantage Through Telecommunications," (unpublished paper, 1989).

Housel and Darden and Keen have identified and analyzed the strategic impact telecommunications is having on the business practices of firms. Housel and Darden, *Introduction to Telecommunications: The Business Perspective*; and Peter G.W. Keen, *Competing in Time: Using Telecommunications for Competitive Advantage* (Hagerstown, Maryland: Ballinger Publishing Company, 1988).

dyad 4, a business initiates a telemarketing call to a potential residential customer. Relationship 5 could cover a wide range of business-to-business services. In instance 6 the business may be providing computer-assisted mapping services to a governmental agency. Dyad 8 may be a government initiated call activating a time-sharing computerized data bank.

TABLE 4-1

A TYPOLOGY OF NINE DYADIC TELECOMMUNICATIONS RELATIONSHIPS
(each dyad is described by a unique number between one and nine)

		Initiator		
		Residential	Business	Government and All Other[1]
Recipient	Residential	1	4	7
	Business	2	5	8
	Government and All Other[1]	3	6	9

Source: Author's construct

[1] Includes all nonresidential and all nonbusiness users.

Of the nine possible dyadic pairs five use the public switched network to provide information services that are essentially business transactions. That is, they result in the sale and consumption of a business-produced service.

New telecommunications services that do not involve a business as one part of the communications dyad are likely to be few. In table 4-2 the nine dyadic pairs are categorized by their likely future growth. Business dyadic relationships are predicted to grow the most. The medium growth category will be government and residential pairings. It is probable that government and not-for-profit groups will use business applications, but lacking the profit motive will do so at a lower level than the business dyads. The lowest growth will be in the residential-to-residential dyad, No. 1. New

applications for this last category would be services provided over the public switched network for the purely nonbusiness use of residential customers. Call-forwarding would be an example of this service. However, cable-TV, stock monitoring services, security alarms, and news services that could be accessed by households (and therefore thought to be residential services) are actually most accurately characterized as dyadic pairs 2 or 4. In any case, business applications for new telecommunications services appear to be the norm and are likely to continue.

TABLE 4-2

A LISTING OF THE LIKELY GROWTH POTENTIAL OF TELECOMMUNICATIONS DYADS CONTAINED IN TABLE 4-1

Lowest Future Growth:	1
Medium Future Growth:	3, 7, 9
Highest Future Growth:	2, 4, 5, 6, 8

Source: Author's construct

As depicted by table 4-2, the largest increase in volume can be expected to occur among businesses. While historically a small number of business customers of the utility have been the largest customers of the utility,[21] the unequivocal entrance of the economy into the information age will mean that the largest users will use more and the current low-level business users of telecommunications services will significantly increase

[21] It is reported, for example, that 5 percent of the customers of NYNEX account for 80 percent of NYNEX revenues: Bolter, et al., *Telecommunications Policy for the 1980s*. "Dealmakers Are Burning Up the Phone Lines," *Business Week*, March 13, 1989, 138-146 reports that the revenues from the telephone companies' top 1 percent of customers nationwide is estimated to jump from 40 percent in 1984 to 55 percent in 1990.

their use of the information transmission capabilities of the public switched network.[22]

The qualitative change in use of the LEC network will be seen in the shift from a weak-to-moderate-strength, and episodic-in-occurrence series of EAS requests to a situation where EAS requests are principally driven by the profit-maximization needs of ordinary businesses, unaffiliated ESPs, RBHC-affiliated ESPs, unregulated telephone companies, and regulated telecommunications utilities. The change in the information age business practices means:

* more: video- and tele-conferencing, electronic mail and voice storage, access to a wider range of data sets and analytical software, interconnection and networking, increases in corporate communications budgets, and computer and telecommunications-based services.[23]

* less: business travel, face-to-face meetings, and paper-based communications.

While the telecommunications infrastructure has been an important factor in the national economy as well as local economies, in the information age its importance and pervasiveness will increase significantly. Accordingly, business will recognize the need for a "full-service and distance-insensitive ubiquitous telecommunications service" (FSDIUTS). An information age business requiring portal-to-portal digital switching and glass fiber cable might be precluded from selling its services

[22] The future development of the communications infrastructures will include a mix of private and regulated networks. It should be the case that in an information age economy, both private and regulated networks will be larger than they currently are. It is not known, nor is it the subject of this report, whether either type of network ownership will dominate and eliminate all other types.

[23] See E. Bryan Carne, "Telecommunications Prediction for the Year 2000," in *Datapro Management of Telecommunications* (Delran, New Jersey: McGraw-Hill, 1987): 120:101-120:105; Peter G.W. Keen, "Business Innovation Through Telecommunications," in *Datapro Management of Telecommunications* (Delran, New Jersey: McGraw-Hill, 1987): 100:101-100:113; and Rex Bowman, "Voice Processing Biz Expected to Take Off," in *Network World* 5 no. 18 (May 2, 1988): 10-11.

to an adjacent community if the requisite facilities were unavailable and perceived as too expensive. Today, when such requests are in a minority and demand is uncertain or unknown, the delay or denial of the deployment of requested facilities can occur rationally. If the information age unfolds as envisioned above, FSDIUTS will be regarded as a necessary condition for business life. Commissions could expect the telecommunications and computer sectors of the economy to form a coalition with "ordinary" businesses that require access to information age services and appear before the commission asking for FSDIUTS service.[24]

Some further insight into the business pressure possible can be obtained through a brief examination of the common model underlying open network architecture (ONA).[25] The ONA common model allows the regional Bell holding companies to disaggregate current service offerings into various pieces and to sell these pieces to enhanced services providers (ESP). The ESP may be affiliated with a subsidiary of the RBHC. ESPs also may be unaffiliated, independent business firms. The intent of ONA is for the LEC to serve in part as a common carrier for certain business services (ones composed of various combinations of the discrete pieces) and that these services be provided on a nondiscriminatory basis.

Two key features of ONA likely to affect the rate of transformation to an information age economy are the charter ONA gives to utilities to provide

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[24] Some measure of the movement toward an information age economy and the importance of the telecommunications infrastructure can be seen in the responses of over five hundred business leaders to a study by Touche Ross. Seventy-eight percent said that the telecommunications infrastructure in the U.S. was "absolutely critical" to the nation's prosperity. Interestingly, 86 percent of respondents with sales of $5 billion or more said that telecommunications infrastructure is critical. Ninety-two percent of the respondents said that effective telecommunications were critical to their everyday operations and 98 percent indicated that telecommunications would become even more important in the next decade. Joseph S. Kramer, *The Impact of Competition and the AT&T Divesture: A Survey of U.S. Business Leaders* (Washington, D.C.: The Touche Ross Monograph Series, 1989), 5.

[25] For a detailed analysis of open network architecture and its possible impacts on different services, jurisdictions, and stakeholders see Robert J. Graniere, *Implementation of Open Network Architecture: Development, Tensions, and Strategies* (Columbus, Ohio: The National Regulatory Research Institute, 1989); and Marvin Kahn, *An Analysis of the Open Network Architecture (ONA) Costing and Tariff Plans Filed by the Regional Bell Holding Companies* (Columbus, Ohio: The National Regulatory Research Institute, 1988).

certain competitive services through their ESP, and the common use independent and utility-affiliated ESPs will make of the public switched network. RBHCs are large, well-financed, and well-managed corporations whose entry into competitive telecommunications markets is likely to result in the increased availability of services and an increase in various kinds of interfirm price competition. The projected result here would be an increased demand for these services by buyers and a demand by sellers for ubiquitous and inexpensive common carriage services. The second feature is that both types of ESP rely on the utility network because, presumably, it is ubiquitous and the least-cost alternative. This second feature makes it less attractive to build alternative networks and makes the utility the clear first choice when an outlying area needs more, better, or less expensive service.

Thus, for a commission, the ONA policy initiative also may result in more frequent and better-financed requests for EAS. Viewed from a longer-term perspective, ONA may be one of a series of phases necessary for the transformation to an information age economy. Faced with such requests a commission must balance these specific business interests against a more diffuse and difficult determination of the net benefit and cost allocation to other customer classes.

Universal and Ubiquitous Service

State and federal regulators consistently have advocated policies designed to increase or ensure current levels of telephone service. Most commonly, universal service is measured by the household penetration rate, which ranges from the high 80s in some rural states to the mid-90s in some heavily urbanized states.[26] The individuals disproportionately unserved by household telephone service come from the following groups: urban poor,

[26] The FCC reports that 93.3 percent of all households in the United States have a telephone and that 1.8 million households were added to the nation's telephone system between July 1988 and July 1989. FCC, "FCC Releases Telephone Subscribership Data," *FCC News* (September 1, 1989), 1.

rural poor, institutionalized populations, short-term transients, and those who can afford telephone service but choose not to purchase it.

The universal service concept is often expressed as "universal affordable service." Unfortunately, little consensus exists as to the exact meaning of affordability: is it, for example, the willingness to pay or the ability to pay?

Recently, universal service has taken on a new connotation, namely being viewed in terms of ubiquity.[27] If affordable universal service was a concept inspired to help POTS residential and business customers, universal ubiquitous service may be best characterized as a concept whose first application will be to help the sales of advanced telecommunications services.[28] Ubiquity used in this connotation refers to the opportunity for all customers of the public switched network to access the full range of information and computer services from any portion of the network. Lacking ubiquitous access, some argue that two classes of citizens and business firms will exist. One class will be connected to a portion of the network that can provide all services (the "information-and-feature-rich" portion). These citizens and firms will prosper and grow accordingly. The second class will be deprived of access because the network is not ubiquitous in terms of its features. This class of citizens and business firms, it is argued, will be disadvantaged and will not prosper as easily as the first class or fully enjoy the fruits of the information age. Thus, if a business firm is located where the public switched network does not support broadband services, the firm would suffer because it could not purchase broadband

[27] See Entmann for a discussion of the regulatory issues associated with ubiquitous access to an intelligent telecommunications infrastructure. Robert M. Entmann, *State Telecommunications Regulation: Toward a Policy for an Intelligent Telecommunications Infrastructure* (New York: Aspen Institute for Humanistic Studies, 1989). NTIA has begun a new docket soliciting comments on whether the domestic telecommunications infrastructure meets present and future needs. National Telecommunications and Information Administration, *Comprehensive Study of the Domestic Telecommunications Infrastructure*: Docket No. 91296-9296, U.S. Department of Commerce: Washington, D.C., 1990.

[28] It is debatable whether or not POTS customers will migrate and consume these sophisticated services within a reasonable time frame. The accuracy of the forecasts of the opposing parties, however, is not the subject of this report and is not discussed further.

services it may need, and sell any of its own services that would otherwise be using broad-band technology.

The key regulatory issues surrounding the ubiquitous nature of universal service are depicted below in table 4-3. The simple categories can be used to analyze a single customer, group of customers, or an entire LEC service territory. The regulatory concerns center around the speed of deployment and the correct assignment of costs.

In the first situation depicted in table 4-3, a congruence exists between the need of a customer for ubiquitous access and the ability of the network to provide the desired access to advanced communications services. The regulatory concern here lies in ensuring that the cost of this access is fairly apportioned.

TABLE 4-3

KEY REGULATORY ISSUES ASSOCIATED WITH THE UBIQUITOUS PROVISIONING OF UNIVERSAL SERVICE AND ACCESS THROUGH THE PUBLIC SWITCHED NETWORK

		Is Access for Advanced Communications Services Desired Through the Segment of the Public Switched Network?	
		Yes	No
Does the Public Switched Network (or Segment) have the facilities necessary to provide access to advanced communications services?	Yes	Situation No. 1: Who pays?	Situation No. 2: Is deployment too rapid?
	No	Situation No. 3: Is deployment too slow?	Situation No. 4: Are deployment and demand being monitored?

Source: Author's Construct

In situations two and three the needs of the customer and the access capabilities are not congruent. In situation two, a too-rapid deployment has occurred, while in situation three the network deployment has been too slow. In situation two the regulator also has a policy dilemma about the

proper assignment of the costs associated with the construction of advanced facilities prior to the presence of sustainable customer demand.

Economic development and the commission's interest in having the utility respond to customer demand are the important policy issues in situation three. Economic development has traditionally been a secondary and poorly defined objective of regulatory telecommunications policy.[29] The intent of ubiquitous access to advanced telecommunications and computer services is to provide the infrastructure needed for the business sector. In general, commissions seem to have increasingly come to classify economic development as an important objective. Accordingly, a commission may be concerned about too slow of a deployment, such as in situation three.

In situation four the needs of the customer and the facilities network are in congruence. The regulatory concern here is one of monitoring to see if the congruence continues. The typical time pattern of demand and facilities construction has been one of short-term incongruence. That is, movement from situation four is most likely to be to situations two or three, rather than to situation one.

The definition of the local calling area and the response to requests for EAS arrangements can also be analyzed using the simple framework found in table 4-3. In general, even when an LEC decides to modernize its facilities for its entire service territory, it does so incrementally, starting first with its highest volume areas or routes. Metropolitan local calling areas are more likely to be in situations one and two and outlying adjacent areas are more likely to be in the slow deployment condition represented by situation three.

EAS requests can be viewed as occasions to review the LEC's modernization plans and deployment procedures. Ubiquitous access to advanced information services is still likely to continue to be installed and occur incrementally, however EAS petitions (when allowed) must also be taken on a case-by-case or incremental basis. In the specific instance represented by the EAS request, the utility may reevaluate its modernization

[29] Commissions have usually made supplying business services one of their primary regulatory objectives. Economic development refers to the nonfirm-specific and longer-term effort to develop or assist in the growth of whole classes of industries in a specific area.

plans and deployment efforts, and the commission may decide to reassess its existing criteria in a way that favors the ubiquitous deployment requested by the EAS petitioners. If a favorable response is made to the request, the change may still not result in changes in modernization and deployment across the LEC's entire service territory. Alternatively, the commission may decide that insufficient demand exists and reaffirm the criteria that led to the utility's decision to delay deployment of facilities capable of supporting advanced communication services in the EAS area.

Again, EAS requests seem most likely when the demand is low. Otherwise LEC monitoring and planning routines should catch most instances where additional facilities or access to facilities are justified. The problem, when it occurs, can happen when a small number of customers or a single suburban firm has a high demand, and this information when combined with the overall pattern of a larger outlying region may not be readily discernable, and a deployment response would not be thought to be economically justifiable.

If a commission has a policy of universal and ubiquitous service, then EAS requests represent an occasion where the policy evaluation and implementation questions about ubiquitous service may be raised. This would be a new feature in many EAS proceedings. EAS proceedings may be avoided somewhat by developing criteria that encourage the early consideration by the utility of outlying areas in its modernization plan and deployment procedures.

Economic Development

Commissions have always been conscious of the impact of regulatory policies on businesses in their state and businesses have traditionally acted to ensure commission sensitivity to business concerns.[30] Current

[30] A survey of the economic development policies of state utility commissions reports that utilities in thirty-six states offer commission-approved economic development rates. Dennis L. Sweatman and Larry J. Mraz, "Economic Development-Incentive Utility Rate Policies Implementation by State Utility Commission," *NRRI Quarterly Bulletin* 10 no. 3 (June 1989): 231-48.

interest in providing ubiquitous access to information services over the public switched network can also be seen as an economic development effort. The intent here is to provide the telecommunications infrastructure needed for a wide range of business firms. Many feel an inadequate telecommunications structure will hamper a state's economic development efforts. Others feel that telecommunications are not yet a significant enough cost component for businesses to justify the investment necessary to build this infrastructure.

Commissions have increasingly had a proactive rather than a reactive role in the economic development efforts of their state. For ease of exposition, because the topic is far more complex, the economic development of a state tends to have four geographical foci: metropolitan areas, suburban areas, small nonmetropolitan cities, and rural areas. The modernization plans, deployment, and site-specific "proving-in" of telecommunications facilities tend to occur in a way that favors metropolitan areas. Deployment of advanced telecommunications facilities, thus, may be "delayed" elsewhere.[31]

The above deployment pattern is influenced by the local calling area definition because of the difference between metropolitan local calling areas and other local calling areas. Metropolitan LCA tend to be large with an economic base sufficient to support a wide range of telecommunications services. Decisions by the commission about the size of the local calling area and the process for expanding the LCA through EAS requests, therefore, can have a direct impact on an area's economic development. The

[31] In its review of the status of competition in long distance and local telecommunications markets in Texas, the Commission found that "rural customers have much less ability than do urban customers to obtain the same, equivalent, or substitutable interexchange services at comparable rates, terms, and conditions." Texas Public Utility Commission, *Status of Competition in Long Distance and Local Telecommunications Markets in Texas,* (January 15, 1989), 27.

insufficient economic base of an adjacent rural area can be leveraged or increased by linking the two areas into a common local exchange.[32]

If a state does not intervene to accelerate deployment, then utilities will follow an economically rational deployment scheme (that is, "do not deploy until cost-justified"). This rule effectively favors large metropolitan areas. Only a commission, because of its cost-sharing authority, can require a utility to deploy facilities "on spec"--that is, in a way not necessarily economically rational for the utility--in order to further the state's economic development goals.[33] As economic development is proactive in nature, to the extent that telecommunications infrastructure is an element of this effort commission involvement is also necessarily proactive. Cost-sharing, either by customer class, or temporally, is the main proactive tool used by commissions when they participate in state economic development. The cost sharing, or cross-subsidization that occurs, is an ongoing regulatory problem for commissions, whether or not an economic development issue is being addressed.

Explicitly linking of EAS requests with economic development means that an externality is introduced along with the other issues normally included in commission deliberation. The underlying policy question becomes, "Does the net gain to society from accelerated deployment at rates higher than would otherwise occur offset the increased cost to the customers in the original base local calling area?" Resolution of this question is inherently difficult because most of the gains are outside the telecommunications sector, whereas all of the costs are inside. A commission with a strong pro-economic development philosophy would likely

[32] Abrahms notes that because there may be some delay in PBX suppliers providing and buyers purchasing PBX-ISDN interfaces, it appears that in some areas ISDN may initially be available only to Centrex customers. This is, again, likely to reinforce the urban-first model of telecommunications technology and services deployment. John R. Abrahms, *Manager's Guide to Centrex* (Norwood, Massachusetts: Artech House, 1988).

[33] Reference here is to deployment that occurs before the normal deployment of the utility, as most equipment is put in place before it meets its rated capacity. Other sources of funding may be available--such as low-interest loans or property tax abatements--that can increase a firm's ability to pay for an increased and sophisticated level of telecommunications services without any corresponding action by the commission.

answer the questions differently than a commission without explicit development goals.

If an EAS freeze were in effect or if a commission had strictly enforced traffic volume standards, then the role of the LCA in certain economic development efforts may be greatly reduced. In the above instance, economic development that required a modernized infrastructure would tend to follow a metropolitan LCA-first pattern. If commissions were not concerned about altering this pattern, then no LCA-based economic development issue would necessarily arise. The tendency over time, however, has been for telecommunications utilities, legislatures, governor's offices, and commissions to express an increased interest in the link between telecommunications infrastructure and economic development.[34]

Use of a Firm's Market Area for a Local Calling Area

Even though the definition of the community of interest (COI) is difficult and the end results are open to question, it is clear that state commissions often rely upon the concept when they determine the most appropriate boundaries for an area. The logic behind applying COI as a standard is directly derived from the purpose served by a telephone utility: namely to allow members of a community to communicate directly with each other by means of the public switched network. Use of calling patterns, access to emergency services, and congruence with political boundaries are three important indicators commissions may use to determine the COI.

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[34] Parker et al. analyzes and assesses the catalytic role telecommunications can play in rural economic development. Edwin B. Parker et al., *Rural America in the Information Age* (Lanham, Maryland: University Press of America, 1989). A similar theme is argued by Lehner, Bloomfield and NTIA. J. Christopher Lehner, "Rural Development at a Crossroads: The Emergence of a National Consensus" *Rural Telecommunications* 8 no. 4 (Fall 1989): 36-41; Shirley Bloomfield, "REA-A Retrospective," *Rural Telecommunications* 8 no. 4, (Fall 1989): 22-27; and in NTIA, *The NTIA Telecom 2000* report.

NARUC has recently passed a resolution recognizing the linkage between telecommunications and rural economic development and the role of the state regulatory commission in promoting efficient provisioning, *NARUC Bulletin*, "Resolution Regarding Rural Development Legislation," 5-6.

A new standard may evolve in the future definition of local calling areas, the use of a market area as a standard for determining any distance-sensitive demarkation of rates. For a business using a significant amount of telecommunications services, or for an ESP, telecommunications services must be regarded as an important, identifiable, and separate cost element incurred by a firm in the production of its product. Firms generally will attempt to lower the cost of all inputs and will focus on the most significant cost elements, particularly those elements most susceptible to cost reduction. For a telecommunications-intensive firm, telecommunications costs are a prime candidate for cost reduction. The apparent arbitrary nature of telephone rates that change on the basis of political or community-of-interest boundaries may be an easy focal point for research and lobbying efforts.

A firm interested in telecommunications cost control generally finds itself faced with one of two generic types of rate structures for what the firm may view as local calls within a LATA. The first situation is one with flat rates within the local calling area and distinct, distance-sensitive toll rates for all calls outside the LCA. Here the firm, if its market area is not identical with the LCA boundaries, finds it is paying a higher price for a service (short-toll calls to areas immediately adjacent to the LCA) that may have no significant cost basis for being different than many calls placed within the LCA.[35] The second situation is one where the local calls are distance-sensitive and where a distinct, separate tariff exists for toll calls outside the LCA. The firm in this case may have less concern about the need to purchase different services, especially if the distance-sensitive portion of toll calls is approximately proportionate to the distance component of local calls.[36]

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[35] The underlying physical facilities network needed to serve customers on one side versus another side of the LCA border are not, from the firm's point of view, significantly different enough to justify the higher rates charged in the toll tariff. Further, a firm located in the suburban area of an LCA may find that an apparent one-mile call outside the LCA costs more than a twenty-mile call within the LCA.

[36] This does not necessarily mean that the firm will abandon efforts to get a commission to reallocate costs or to design favorable tariffs, only that the need to do so may be significantly less when all rates available to the firm have a distance component.

All firms have markets that describe the "area of interest" to the firm and are roughly analogous to the community-of-interest concept. A firm, of course, may have an international, national, state, LATA, or LCA market. There is no necessary public interest in ensuring that each firm has access to a local calling area that is identical to its market. A problem may occur when the core area of the firm's market is just somewhat larger than the LCA. For instance, firms selling burglar alarm services typically view their home metropolitan area as their core market. But this may not coincide with the boundaries of the LCA. These firms may argue that the economic market is as important in defining the LCA as any of the other community-of-interest criteria used by the commission. The line of reasoning here is that just as the LCA boundaries changed over time to accommodate changes in political boundaries, so too should changes be made in LCAs to reflect legitimate changes in local markets due to changes in technology.

Irrespective of how a commission finally rules on such a requested change in the service available to a firm, the mere existence of these market-based requests may cause commissions to consider a market-based standard in addition to the other standards it employs in defining the local calling area. As the American economy moves further into the information age, more and more firms may form user coalitions designed to obtain calling areas appropriate for the markets they serve. This will occur, as noted above, because of their need to lower input prices to stimulate demand and fend off competitors.

The key issue for a commission will not be whether or not a market standard should be applied, but what the standard should be. Further, the relative weight of social, political, and market standards will have to be determined. Is it, for example, more important to have an LCA that allows access within municipal boundaries, or to have one that is bounded by the economic ties that characterize most Standard Metropolitan Statistical Areas (SMSAs)? And, how should this be paid for? How would a larger LCA affect the development of intraLATA toll competition? These are questions that will need to be answered if commissions apply a market standard.

Other Telecommunications Issues Directly Affected by the Definition of the Local Calling Area

The boundaries selected for a local calling area affect a number of other important telecommunications issues. Two of these are examined here: the affect on the development of intraLATA competition and the impact on the revenue requirement.

The Affect of the Definition of the Local Calling Area Boundary on IntraLATA Competition

The deregulation of various telephone services has transformed the telecommunications industry in a number of important ways, including the introduction of new services, the use of new technologies, and the sale and development of telecommunications services by a wide range of providers. State and federal regulatory commission policies and certain provisions of the Bell System divestiture agreement have given utilities and unregulated firms the approval needed to provide some telecommunications services on a more or less competitive basis.

A number of commissions have identified competitive services. For example, the South Dakota Commission found that cellular radio services, premise cable, inside wire, billing and collection, and interLATA new products are fully competitive; Cention and Cention-like services, interLATA MTS and WATS, and intraLATA MTS and WATS are emerging competitive; and intraLATA new products and services, local loop and recording services, and billing name and addresses are noncompetitive.[37]

The action of the Wisconsin PSC to permit various interexchange carriers to provide certain intraLATA toll telecommunications services is another example of state commission efforts to promote, where applicable, competition in LATA markets.[38] All states with two or more LATAs permit

[37] South Dakota Public Utility Commission, *Amended Decisions and Orders: Competitive Status of Telecommunications Services,* Nos. F-3742 and F-3743, June 30, 1989, 13-14.

[38] Wisconsin Public Service Commission, *Application of Various Interexchange Carriers Authority to Provide Certain IntraLATA Toll Telecommunications Services,* Docket 05-NC-100, June 29, 1989, 31.

interLATA competition, and most of these allow some form of intraLATA competition.[39] Gross et al. reports that cost and community of interest are the most frequently mentioned (thirty-nine states) criteria employed in determining when EAS should be granted.

A local exchange company faced with an environment that is increasingly competitive has six generic strategies open to it:

1. Seek reregulation of unregulated services

   No RBHC or major telecommunications carrier has advocated this course of action.

2. Offer only monopoly and/or common carrier services

   One risk-averse way to deal with competitive pressures is to offer services only in those monopoly services protected by regulatory fiat. This "common-carrier-only" strategy has been firmly rejected by all of the RBHCs based, in large part, on their concern that this would limit them to the highest-cost and lowest-return portion of the growing and profitable telecommunications market. It is unclear at this point what the regulatory response to such a strategy would be.

3. Delay the ability of the network to fully provide competitive services until RBHC subsidiaries are able successfully to compete with unregulated telephone companies or ESP

   No public statement of a RBHC or a regulatory authority supports this strategy. It is, however, a theme in proceedings such as the FCC Open Network Architecture Docket, that network services may not be provided exactly as the ESPs desire and that this discrepancy may be due in part to the desire of RBHCs to obtain a competitive advantage. State and federal regulatory policies, however, consistently have been directed toward the goal of ensuring a "level playing field" and the use of policies enforcing some form of equal and/or open network access.

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[39] Horning et al., *Evaluating Competitiveness of Telecommunications Markets: A Guide for Regulators*, 92-3; and Paul Teske, *State Telecommunications Regulation: Assessing Issues and Options in the Midst of Changing Circumstances* (New York: Aspen Institute for Humanistic Studies, 1987), 13.

4. Expand and compete aggressively in all areas permitted by regulatory commissions

This strategy is one publicly endorsed by all RBHCs. It is the counterpoint to strategy No. 2 and envisions the utility growing as the entire telecommunications market grows.

5. Expand the definition of LEC-provided local monopoly services

Here the objective would be to include services such as touchtone dialing into the definition of POTS. The interest in rural cable TV may fall under this heading, if offered on a regulated basis by LECs. The purpose of this strategy is to reduce services available for sale by potential competitors and to increase the LEC revenue stream.

6. Expand the size of the local calling area

While the evidence is not clear on this, traditionally it was believed that LECs opposed extensions of local calling areas because these extensions required the LEC to undertake special cost and traffic studies, and lose revenues from profitable toll routes. In return for the toll route revenues lost when an EAS request was granted, the utility as a whole was protected from loss by various mechanisms and generally enjoyed significant traffic stimulation from the lower net EAS rates.

In a competitive era it may be to the LECs' advantage to seek an expanded definition of the local calling area.[40] Such an expansion would trade off the risk of lost toll-route revenues forecasted due to intraLATA toll competition for the greater certainty of revenues from monopoly local services.[41] An LEC could offer flat-rate "local-calling" service or some

[40] John T. Wenders, *The Economics of Telecommunications* (Cambridge, Massachusetts: Ballinger Publishing Co., 1987), 117 views the historical LEC interest in EAS as one way of using excess earnings to provide more service rather than engaging in price reduction.

[41] The Florida Commission, to cite one example, considers the competitive implications when it evaluates the need for an alternative to toll. Florida Public Service Commission, *Competition in the Telecommunications Industry in Florida* (Tallahassee, Florida: Florida Public Service Commission, 1989), 65.

form of measured service for the entire LATA and would not face toll-route competition in these areas. Such a proposal could turn on the traditional EAS concern of whether a sufficient LATA-wide community of interest existed, although community of interest would probably have to be defined differently if a LATA-wide local calling area were envisioned. If sufficient interest existed, then the traditional post-EAS traffic stimulation could occur with a positive effect on rates and costs. In an urban and compact LATA, such a local calling area may be more likely than for a rural and large LATA.

Recently several state commissions have approved significant expansions of local calling areas in their states. Four are:

* Oregon, which has approved the designation of the Portland metropolitan area as an "EAS region" where long distance routes will be eliminated.[42]

* Tennessee, which ordered an expansion of the local calling area around certain metropolitan areas and toll-free calling to the county-seat exchange.

* California, which authorized an expansion of the LCA from eight to twelve miles and/or expanded zone-one calling to include the current zone-two calling area.[43]

* Colorado, which approved a statewide telephone calling area plan for communities serviced by U.S. West Communications.[44]

Each of these expansions in the local calling area was influenced by different factors and regulatory objectives. The common feature across all, however, was the effective expansion of the local calling area. The resulting tariffs are also different.

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[42] Oregon Public Utility Commission, *New Policies for Extended Area Service*, press release, Order 89-815, Case UM.189, June 19, 1989.

[43] California Public Utility Commission, *In the Matter of Alternative Regulatory Frameworks for Local Exchange Carriers: In the Matter of the Application of Pacific Bell (V 1001 C), a Corporation, for Authority to Increase Intrastate Rates and Charges Applicable to Telephone Services Furnished Within the State of California; Application of General Telephone Company of California (V 1002 C), a California Corporation, for Authority to Increase and/or Restructure Certain Intrastate Rates and Charges for Telephone Services; and Related Matters*, Decision 89-10-031, October 12, 1989.

[44] NARUC Bulletin, "Colorado Public Utilities Commission Approves Local Telephone Calling Areas," *NARUC Bulletin* no. 32-1989 (August 7, 1989): 22-3.

Since state and federal commissions and regulated and unregulated telephone companies have publicly announced policies favoring competition "where appropriate," it would follow that an important new criterion to add to a state commissions's EAS policy would be the "impact of EAS on competition." Here the tradeoff would be between the net benefits of competition on toll routes connecting outlying areas to the local calling area (in those states where intraLATA competition is permitted) versus the net benefits of an enlarged and possibly LATA-wide toll-free calling area.

The Impact on the Revenue Requirement

Under rate-of-return regulation a local exchange company has a commission-approved tariff designed to allow the LEC to recover its revenue requirement. The tariff is based upon a known or forecasted pattern of demand for all of the regulated telecommunications services sold by the LEC.[45] If the demand configuration changes, the LEC may under- or overrecover its revenue requirement, possibly necessitating some adjustment to the affected tariffs.

Consider a case where an LEC sold just two services: local calls and short-toll service to subscribers immediately adjacent to the local calling area. Assume further that both services were sold exactly on a cost-recovery basis and that the two services had different cost characteristics. Every expansion of the local calling area would mean that the proportion of services sold would be different and could require a tariff adjustment if revenue requirement goals were to be met.[46] A sense of the shift possible and the size of the stakes involved can be obtained by noting that local services accounted for 46 percent of LEC operating revenues (or $35.5 billion in 1986), network access accounted for 32 percent (or $26.5 billion), and toll 13.5 percent, (or $11 billion).[47]

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[45] Charles F. Phillips, *The Regulation of Public Utilities* (Arlington, Virginia: Public Utilities Reports, Inc., 1988).
[46] For purposes of exposition and simplification it is assumed that the time pattern of demand for both services is identical and that the ratemaking principles underlying each tariff do not change.
[47] U.S. Department of Commerce, *NTIA Telecom 2000*, 204-5.

Revenue requirements are front-end loaded and may function to slow innovation and minimize the incentive of utilities to undertake risky behavior. As noted above, recovery of the revenue requirement is one of the primary objectives of the tariff, but this is done on the basis of established or predicted traffic volumes for specific services. Utility forecasts of long-term demand for new services often envision that current ratepayers pick up some of the cost through the expanded revenue requirement due to increased capital expenditures. In no case does the utility voluntarily forgo recovery of the revenue requirement--or place a significant portion of its public switch modernization expenditures "below the line." Voluntary action by the utility to recover less than its full revenue requirement would raise the cost of its capital and at some level of denial would require commission oversight. However viewed, the perceived need to recover the revenue requirement appears to act as a disincentive for providing new services.

Commissions have relied on traffic stimulation (when it would increase revenues), or on cost-sharing with the base-area LCA customers to make any needed tariff adjustments. As commissions have a good ability and a wide array of standard tools to diagnose and remedy revenue requirement shortfalls, this should not be an area of great concern for regulators.

Conclusion

The definition of the local calling area is affected by a number of factors that are either brought to the commission's attention by various affected parties or are monitored by commission staff. The resulting local calling area is defined by the commission's qualitative evaluation of the following factors:

* Cost minimization
* Geographical growth
* Community of interest
* Political boundaries
* Technological change
* Utility modernization and deployment plans
* Utility monitoring and standard assurance procedures
* Network needs
* Boundary marginalism

* Ubiquitous provisioning
* Economic development
* Business needs
* Market considerations

The qualitative decision-making mode of commissions is both a virtue and a necessity as most of these thirteen factors are not easily measured as continuous or quantifiable variables. As such, they do not neatly fit in a computer program or any other monotonic analytical device. Instead, these factors are combined and recombined over time by successive commissions to define local calling areas and to determine if expansions to local calling areas are justified. At its best, this qualitative method trades off the arithmetic accuracy of single-factor boundaries for the greater validity of multifactor boundaries. Unfortunately the qualitative optimization is not always replicable or stable. Yet, unless a single-factor method for determining LCA boundaries is selected by a commission, the qualitative optimization method is likely to continue as the primary method for setting local calling area boundaries.

CHAPTER FIVE

POLICY OPTIONS FOR REGULATORS

Introduction

Rarely do commissions and telecommunications utilities have the opportunity to design or establish a local calling area from scratch. Traditionally, concern about LCA boundary definitions and optimum size occur in an incremental mode and in reference to an existing network and tariff. Historically, the most visible occasion for reconsidering an LCA happened in an extended area service (EAS) proceeding.[1] Accordingly this report has examined EAS to better understand the boundary and sizing considerations associated with LCA.

Procedural Considerations

The regulatory commission is responsible for establishing the public policy parameters under which utilities operate. To accomplish this, procedural strategies have been developed. To a large extent these developments are incremental and are guided by the experiences of the commission with prior procedures. As the commission gains experience with its established procedures and perceives difficulties or insufficiencies, adjustments are considered and implemented. Against a backdrop of a stable or slowly evolving environment, this incremental approach to procedural refinement appears to work well. However, in a rapidly changing

[1] EAS proceedings can become politicized and become the occasion for state legislative action. Diane Wells, *Minnesota Telecommunications Issues Summary*, handout (November, 1989).

environment, new considerations can be introduced which are not easily evaluated within the established procedural framework. If the change is sufficient to challenge the underlying premises, or if it introduces substantial public policy variables not previously relevant to the considerations, it may be necessary to abandon the previous procedures and institute new policies and procedures for their evaluation.

Developments in the telecommunications industry over the past few years have been dramatic, certainly raising the question of the adequacy of established procedures to address the changed environment. Procedures for defining the local calling area are but one of a group of established procedures that may require substantial review and rework as a result of these changes. In this sense the analysis of methods for examination of the local calling area procedures can exemplify the kind of analysis of the adequacy of the procedures in place for other regulatory issues.

When procedural changes are proposed or implemented, a commission can expect to encounter substantial conflict among stakeholders. Some will perceive that their interests are best served by continued exercise of the established procedures, even recognizing the limitation of that procedure to consider newly relevant information. Other stakeholders may sponsor incorporating new considerations that they believe will serve their purposes. The public interest is well served by the debate that ensues as various special interests attempt to convince the commission of the wisdom of their particular goals and preferences. Stakeholders are faced with the pace of change of telecommunications no less forcefully than the regulators. It may be as challenging for them to identify where their real interests lie as it is difficult for the commission to identify the actions appropriate to further the public interest. If the future is so uncertain as to render the individual stakeholder's assessments of its own interests unreliable, the debate among the stakeholders will be less reliable as a guide for the commission. Uncertainty in regard to the affects of regulatory action on individual stakeholders assures uncertainty in the overall affect of the actions on the overall public interest.

If the commission perceives that the level of uncertainty has risen to the point that rational policy development is hampered, then a legitimate initial objective is to reduce the uncertainty. Evidence of responses of this sort exist in efforts to define the local calling area. To the extent

that revisions in the local calling areas are possible within the established procedures and the effect of changes in calling areas is uncertain for the utilities or their customers (including vendors of other telecommunication services), the commission can reduce uncertainty by suspending the procedures that trigger the changes. Seven states have taken such a freeze-type action explicitly on EAS-type petitions, while fifteen appear to have effectively established a de facto moratorium through individual decisions.[2] Until fairly recently, sixteen states did not change local calling areas either because they had no established procedure, or because the procedures in effect maintained established calling areas. The current status, then, is that the definition of local calling areas is not "on the table" in most states.[3]

There appears to be no active, continuing, or comprehensive evaluation of the issue of optimizing the local calling area in any of the states. That may indicate that this issue is of secondary importance to other initiatives that are already underway. The stakeholders also may see a significant negative outcome from initiation of such a review, and therefore are reluctant to pursue it. Or it may simply be indicative of a silent consensus that the policy has not reached the point that the reexamination of procedures for local calling area definition from scratch is ready to be developed.

These possibilities can be classified as follows:

1) The issue is not recognized.

2) The issue is recognized, but thought subservient to other issues.

3) The issue as unique and important is recognized, but is perceived as be intractable at the current state of knowledge.

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[2] Tom Gross et al., *Extended Area Service Results* (National Association of Regulatory Utility Commissioners: Washington, D.C. 1989).

[3] Yet in a number of states EAS is on this policy agenda. In Florida, for example, there are 500 routes with non-optional two-way EAS service. All but 19 of the 284 telephone exchanges in Florida do not have traditional EAS. The Commission is looking at and has implemented other EAS alternatives. Florida Public Service Commission, *Competition in the Telecommunications Industry in Florida*, 64.

Five Alternative Regulatory Approaches

Based on the analysis of the factors affecting the definition of the local calling area found in chapters two, three, and four, it is reasonable to conclude that the importance of the LCA may increase because of the changes likely to occur in the factors that commissions have used to define the local calling area. Given that nearly all other basic components of the regulated and unregulated portions of the telecommunications industry are in some kind of transformation, the conclusion that the local calling area definition may change is not surprising.

Five alternative approaches are identified below that a commission may use in establishing, clarifying, or studying its current policy regarding local calling areas and extended area service requests. Each approach requires a different level of staff resources and involves a different mix of regulatory goals. The approaches are not necessarily mutually exclusive and may be used in combination. The five LCA approaches are:

1. Freeze commission consideration of requests for changes in existing local calling area.

2. Handle all local calling area changes on the basis of complaints received.

3. Assess the impact of proposed changes in local calling areas on commission goals regarding economic development, competition, and deregulation from a comprehensive policy-integration approach.

4. Establish the "impact on the local calling area" as a criterion to be used in other commission proceedings. An ONA proceeding would, thus, explicitly include a consideration of how an ONA tariff would affect the local calling area.

5. Establish a comprehensive set of LCA standards that accommodate future telecommunications trends.

Redesigning existing tariffs can occur under each of the five policy options.[4] Tariffs are changed for a number of reasons, and consideration of the LCA is only one of the factors. A commission can switch from a flat local rate to a measured or banded local rate, such as is used in the Chicago metropolitan area. This type of change may be more of a tariff change rather than exclusively a local calling area change.[5]

As noted earlier, commissions have used a variety of tariff structures in response to LCA requests. Some EAS areas receive flat rates, some discounted toll, and some a form of pool or toll allowance. Self-selection, where LCA customers can choose from different tariffs, is also an option

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[4] Wenders, *The Economics of Telecommunications*, 122 argues for what would, effectively, be a sixth option. He argues that the most economically efficient course of action for a commission faced with an EAS petition is to reduce toll rates to marginal cost and convert local flat rates to cost-based measured rates. He notes that this course of action tends to be politically unpopular because "... the lowering of toll prices will benefit a few people a lot and the consequent raising of local access prices will hurt a lot of people a little."

This and other tariff-based responses are not examined in detail in this report. Once a commission has a strategic plan or set of known objectives, the design of an appropriate tariff is relatively straightforward. The harder task is establishing workable objectives.

[5] Some states have introduced customer self-selection opportunities in their treatments of the extended area service and toll rate discount issues. In a self-selection situation, the customer selects the tariff and presumably does so on a cost-minimization basis. Those with a calling pattern heavily interconnected with the adjacent local calling area, for example, would be expected to favor one type of tariff. Those customers having no significant community of interest in the new calling area may favor the retention of the existing tariff. In this same sense, WATS service is a means of self-selection by business customers of redefined local calling areas.

Self-selection mechanisms can be used quite effectively. The options available will be constrained by the physical characteristics of the telephone network. Some limitations will occur because of switching and billing limitations in existing central offices. The physical deployment of the local loops which define the telephone served by a specific switch will also limit the ability to present the choices to the customers.

A self-selection policy that recovers utility company costs, permits a fair rate of return, and allows the customer to select the most favorable rate structure would allow all stakeholders to be winners. The accurate design of such a policy and set of tariffs is difficult. Every tariff change should be expected to result in changes in the calling pattern and in the revenues of the utility. Self-selection policies require iterations in order to achieve any desired equilibrium. Their primary advantage, however, lies in their ability to give customers a choice of tariffs, and reveal the local versus toll preferences of customers.

commissions can use.[6] This report does not directly address tariff design issues, as other important issues must be determined first. A commission must decide its regulatory policy objectives before it can determine the local/toll distinctions it needs in its LCA tariff. Once a commission has selected one or more of the approaches, the design of an appropriate tariff can be undertaken.

Freeze on LCA Boundary Changes

In 1989 a NARUC survey found that following a period of rapid expansion of LCA, through EAS requests that occurred in the 1950s and 1960s, the 1970s and early 1980s was a period of little EAS boundary-driven change. While twenty-five states reported having no specific rules for handling EAS requests, the remaining states reported either having rules (twenty) or having some rule under consideration (four). Most states (twenty-three), however, indicated that no EAS requests had been received in the past year. Twenty-five states reported receiving EAS requests, with thirteen indicating that they had had more than five requests.

In some instances a freeze may be used while a state is experimenting with a generic EAS tariff or set of rules. A commission may decide to freeze current LCA boundaries and not consider any EAS or other type of petitions to change the boundaries during the freeze.

A freeze is simple to implement and avoids having the commission incur administrative costs. A freeze produces little conflict as long as traffic patterns remain stable, the population and economic growth of the service territory conform to established calling areas, and utility deployment or modernization plans do not lower costs or provide new services on an areal-basis. Continued growth of urban areas, modernization, and competition are features of the current telecommunications environment that suggest that a

[6] Each tariff option is designed to recover the revenue requirement, although this may require some subsequent adjustments if significant changes in usage occur. Self-selection options work best within an LCA, but less well when options available for some customers may overlap with areas not available to all other LCA customers.

freeze is unlikely to be sustainable or to produce an equitable outcome for all users of the public switched network.

There seems to exist a de facto freeze on the contraction of LCA. Once an area is included in the base calling area, it traditionally stays with the LCA. Two aspects of this inclusion and retention principle are worth brief examination. The first is the LCA tariff and the second is the trend toward differentiated tariffs or services.

Inclusion within the geographical boundaries of a LCA traditionally meant that all customers could call all other customers under the LCA tariff, using a flat rate. A trend over time has been for commissions to consider and, as appropriate, to adopt some form of measured or metered rate structure for large metropolitan areas. The rationale for the new tariff method is that it better assigns costs than the flat-rate method.

The heart of the EAS petitioner's effort is the substitution of either flat rates for variable (toll) rates, or discounted toll rates for current and higher toll rates. In either proposed substitution, the EAS petitioners are saying they desire to achieve cost minimization through inclusion in a flat-rate LCA, or flat-rate toll EAS, or discounted toll EAS. All three discount, reduce, or eliminate the distance-sensitive effect of the existing tariff. When distance is explicitly reintroduced as a factor under metered service, some or all of the cost minimization based on the overall elimination of the distance factor may be lost. The old EAS petitioner, when tariff methods change, may be treated like any other LCA customer who wishes to make a call of X miles in length. The main difference is that the customers living just within the LCA boundary may need to make more "multi-ban" calls than customers living near the center of the LCA.

The second is the trend toward increasingly specialized tariffs or service offerings. Historically, LCA service meant all customers desired dial-tone--plain vanilla--POTS service anywhere within the LCA. Currently, demand exists for different kinds of service within the LCA. A large retailer may offer an inward WATS 800 service to its rural customers on a per-call basis, thus making their local exchange effectively a part of the retailer's LCA. Residents of the metropolitan LCA may also avail themselves of similar 800 services and temporarily become a part of an exchange located elsewhere. The likely advent of open network architecture-type services from enhanced services providers will also increase the variety of services

and "tariffs." In the future, the clear and visible cost-minimization difference that existed between old short-toll routes and LCA rates may not be as discernable. Specialized tariffs may effectively reaffirm short-toll as "just another service." In an environment where businesses and residents expect to pay different amounts for longer or shorter local calls, for burglar alarm services versus WATS service, or for Centrex versus PBX service, a tariff that provides short-haul toll may not seem as objectionable.

It seems likely to expect both expansions and changes that are effectively contractions in local calling areas. A freeze policy could be under pressure from both perspectives.

Complaint-Driven EAS Requests

Reliance on a complaint-driven EAS process may lead to reactive, episodic, and ad hoc responses by a commission. Basing commission attention on a complaint-driven policy means that some sort of failure generally must occur before explicit and direct commission action can occur. A group of customers must experience (from their perspective) a service that is too expensive or unavailable as desired, and then complain, before commission dispute-resolving mechanisms are activated.

Utilities are affected by the complaint-driven process in their monitoring and deployment activities. If the utility has deployed its facilities and monitored traffic based on a topology and traffic pattern designed to treat the EAS petitioner's area as a short-toll route, it may have to reoptimize its network if the EAS request is granted.

A reactive EAS policy may also lack congruence with other commission policies. A commission allowing or promoting intraLATA toll competition, for example, may have to amend its current EAS policy. A commission with an interest in promoting a sophisticated telecommunications infrastructure as part of its state's economic development policy would need to determine the preferred geographical pattern of deployment. For example, would the economic development interest of the state in a rural industrial park override an existing deployment that scheduled metropolitan commercial centers ahead of rural areas?

A pure complaint-driven process can be disruptive to the utility and to the commission. When an EAS complaint is filed, commission staff are temporarily assigned to gather data and (often) to provide technical assistance if the petitioners are primarily residential customers. While commissions are well suited administratively to handle complaints, EAS petitions raise issues not easily solved by reference to commission rules. In lifeline, quality-of-service, and rate-design proceedings, a commission sets general policies and implements them in specific cases. In an EAS proceeding the same level of policy guidance does not occur. Instead, principles such as cost-causation (which have greater analytical power when applied across whole classes of customers or services) are applied in an effort to determine if the substitution of one minuscule toll traffic flow for another minuscule EAS flow has cost consequences. This type of analysis may produce results having specious accuracy and dubious validity.[7]

A complaint process does, however, ensure that service needs not detected by existing standards have an opportunity to be heard. The mere existence of the EAS and other complaint-handling procedures at a commission also serve a very real psychological need on the part of ratepayers for clear access to commission decision makers.

Policy Integration Approach

One way of setting a comprehensive commission LCA policy is by assessing the impact of LCA policy upon other commission policies or objectives. This perspective sees a coherent LCA policy as one of its main objectives and "reaches out" and examines other policies or issue areas to assess impact and to ensure conformance. A typical question might be, "What is the impact of removing short-toll routes from possible inclusion in the pool of toll routes open for intraLATA competition?"

[7] Utility deployment and costing routines are necessarily designed to handle the average situation and use average cost figures in their analytical routines. Unless the EAS exactly corresponds to these averages the comparison analysis will suffer accordingly. However, if the EAS is large enough, the averages may be of sufficient accuracy.

The policy integration approach seeks to ensure that LCA policy does not hinder the commission's ability to achieve other important regulatory goals it may have. Other goals likely to be affected are economic development, competition, and deregulation. As noted earlier, if policy makers are concerned about a rural industrial park having inexpensive telephone access to an adjacent metropolitan LCA, a state's interest in rural economic development may cause a change in its LCA policy. A commission may need to reconsider its LCA policy in terms of its impact on intraLATA competition.

Using an "outreach" approach requires either individual LCA proceedings or generic LCA proceedings to consider other specified commission policies. Short-term commission administrative costs are increased in return for the (hoped for) benefit of better achieving other commission goals and better optimizing potentially conflicting commission goals. Implementation procedures likely would involve:

* Identifying distinct commission telecommunications objectives and policy-issue areas
* Examining linkages and possible conflicts
* Modifying objectives where appropriate

The underlying logic of the policy integration approach rests on the realization that the service network is dependent upon the tariff-based definition of the services, the nature of the facilities network available and projected in the short-term future, and the traffic pattern. A commission sets policies based on its regulatory objectives that affect the network from each of these three perspectives. A policy integrationist seeks to ensure that suboptimization does not occur such that LCA objectives are achieved at the disproportionate disadvantage of other objectives.

Using the LCA as a Criterion in Other Proceedings

This approach examines LCA policy only in the context of other commission proceedings. A commission ONA proceeding may reveal market demands, for example, that require changes in LCA policy. Consideration of

lifeline rates for the elderly may also require an assessment of LCA policy. The initiation lies within other policy issues, but becomes a part of a commission's LCA policy when these issues are "brought back" and considered (at least in part) from an LCA perspective.

This approach would not usually occur in the context of an LCA proceeding. Instead, a commission in the course of other hearings, rule-making, and policy research efforts specifically seeks (as a secondary objective) to determine the impact of an action on its local calling area policy. A commission policy change that allows, say, Centrex to be provided at nondistance-sensitive rates throughout a service territory has implications for the LCA. An LCA criterion-based approach would consider LCA policy in examining the change in Centrex pricing policy.

This approach has a good fit with other commission operating procedures.[8] Commissions typically open generic proceedings on an issue with a public notice of some type and include questions, potential problems, and/or criteria or objectives that must be addressed in the proceeding. Thus, in proceedings as diverse as lifeline, economic development, depreciation, or competition, specific consideration could be given to the impact of a proposed rule or change in a rule on LCA. The incremental expense of adding this consideration is likely to be low. In those instances where the incremental cost is not low, the criterion-based perspective would likely be responsible for uncovering a previously unrecognized problem. Accelerated depreciation of older (and generally smaller) switches may make redefining certain LCA necessary, for example.

A commission would not be precluded, of course, from holding LCA-only proceedings; rather it would find that most of the change in LCA policy would stem from the resolution of other regulatory issues. For example, it seems likely that some form of ONA will occur at the local level and that the ability of enhanced services providers (ESP) to repackage and sell services will have direct and indirect impacts on LCA definition. Direct

[8] The Michigan Commission, for example, may maintain or create EAS as a part of flexible regulation. Michigan Public Service Commission, *Summary of Issues Before the Michigan Public Service Commission*, handout (November 1989), 4. This kind of approach allows a commission to develop a coherent LCA and/or EAS policy without necessarily requiring separate proceedings.

impact will be on the felt need of ESP for uniform tariffs for areas larger than the LCA. Indirect impacts can occur as the economic development needs of an area conflict with what could be seen as arbitrarily drawn LCA boundaries. Resolving these issues in each different proceeding should result in a coherent commission LCA policy.

Comprehensive LCA Standards Approach

A state may set standards for its jurisdictional utilities to follow in monitoring and deployment practices that by themselves trigger LCA expansions, whether from EAS requests or some other change or trend. Unless a complaint process exists only for political or cosmetic purposes--and thus may be in danger of having too low a grievance threshold--the existence of complaining petitioners is some evidence that the current standards may not be sufficient or are not being implemented properly.[9]

A comprehensive-standards approach is driven by usage, which in turn may cause changes in tariffed services and in the physical facilities network. Consider the case where 70 percent of the customers in an adjacent exchange make five calls a month to the base local calling area. If this calling volume crosses the commission-approved exchange boundary standard, then the boundaries of the adjacent exchange will be modified nearly automatically to conform to the established regulatory standard. Commissions have a range of tariffed services that they can use for the EAS customers. These choices range from extending the existing LCA flat, measured, or metered rate to the adjacent EAS area, to discounted inward

[9] The relevant regulatory policy issue has two components. The first lies in determining whether the expressed interests of the EAS petitioners accurately represent the wishes or calling practices of (1) the majority of the customers of the outlying exchange of the petitioners, and (2) the preferences of the customers residing in the base local calling area. The second issue, which is activated usually after clear customer preferences have been established, is determining the best services network that fits with the existing facilities network and traffic usage network. This second effort necessarily focuses on costing and pricing analyses and the establishment of quality-of-service standards.

and/or outward toll rates, to calling discount plans based on average number of EAS-type calls.

Depending in part upon the service selected by the commission, the LECs' physical facilities network may have to be modified. Different modifications may be necessary to suit different EAS services. Less modification, for example, would occur for a discounted toll service than for a flat service. This is because an allocated portion of existing toll lines and facilities are being transformed to different service categories. This requires expenditures and reallocations by the LEC.

Besides changes necessary to accommodate the new service offering, the facilities network may need changes due to forecasted changes in usage due to the new EAS tariff and/or the growth pattern in the EAS area, and the need to meet other commission and utility quality-of-service standards. The first change illustrates the impact of growth, while the second shows the need for investment to ensure reliable service.

The LCA standards approach has several advantages. First, it provides a working definition of a local calling area, saying, in effect, that adjacent areas shall be included in the base LCA whenever a calling threshold standard is passed. Second, unless procedural appeals or special hearings are incorporated into the standard, the approach is automatic and should require less commission oversight than other approaches. Third, because such a standard approach is traffic-driven, it does not matter whether the impetus is the result of competition, modernization, or changes in demographics. The neutrality of this approach has the advantage of being explicit and automatic and the disadvantage of possibly being inappropriately applied under certain circumstances. It is possible, for instance, to imagine a situation where an intraLATA route may be suitable for competition from other carriers, but may become protected from competition by its automatic inclusion in the LCA of the LEC. Conversely, the commission's economic development goals may be thwarted when the calling pattern from an adjacent area targeted for development falls below the threshold standard for inclusion in the base LCA, and results in rates that are viewed as too high by development officials and business firms. Other disadvantages of the standards approach are that it places the commission and the utility in a reactive mode (in certain instances), it may not eliminate the need for an EAS petition procedure, and it may be in conflict

with the goal of having all inhabitants of a municipality able to reach each other with a local call. The reactive-mode problem occurs because action does not happen until after the traffic pattern threshold is passed. This problem can be reduced by (and this is a standard utility practice) allowing forecasts of growth to be incorporated into the commission-approved portion of a utility's monitoring and deployment procedures.[10]

The standards approach may reduce but may not eliminate the need for a customer EAS complaint procedure. If the standard requires "large" shifts in usage, then EAS petitioners may find the threshold too high. They still may need a complaint mechanism. If the standard is too low, there may be few EAS complaints, but this could occur at the expense of creating a suboptimal calling area, and by weakening the utility's ability to achieve cost-minimization goals. The third disadvantage, namely the inability to ensure congruence with political boundaries, is largely irreconcilable with standard cost and engineering optimization principles, as LCA boundaries have nearly always been adjusted to follow municipal political boundaries.

Future Development of the Local Portion of the Public Switched Network from the Services, Facilities, and Usage Network Perspectives

In choosing an approach for defining the local calling area the state commission may be at an advantage by considering the LCA issue in the context of the developments and evolution of the telecommunications system. The model for the system incorporating the facilities, usage, and services networks can be a useful tool for organizing such an analysis. Examination of local calling area policy options within the same framework will clarify the relevance of the expectations across a broad range of issues. The following sections illustrate such an analytical effort. Primary

[10] As noted earlier, commissions and utilities may differ as to the input, analytical method, and output of a particular forecasting technique. Use of forecasted data with an LCA traffic standard would work best where the commission and the utility were in agreement on the forecasting model.

telecommunications issues are identified, set into the model, and future developments that may influence local calling area decisions are specified. The reader may add issues or interpret those listed differently, as conclusions are subject to challenge. The purpose of the exercise is not to prove that any one conclusion is superior to all others, but rather to demonstrate a robust means for considering the wide range of factors with actual or potential significance in defining local calling areas.

The User and the Usage Network

Universal and Ubiquitous Service

The concept of universal service will continue to expand. The type of telecommunications usage will depend upon the type of access users have--some of these will require current state-of-the-art telecommunications capability. While advancements and enhancements will continue to sweep the telecommunications industry, the level of service will necessarily be raised for all. If society becomes more telecommunications dependent, failure to provide universal and ubiquitous access to the range of services offered and needed would disenfranchise individuals, potentially creating an underclass of information-poor people. Problems are likely to persist with the inability of some to pay for the informational content of the messages. Even so, the means of delivery will be even more strongly perceived as a necessity for all people.

As telecommunications use in commerce expands, regional economic development requirements will require access by businesses to the level of telecommunications services available to their competitors. This will provide strong impetus for the rapid dispersion of those communications services that support commerce of all types.

These basic forces driving policies for equal availability of all telecommunication services will be aided and abetted by the providers of enhanced telecommunication services of all types. These providers will press for market expansion through the diffusion of the telecommunications network capabilities necessary for the delivery of their services.

Divergence in Use

As the telecommunications system becomes more powerful, capable of delivering an increasing variety of useful communications and information services, it is inevitable that differences in the rate of utilization of the system by end-users will occur. Some users will immediately use the new services and others will be slow to change their usage patterns. The expected divergence in the variety of services available through the telecommunications link will result in a geographically dispersed demand for the services. Voice communications are between people. Those called and those calling have a common interest in the communication fostered by other nontelecommunications encounters they share. Proximity in a physical sense is one important ingredient in establishing the relationship that leads to the call. As a greater portion of the traffic becomes service-oriented as opposed to voice-communications oriented, the requirement for a relationship to exist apart from the tie through the telecommunications network is less important. The relevance of geographic proximity likewise may be diminished.

Thus, regulators will have to confront trends that may deploy services geographically, but that also may contain the technological capability to make the distance between callers a nonissue. Developments like these will require commissions to reassess continually their community-of-interest standard.

The Network Planner and the Facilities Network

Balancing Supply and Demand

The capability of yet-to-be-universally deployed technology in paths (fiber optics), switches (modular digital), and intelligence (SS7 and enhanced computing capabilities) assures that it is not a question of what should be deployed, but when. The pace of developments promises a continued declining cost pattern for network capability advancement, prejudicing some choices toward delay in anticipation of lower future costs. Growth in the use of existing services would make conservative, low-technology expansion

paths viable in the sense that corporate goals can be achieved while avoiding the risks of providing for unproven services. The potential for long-term displacement from the market by the deployment by competitors of modernized facilities may mitigate against conservative deployment strategies by the local exchange companies.

Better forecasts of the demand for communications services will be the highest priority for network planning. The network planner will, to a greater degree, incorporate considerations of the tariff designers' interpretation of facility capability and the needs of the users of the system in choosing the timing for deployment. The importance of these broader considerations may involve public policy makers in the planning activities of the local exchange companies.

Traditional measures of the effectiveness of the planning process in terms of the rates of utilization of already-deployed facilities may not be as important as measures of unfulfilled telecommunication requirements. In growing markets constrained by the deployment of facilities, equipment utilization projections tend to be self-fulfilling prophesies.

Paths

The technology of the transmission paths lessens the operating importance of path length, depreciating the importance of the location of the user in regard to other equipment in the facilities network. While the cost of initial deployment is influenced by path length, signal-path length is not the constraint on network topology that it once was. The path bandwidth constraint is related to the length constraint. Better utilization of bandwidth and technology that improves the performance of the paths both lessen the importance of bandwidth considerations in the deployment choices.

Switches

Nonblocking modular digital switches create considerable flexibility in configuration, capability, and physical placement of the switching

functions. The relaxation of distance constraints on the paths and the increases in intelligence permit system designs either with fewer switch nodes serving more users over longer paths, or more switching nodes with implications for added deployment flexibility. The result is that no longer is it a certainty that the trade offs between path length, intelligence, and switch capability will result in fewer not more switch sites, and that the number and location of switches will not be controlled by capability limitations inherent in the switches.

Intelligence

Ability to control the physical network--to cause it to perform desired functions--is the measure of the network's intelligence. Whether that control capability is made available to the users is the province of tariff designers. Independent from that decision is the freedom in deployment strategy that intelligence provides the network designer. Of particular importance is the ability that sufficient intelligence provides to create within the facilities network virtual networks that appear to users to function as some alternative physical network (call-forwarding is a simple example). This feature of intelligent networks depreciates the significance of the physical location of the facilities and the users.

The Tariff Designer and the Services Network

LATA Boundaries

LATA boundaries arise not from constraints inherent in the deployed technology nor from the distinctions between the demands of the users, but as a result of market structure objectives. The cyclic nature of the interplay of service-offering barriers, such as LATA boundaries, user responses, and facilities deployment will reinforce the significance of the LATA boundaries for the foreseeable future with regard to ownership and control of the intraLATA facilities and the services available within each LATA.

Open Network Architecture

Open network architecture is a fundamental change in the way that tariff designers define the service capability for the users. The dominant characteristic of current service offerings is that the tariff designer conceived a use for the network capability, judged that it would be of value to the user, and designed a tariff to provide the service. In open network architecture the focus is on defining the underlying network capability without necessarily judging its value to the user. The user can combine the offered capabilities, perhaps providing additional capabilities from outside the telecommunications network, and create a usefulness unconstrained by the creativity or values of the governmental tariff designer.

Residual Pricing and Revenue Requirements

If the telecommunications industry is a declining-cost industry over time with substantial economies of scale for wire- and switch-service usage, the ability to pursue public policy goals through pricing preferences will increase with the modernization and increased utilization of the network. That does not suggest that current preferences can or should be maintained, but rather that the end of commission-established pricing prerogatives is not near. At least within the local exchange company, services which are valuable and can be provided by the LEC at costs considerably below providing them through nonLEC alternatives will continue to exist. Services with those characteristics will include both the natural monopoly services based upon the location-specific advantages of the local loop and services for which the LEC has the benefit of economies associated with their provisioning of the local distribution system. Tariff design will continue to be a balancing of the interests of the LEC with the other public policy objectives, including efficiency in the market sense, efficiency in the provision of services, ubiquity of service availability, and equity.

The Art and Science of Tariffs

The facilities network can be thought of as a machine which functions to serve the user. It is analogous to a computer and adds value through its support of the activities of the users. Furthering the analogy, only a small number of users (albeit the most active users) have any understanding of the inner workings of their computers or of the facilities network. The tariff designer can be described as the software developer of the telecommunications system. The tariffs are the software and provide the linkage between the bits and pieces of equipment and the performance of desired functions for the user. The drive to user-friendly interfaces between customer and facilities-based features may lead to tariff structuring as different from tradition as Pac Man is different from Visicalc.

Conclusion

While none of the five policy options is flawless, the use of the impact on the local calling area as a criterion seems to have the easiest fit with the ongoing operations of a commission. The approach does not presume that a commission should open a new docket or start some kind of formal proceeding defining the local calling area. Instead, its primary thrust is to seize upon targets of opportunity as they arise in other proceedings or analyses conducted by the commission. Just as the commission considers criteria such as economic development or universal service in its analysis of issues like modernization and ratemaking, this approach would add consideration of the impact on the local calling area as a criterion. The marginal cost to the commission would be low, as most commission formal proceedings already either invite or receive comments from interested parties on a number of aspects of the issue or issues under consideration. The cost to the commission would lie in adding the LCA criterion to a proceeding and in analyzing its impact.

The other approaches all make consideration of the local calling area the central focus of the effort. While this is not a problem in and of itself, the 1989 NARUC extended area service survey indicated that formal

consideration of the local calling area is not a priority on the agenda of many state regulatory commissions. Given the attention many commissions will be giving to high-priority high-visibility issues such as open network architecture, rate-of-return alternatives, rate design, and competition, it seems unlikely that most commissions will realign their policy agendas to analyze local calling areas.

On the other hand, it would seem inefficient not to use the opportunities presented by these other regulatory policy initiatives to consider the impact on and of the local calling area. As telecommunications services become a more important cost factor for business firms, the need of firms for low-cost access to their local market could be an issue in modernization, competition, ONA, and ratemaking proceedings. The criterion perspective would ensure the explicit consideration of the LCA issue by its adoption as a criterion in these other proceedings.

Following this policy across all proceedings should significantly reduce the number of extended area service petitions received by commissions as the various causes for the petitions are reduced. EAS petitions are best viewed as an early warning indicator that some of the stakeholders feel that the telecommunication regulatory policy equilibrium has or is about to become unbalanced. The lack of an explicit consideration of the LCA criterion in some previous regulatory proceeding increases the probability of an EAS petition as no other easy remedy was perceived as being available by some ratepayers. The analysis in this report indicates that just as many of the existing parameters and benchmarks of telecommunications and regulatory policy are undergoing significant change, new factors, such as the impact of LCA boundaries on the development of intraLATA competition, may emerge that affect the LCA policy equilibrium established by commissions.

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