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AN OPEN NETWORK ARCHITECTURE PRIMER FOR STATE REGULATORS

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PREFACE

This is an Open Network Architecture Primer for state regulators. It is intended to provide regulators with varying levels of expertise in telecommunications and little or no exposure to Open Network Architecture (ONA) with a framework for understanding ONA. The framework is intended to facilitate efficient use of the regulators existing expertise in addressing the issues of ONA.

ONA could be approached technically by examining the cables, switches, hardware, and software that actually provide ONA services. That approach is not used for two reasons. First, it would be burdensome and difficult for those regulators not thoroughly grounded in telecommunications engineering, and, second, because ONA is not intrinsically a switch-and-wire concept. Regulators with expertise in the engineering and operations of the physical network will have little difficulty applying their knowledge to ONA issues once they have an understanding of the ONA concept.

ONA could be approached analytically as a set of service offerings requiring the application of established regulatory practices. Pricing ONA services, preparing terms and conditions for service, and establishing minimum service standards all are regulatory activities that will be triggered for ONA services. Analyses of regulatory practice were not chosen to describe ONA because the dominant considerations in these practices are in the choice of techniques and standards. These choices are not unique to ONA and regulators engaged in these practices will be able to make appropriate choices based upon an understanding of ONA concepts.

ONA could be approached as it has been most often by tracing its history. Many current ONA practitioners have participated in its development and have learned about ONA as it has been shaped by the federal regulatory process. The primer does contain an appendix showing the milestones in the development of ONA. The principal purpose of this section is to prepare the reader for the next steps in ONA's evolution. Tracing ONA's history helps add substance to understanding its present status, but the history alone is not an efficient way of describing ONA as it exists now.

This primer treats ONA as a concept with applications in a wide variety of telecommunications issues. It makes no attempt to explain to the cost analyst how to conduct cost analysis but rather attempts to highlight the objectives of ONA that may affect professional judgement within the cost study. Similarly, the primer does not attempt to formulate the policy issues or specify how they should be dealt with by a commissioner or senior state regulatory policy advisor. Rather, it seeks to define the ONA concept so that these regulators can evaluate the impact on other telecommunications policies, such as universal service and economic development.

In addressing the great diversity of expertise within the regulatory community the primer does not presume prior knowledge of any specialized area. Only the very general structure of the telecommunication industry and its history is presumed. Readers of the primer should be able, after reading it, to better understand the discussion of ONA issues in their field of expertise and ultimately be able to bring their skills to bear on the ONA issues of their jurisdictions.

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FOREWORD

Open Network Architecture is a concept that has been developing primarily in the federal arena. It is about to come to center stage in the continuing evolution of state regulatory policy. State regulators will be called upon to address specific ONA implementation issues and consequences. This primer introduces ONA to assist in the understanding of the key underlying issues.

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CHAPTER ONE

WHAT IS ONA?

Open Network Architecture (ONA) has been variously described as: (1) a vehicle to allow the Bell Operating Companies (BOCs) to enter the enhanced services market without the burden of separate subsidiaries, (2) a means of facilitating the use of the network by enhanced service providers (ESPs) by allowing them to purchase unbundled factors of production for their services, and (3) a new way of thinking about how services are defined. Each for these concepts of ONA is true and valuable in explaining ONA.

In a larger sense ONA is the network functionality part of a broad movement to convert the telecommunications industry from a supply-controlled environment with suppliers' willingness to offer services controlling the pace of evolution to a demand-driven environment with user needs driving advances. Prior to divestiture, the telecommunications business advanced at the pace that AT&T advanced. Only those services that AT&T chose to supply were available, and it defended its right to control the pace of advancement. Given the dominance of AT&T over telecommunications, its policies regarding the development of new services and technologies for the network were the policies that mattered. It is fair to classify this arrangement as a supply-controlled environment.

AT&T operated an excellent technology advancement center in Bell Labs. New discoveries were made and new ways of designing and operating the network were devised. With these advancements, AT&T decided when and to what extent to deploy improvements. In making those decisions a conservative investment strategy was followed. Essentially, a new technology or a new way of doing business was introduced when that technology demonstrated that it would be the most economically efficient way of providing those services already in use. In other words, the new technology was validated on the basis of more efficient production of existing services. As long as that strategy was followed, all new technologies were successful. Each did

reduce the costs of providing services. As the new technologies were introduced to save money on existing services, they sometimes incidentally created the capability of providing new services. The Bell System might offer these new services to customers and, if they did and the customers chose to use them, a new definition of existing services would evolve. The next generation of technology would be introduced when it could serve existing services more efficiently than the old technology.

Supply-Control Deployment

The supply-control process can be visualized by considering three activities related to the telephone system's evolution. One of these activities is the deployment of equipment in the network. This is the province of the network designer and results in the creation of the facilities network. Another of the activities in the evolution of the network is the definition of the services that will be provided to users. This is the province of the tariff designer and the product of this effort is the tariffs. The third activity is the use of the network, the province of the customers and the product of their activity is the traffic on the network. Figure 1-1 depicts the relationships that these elements have to one another in a supply-control environment. The network designer constantly monitors the use of the network, remains aware of the technologies available, and makes decisions to equip the network to meet the offered traffic as efficiently as possible. The capabilities that the network designer imbeds in the network are defined by tariff designers in terms of services made available to the customers. The customers make their usage decisions constrained by services defined in the tariffs. The decision path is counterclockwise around the diagram: deployment decisions trigger service offerings which trigger uses which trigger deployment.

Only when the service provider has some form of control over the ability of users to take advantage of technology can the supply-controlled model dominate the rate of advancement. The local exchange company (LEC) has such control in at least the local switch and much of the local loop portions of the network. This control is mitigated and eventually eliminated in a competitive market.

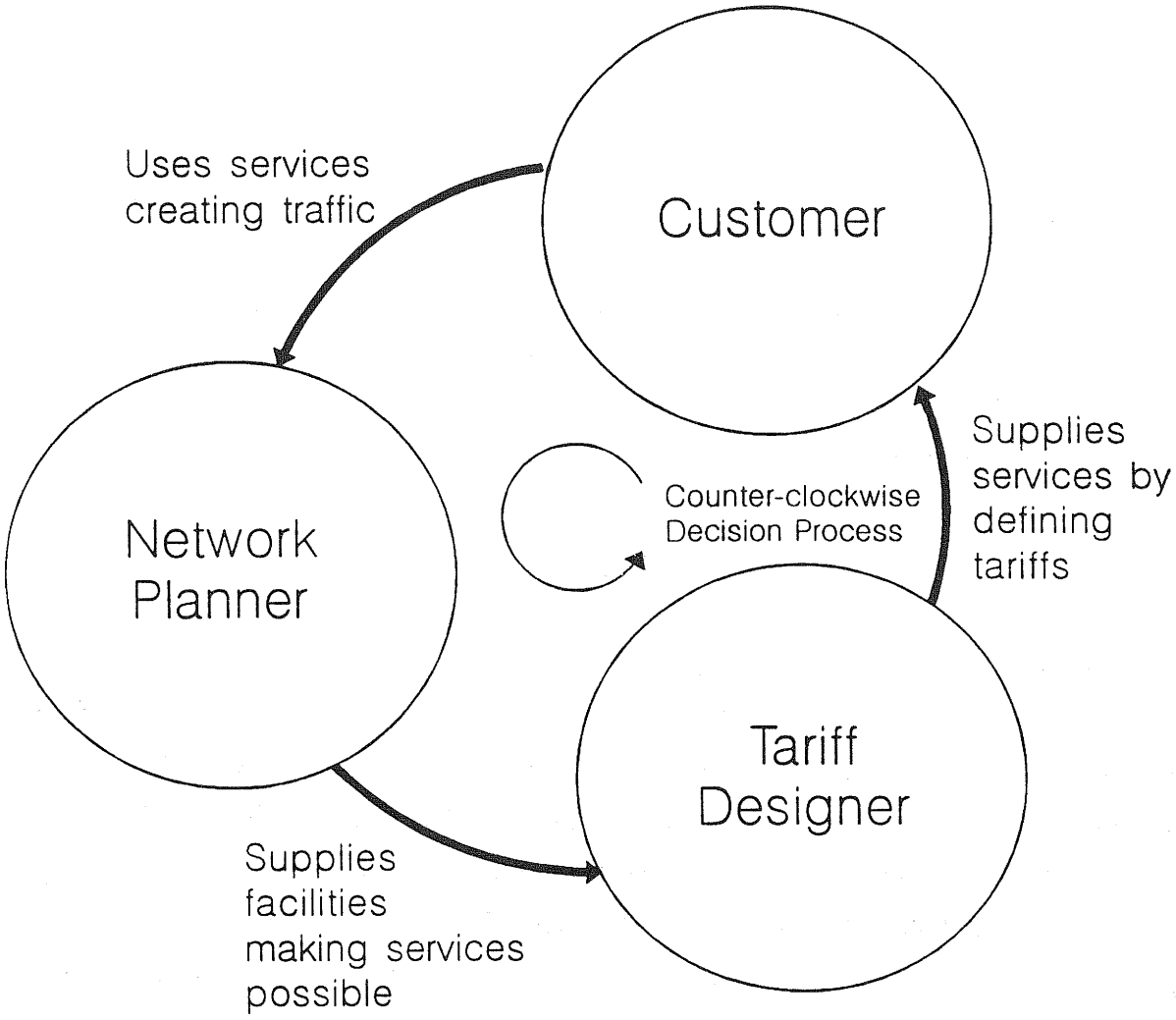

Fig. 1-1. Supply-Control Network Evolution

The conservative investment strategy of supply-control can lead to loss of market share to competitors who aggressively offer new services that better meet the customers' needs. Determining customer needs and creating better ways to serve them is a primary characteristic of competitive markets. However, competitive markets are not easily established for the local switching functions and local distribution. ONA may contribute to establishing competitive markets for enhanced services, but ONA alone will not materially affect the monopoly status of the switch and local distribution. ONA adds regulatory tariff structure specification and service development process requirements.

Demand-Driven Deployment

ONA will establish an alternative path for driving the development of the public switched network. With ONA, customers will be able to specify the services that they desire. Those desires will be formalized as requests for tariffed services and demands for the services will drive the deployment of capabilities in the physical network. This is a demand-driven deployment and is in stark contrast to the supply-controlled environment that has dominated network development in the past. In figure 1-2, the demand-driven environment, the ONA scenario is shown as a clockwise flow of decisionmaking, from the customers' needs through tariff definition to facilities deployment.

The difference in goals between the ESPs--who want to use the network in creating new products to market and who need a demand-driven network development policy--and the LECs--who prefer the supply-control policies--makes ONA a regulatory issue. For regulators the issue is clouded by the rhetoric of the various parties. This primer maintains that the arguments, goals, and actions of the parties can best be understood as a clash between supply-controlled and demand-driven visions of ONA. ONA has to do with creating a new focus for the development of the public switched network, a focus on the needs of the customers. Dominance and control over

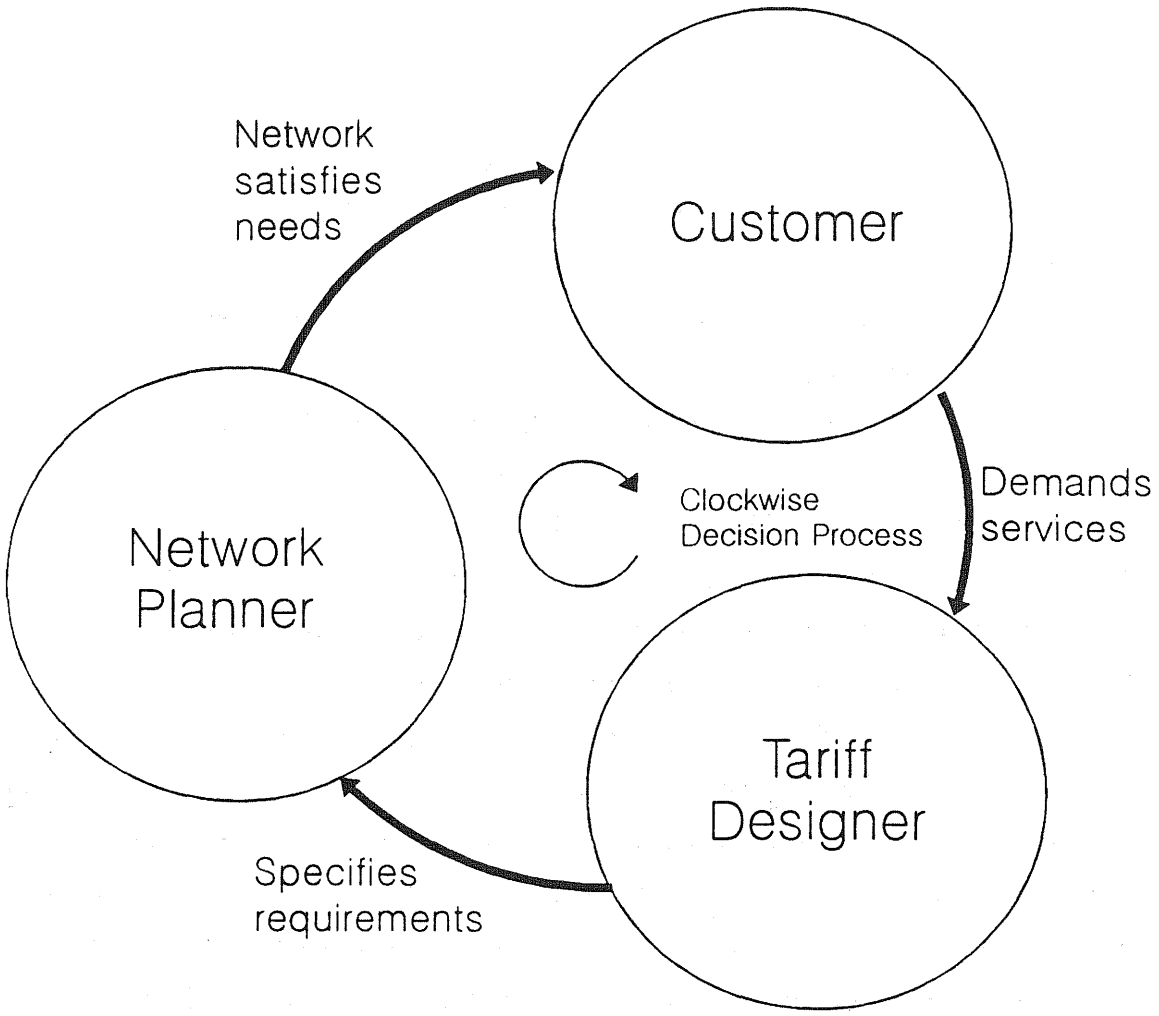

Fig. 1-2. Demand Driven Network Evolution

network development by the designers will be substantially reduced if ONA is successfully implemented. The decision process will run clockwise on the diagram.

The balance of this primer will describe the details of ONA implementation. Attention is paid to the incentives of the various participants in developing and using the network and the effects they each have on ONA evolution. Accommodations are necessary to provide for the transition from the supply-control to the demand-driven public switched network, but the underlying objective remains clear--successful implementation of ONA requires that users define the network of the future.

A regulatory initiative is necessary to achieve the objectives of ONA because for now and for the near future the local switch is an essential component of the telecommunications network. That switch still stands as a bottleneck facility. Control over the local switch's capabilities and how these capabilities are tariffed and used will be an important factor in the evolution of the telecommunications market. At present, the alternative of bringing competitive pressures to bear for the purpose of more directly determining the true wants and needs of customers is not generally feasible in the case of the local switch and its capabilities. A means of empowering users and potential users of the switch to affect the development of new switching functionalities is required. The methods chosen to conduct this assault on the status quo are one of the subjects of this primer. No one can say whether the local switch will always retain its dominant position in the fabric of telecommunications. What matters is that it currently does, and that circumstance is expected to continue for some time to come.

As we discuss the specifics of ONA, remember that the focus is on what is achievable in the short term. To a great extent, this is limited to requirements for redefining the service offerings of the network as currently deployed. These initial steps focus on bringing user desired service definitions into the tariffs. ONA is not the first regulatory initiative that has sought first to identify the needs of the LEC's customers and impose tariffs based on those needs. Similar regulatory initiatives have been used to define the interconnection requirements for interexchange carriers. That regulatory involvement in the operations of the LECs was also required because the

switch was an indispensable part of providing interexchange services. ONA carries this regulatory approach to the full range of services that can be used by ESPs.

There are other significant differences between the ONA and equal access initiatives. Equal access was simply mandated, no incentives were offered, and no choice was given to the LECs. ONA in contrast has elements of incentive included. There was a time when the BOCs would have been able to participate in the enhanced services market on an unseparated basis, partly in exchange for meeting the requirements of ONA.[1] A still existing incentive is that enhanced services' production is generally viewed as a stimulus to the demand for basic services, thereby increasing the revenue producing potential of the network. As a result, the LECs stand to benefit by meeting the needs of nonaffiliated ESPs as well as from the direct production of enhanced services by their affiliates.

The future of enhanced services (which are those services that combine the transport and switching function of the traditional telephone network with computer processing of the users' messages, access to information through the network, and intelligent handling of the customer's messages in accordance with the customer's wishes by the network) has become virtually synonymous with the future of ONA. Certainly ONA is about enhanced services, but it bears remembering that ONA is, in a larger sense, about increasing customer control over the future of the network.

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[1] The intent to trade ONA implementation for the unseparated production and sale of basic and enhanced services is included in the FCC's series of ONA orders. However, the enforceability of this intent was severely limited when the FCC's Third Computer Inquiry order was vacated by the Ninth Circuit Court of Appeals. While ONA implementation is moving forward, it still is a clouded issue whether BOCs can produce and sell basic and enhanced services on an unseparated basis.

CHAPTER TWO

THE OPEN NETWORK MODEL

> BSAs are the underlying switching and transmission services, for example, trunkside switched access. BSEs are optional unbundled features, for example, Automatic Number Identification. BSEs are generally software-based features and functions resident in the stored-program-controlled switch located in the carrier's central office. A customer must purchase a BSA to gain access to a BSE. The switched service BSA is essentially a combination of the existing common line, local switching and transport elements that does not include existing features offered as BSEs.

These definitions, taken from the FCC's Part 69 order released July 11, 1991, arise from the "Common ONA Model" developed by Bell Communications Research (Bellcore), an organization jointly funded by all of the Regional Operating Companies. Understanding this model is necessary to understanding ONA.[1]

The Common ONA Model

The network architecture of the common ONA model is divided into three components:

1. Complementary Network Services (CNSs)
2. Basic Service Elements (BSEs)
3. Basic Serving Arrangements (BSAs)

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[1] In the Part 69 order of July 11, 1991 the FCC did not precisely follow the ONA model which had been the basis of previous discussions of the ONA concept. The model as herein described establishes a clear distinction between the transport function of the end-users' local loop and the transport afforded to the ESP. The transport service available to the ESP in the model does not include the local loop transport. This demarcation is not followed in the order. In the following discussion the terms ONA model, common ONA model, and Bellcore's ONA model all refer to the concept as understood before the order. The FCC did not explicitly reject the model and may intend for implementation to proceed in accord with the ONA model as discussed.

A fourth component--ancillary services (ANS)--is not a part of the network architecture but may be useful to ESPs. BSEs and CNSs are service options to be used with "bare bones" access and transmission. By choosing options the user can add capabilities to best fit his needs. The CNSs are options for use with the local loop while BSEs are for use with BSAs. Automatic Number Identification is an example of a BSE, while Three-Way Call Transfer is an example of a CNS.

A BSA is the minimum transmission service necessary to connect an ESP to a BOC's network.[2] Therefore, for regulatory and pricing purposes, a BSA is different from the "local loop." Whereas the local loop is the facility used to connect an end user to the BOC's network, a BSA is the facility used to connect the ESP to the BOC. Examples of the services offered over the local loop are residential and business services.

ANS are peripheral services not required for the technical operation of BSAs or local loops. These services assist an ESP with the administrative aspects of its business. An example of an ANS is billing and collection services provided by a BOC to an ESP.

Using a distance analogy to describe the common ONA model, a BSE is miles away from the premises of an ESP. Its delivery requires the construction of a road and vehicle carry it. The BSA represents both the road and vehicle. If a BSA is thought of as a horse moving along a road, the BSE is the rider. The ONA concept raises questions of whether the horse is a thoroughbred or quarter horse, whether the road is turf or dirt, and whether the rider is jockey or cowboy. Whatever the actual combination, a BSE and a BSA represent the joining of rider, horse, and road. Although each can exist without the others, their value depends on their working together smoothly.

The relationship between a local loop and a CNS is identical to the relationship between a BSE and a BSA. The local loop represents the road and the

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[2] *Open Network Architecture Plan of the Ameritech Operating Companies,* Ameritech (May 19, 1989), 33. "A BSA is the minimum necessary arrangement for the delivery of unbundled features and functions to enhanced service providers."

horse, and the CNS represents the rider. Whereas the BSE travels a road connecting an ESP's premises to a BOC's network, a CNS travels a road that connects an end user's premise to a BOC's network. Therefore, a complete ONA model can be viewed as two sets of road, horse, and rider, with each road connected at a point in a BOC's network. The point of connection is a BOC-owned switch. A switch such as 1A ESS, 5 ESS, or DMS100 is the home of a BSE and a CNS. Therefore, these riders start out at the switch and return to the switch over BSAs and local loops respectfully.

A final feature of the common ONA model is that the point of interconnection must permit the BSE and the CNS to hand off information and data to each other. Hence, the common ONA model can be thought of as a pony express system with riders meeting each other at prearranged destinations and handing over mail pouches to each other.

Complementary Network Services

A CNS serves double duty. First, it is a switch-based feature or function that easily could be useful to an end user that purchases no enhanced service. Second, this network capability can be helpful to another end user that sends or receives an enhanced service message.

Every CNS could be the equivalent of vertical services such as call forwarding, call waiting, and three-way call conferencing. To carry the correspondence between vertical services and CNSs further, a CNS can be thought of as an option available to the ESP's client. It has the same technical relationship to a local loop as conventional call waiting has to a residential telephone line. Specifically, a CNS is appended to a local loop just as call waiting is appended to flat-rate or usage-sensitive residential service. Therefore, a CNS can be purchased only by an end user or its authorized agent solely for the use of the end user. Hence, prices, terms, and conditions for the purchase of a CNS will be found in the BOC's local exchange services tariff, implying that regulatory authority over a CNS is exclusively within the jurisdiction of the states.

Basic Service Elements

A BSE and a CNS are switch-based features or functions. One important difference between them is that a BSE can be purchased directly by an ESP. For example, an ESP can buy the automatic number identification (ANI) BSE out of the state and federal access tariffs.[3]

A BSE increases the economic value of the transmission function--the BSA--that connects an ESP to a BOC's network.[4] BSEs are not meant to compete with the unbundled vertical services purchased by an end user. Instead, they are to improve the ESPs production process.[5] A complication, however, has been that the ESPs have asked for BSEs that are almost equivalent, functionally, to existing vertical services. Consider Three-Way Call Transfer,[6] a BSE that is similar to the three-way call-conferencing vertical service that can be purchased directly by end users.

When a BSE competes with an existing vertical service, some rule must be imposed to prevent tariff shopping.[7] When a BSE does not compete with a vertical service, the pricing issue becomes whether the same rules should be used to set rates and charges for these services. While the costs of producing identical BSEs and vertical services are the same, social policies may differ concerning their pricing.

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[3] ANI provides an ESP with the billing telephone number of the calling party. ANI is the capability that an interexchange carrier uses for creating bills for its "1+" subscribers.

[4] In this sense, a BSE is similar to a vertical service or a CNS bought by the end user. A vertical service or CNS increases the economic value of the local loop.

[5] This point has been made most forcefully by the FCC when it decided that a BOC only has to respond to requests to develop a BSE that are made by ESPs.

[6] Three-Way Call Transfer permits an ESP already connected to a second party to bring a third party onto the call. After establishing the connection between the second and third parties, the ESP can disconnect itself.

[7] Tariff shopping occurs when a customer can choose between two or more tariffed items that are functionally equivalent to the customer. The customer can "shop" for the lower price.

Basic Serving Arrangements

A BSA is a bare bones transmission service that connects an ESP to the public network.[8] It is part of the common ONA model because the value of a BSE depends on readily available transport services. A BSA provides an ESP with the capability to bring its service to its client.

Structurally, a BSA is a transport medium and interconnection device at the ESP's and BOC's premises. This means that BSA deployment issues are not new to regulation, but are variations of the equal-access deployment issues.

Ancillary Services

An ANS is neither part of the basic transport path nor a network functionality. Still, ESPs may find an ANS to be a useful additional factor of production when providing its services. The best example of an ANS is BOC-provided billing and collection service.

Analysis of Bellcore's Common ONA Model

Bellcore's common ONA model reconciles the opposing business interests of the BOCs and the ESPs. In an effort to isolate these business interests, this model draws meaningful distinctions between ONA users and CNS users.[9] End users purchase CNSs and ESPs are the primary beneficiaries of BSEs and BSAs.

Figure 2-1 describes the basics of Bellcore's common ONA model. No BOC is bound by this model when it comes to the classification of specific network features

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[8] Prior to ONA, the BOCs met this need by selling conventional access, private line, and local exchange services to ESPs. Local exchange services were selected most often by the ESPs because they are relatively inexpensive in relation to private lines and conventional access services.

[9] Technically, the common ONA model had to assimilate the differences between purchasing an intermediate versus a final good.

COMMON ONA MODEL: SIMPLIFIED SCHEMATIC

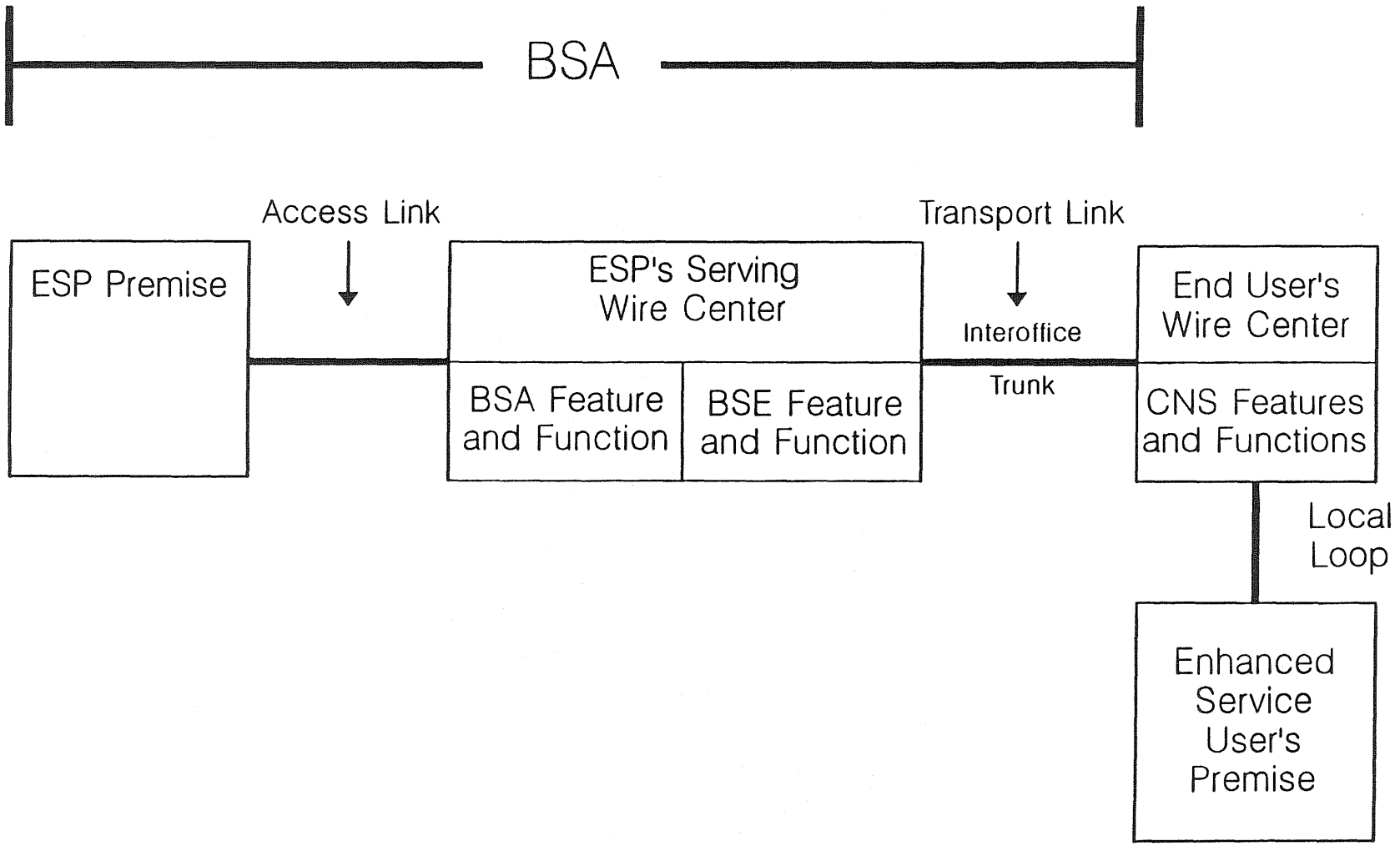

Fig. 2-1.

and functions. Consequently, each BOC may not classify every network feature and function available under ONA in the same manner. However, each RBOC is expected to classify its own ONA components consistently.

Figure 2-1 shows the local loop as providing the connectivity between the ESP's customer and the BOC's switch. In this instance, the local loop is part of the value-added chain of an enhanced service. No enhanced service buyer would recognize voice messaging as having a positive economic value if he or she could not receive the messages. This is not, however, the usual technical functionality of the local loop. The service concept for the local loop found in Bellcore's common ONA model is different from the service concepts of the local loop with respect to access and local exchange services. In the context of connecting an ESP's customer to the BOC's network, the local loop is not part of the BSA. In the context of connecting an IXC's customers to the BOC's network, the local loop is included with the remaining facilities providing access services. In the context of connecting a local service subscriber to the BOC's network, the local loop represents the primary block of facilities necessary to provide local exchange services. In the latter two senses, the local loop represents bottleneck facilities.

It is acknowledged that there are physical similarities between the local loop connecting the BOC to an ESP's client and the BOC to the IXC's customer. Still, important economic distinctions need to be noted. On one hand, an ESP operating under Bellcore's common ONA model would not purchase a local loop or the equivalent of a local loop service. On the other hand, an IXC operating under the existing access rules does purchase the equivalent of a local loop. Because both IXCs and ESPs are consumers of intermediate goods, it follows that ESPs are assigned none of the responsibility for recovering local-loop costs. Consequently, ESPs are in the position to pass through fewer transmission costs than the IXCs under Bellcore's common ONA model.

Another important point is that the local loop connecting an ESP's client to the BOC network is conceptually a new communications service. Physically, it is identical to the local loop that is the primary component of residential or single-line business service. Therefore, the local loop, as it applies to Bellcore's common ONA

model, is a local exchange service. This characteristic of the model means that the prices for this network functionality will not be found in state of federal access tariffs. Instead, they will be found in the BOCs' local exchange service tariffs whenever Bellcore's common ONA model dominates ONA implementation.

Bellcore's regulatory treatment of the local loop is consistent with its regulatory treatment of CNSs. A BSE functionality also may be a CNS functionality and a BSE can compete with a CNS which often is the equivalent of a vertical service. Therefore, a BSE may have the capability to assist the end user directly, yet, a BSE cannot be purchased by an end user and used as a CNS or vertical service. This is because of the structure of Bellcore's common ONA model. Similarly, a CNS cannot be purchased by an ESP and appended to a BSA or to intrastate or interstate access services.

Moreover, an ESP not acting as an agent for its customers cannot currently purchase a CNS and connect it to its customers' local loops. However, an ESP can purchase, for its own interstate use, the equivalent of the local loop connecting its clients to the BOC's network when it exercises the FCC-approved access charge exemption. These service restrictions sever a CNS from a BSE in much the same way as the local loop is severed from the BSA in Bellcore's common ONA model. Consequently, the structure of the common ONA model limits the availability of BSEs to those ESPs willing to substitute a BSA for a local exchange service. This means that an ESP has to become familiar with the technological capabilities of a BSA before changing the existing configurations of its enhanced services.

Because an ESP is required to purchase a BSA and BSEs jointly, a BSE has no independent value as far as Bellcore's common ONA model is concerned. This characteristic of the model has created areas of dispute that will continue to be sources of controversy long after the initial implementation of ONA.

The first area of dispute is which transport services should be placed in the BSA category. For example, existing intrastate and interstate access services as well as existing residential and single-line business services could be BSAs. The second area is what level of unbundling is technically feasible, economically correct, and suitable from a regulatory perspective when BSAs are derived from an existing

service. For example, a trunk-side, switched access-like service could be provided without ANI. The third area of dispute is tying the use of BSEs to purchases of BSAs. There is no technical reason why a BSE that is functionally and technically equivalent to a CNS cannot be appended easily to, say, basic residential service even if this service is not considered to be a BSA.

These three areas of dispute indicate that a market-structure issue eventually will take center stage in the ONA implementation process. The BOC is not the only firm that can provide a BSA functionality if the secure interconnection of disparate transport facilities is free and open. Specifically, an ESP or other firm can invest in its own transport capabilities, BSE features, and functions for its enhanced services.

Still, the technical aspects of secure, free, and open interconnection are not the only factors that must be considered in defining the rules for ONA implementation. Connecting multiple carriers to a BOC's local network creates a second set of business and societal issues that go beyond the technical capability of firms to provide this or that form of network access. This second set of issues is what ultimately will define the form of extended interconnection, if any, that will accompany ONA implementation. In matters pertaining to the optimal unbundling of the network, it is of major consequence whether a BSA is severed from BSEs. While an ESP would prefer to make an uncoerced decision whether or not to purchase a BSA, it also matters whether severing the BSA and the BSE could threaten the prices of services used by residential and single-line business service subscribers.

Footnote for the Bellcore Model

With the issuance of the Part 69 Order in July 1991, the FCC linked the ONA process with the established feature group access arrangements used by IXCs. In doing so an apparent conflict within the model has arisen. Feature group access prices include a cost responsibility for use of the local loop. The FCC's order requires the restructuring of the feature groups to conform to the ONA principles. Two BSAs are required for IXC feature-group-like access; one line-side voice-grade switched access BSA and one trunk side BSA. The BSEs are the switched based

functionalities that will allow the construction of services functionally identical to the feature groups. Since the local loop to the end user is a part of the feature group access, and since it is not a BSE, the apparent conclusion is that it may be part of the BSA.

This is an issue of considerably more than academic interest. It appears that one characteristic of the Bellcore Model is that the ESP cannot order BSEs for the local loops. However, if the voice-grade switched BSAs do include the local loop, it may be possible for the purchaser of the voice-grade switched BSA to order a BSE installed on the local loop (compatible with the loop, of course.) Such a BSE would be identically equivalent to a CNS or vertical service. To permit the ordering of a BSE from the interstate tariff to be installed on the local loop would bring the BSE in direct competition with the CNS. Obviously that would raise the specter of tariff shopping and incompatibility between CNS prices and policies, and BSE prices and policies. A direct means of avoiding these results is to prohibit equipping end-user local loops with BSEs. Such a prohibition has not been made explicitly, although it may be implicit in the FCC's ONA policies.

Tariffs

The ability of users to employ the telephone network to serve their needs is limited by those services made available to them. (Available services are defined by the tariffs of the telephone companies.) While ONA is primarily a federal concept at this time, state tariffed elements fit into the ONA scheme. Table 2-1 shows the four elements of the basic ONA model and their relationship to the LEC tariffs.

The BSA which provides access to the network for the ESP will be tariffed in the interstate tariffs. The ESP can also gain access through the local exchange tariff, at the state level. The state tariff provisions do not refer to ESP access as BSAs. Such ESP access is accomplished though the regular business line access of the state tariff. Significantly there is no carrier common line charge associated with business line access purchased through the state tariff. If the ESP chooses to use the local exchange tariff for access to the network, it will be subject to the terms and

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

Table 2-1

conditions of the state tariff and may not be able to achieve the same ends that are available through the federal tariff. For example, the state may not provide a means for the ESP to request additional functionalities equivalent to the federal rules requiring the BOC to respond to requests for BSEs.

Basic service elements will be part of the federal access tariff. An ESP that chooses access via a federal BSA must use the federal BSEs. An ESP accessing the network through state tariffed lines will have available those vertical services that are in the state tariff which may correspond to the federal BSEs. The ESPs choice of access--federal or state--will control which set of services are available because state vertical services cannot be appended to federal BSAs and federal BSEs cannot be appended to state access lines.

Complementary network services are only available through state local exchange tariffs, are appended to the local loop and switch serving the end-user, and must be purchased by the end-user.

Ancillary services are not telecommunications services and are not tariffed.

Summary

ONA will be implemented within the structure of the common ONA model, which was developed for the provision of services to ESPs. The model provides nomenclature for discussion of ONA and the framework for the rules and requirements that regulators will use.

The typical basic arrangement of the enhanced service provider, the public switched network, and the end user are shown in Figure 2-2. The ESP gains access to the network through an access link to the network switch serving the ESP. The end user has access to the network through an access link to its serving switch center. A communication path through the network linking the switches--the transport link--is required. The ESP may find other, non-network based services useful in serving its client end-user. These are the basic necessities of providing enhanced services.

Figure 2-3 indicates those elements of the basic configuration that are part of the basic serving arrangement. The BSA is the minimum transmission service,

stripped of all nonessential (to the transport of communications through the network, at least) functionalities.

The basic service elements are shown on Figure 2-4. These network-based functionalities, exclusive of those appended to the end-users' access, give the enhanced service provider the ability to create services which can be sold to its end-user client.

Functionalities that are appended to end-user access are complementary network services, (CNSs). These services are necessary for the end user, or his telephone equipment, to interact appropriately with the signals, functions, and features of the enhanced service provider. The relationship of CNSs to the basic configuration are shown on Figure 2-5.

Ancillary services facilitate the enhanced service providers' ability to service its clients, but are not a part of the physical facilities necessary to provide the communication linkages. Figure 2-6 shows this relationship.

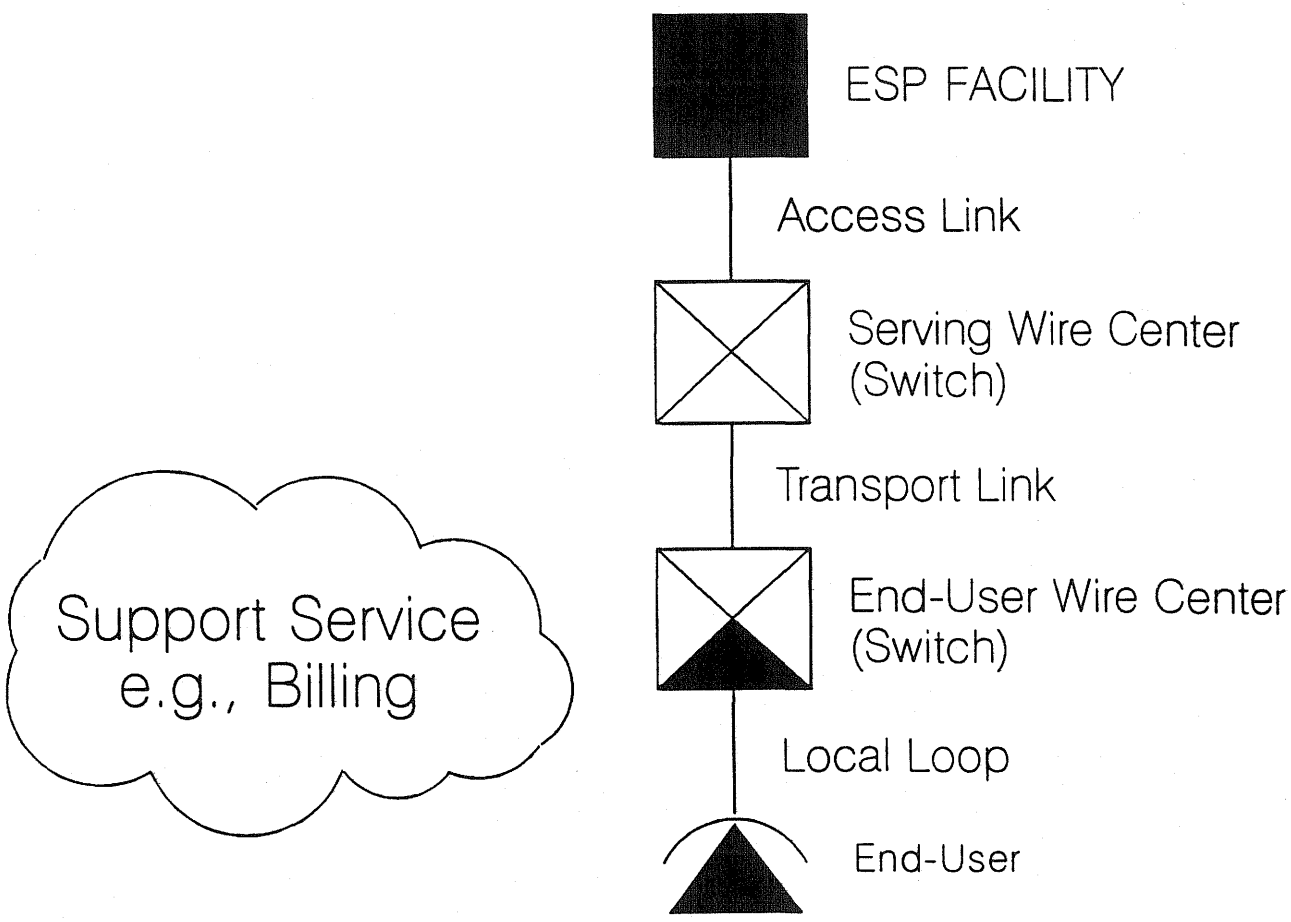

Fig. 2-2. The enhanced service provider uses its facilities in conjunction with features and functions of the LEC's network to produce enhanced services which are transported through the network.

BSA
Basic Serving Arrangement
"Minimal" Transmission Service
connecting an ESP to the
public switched network

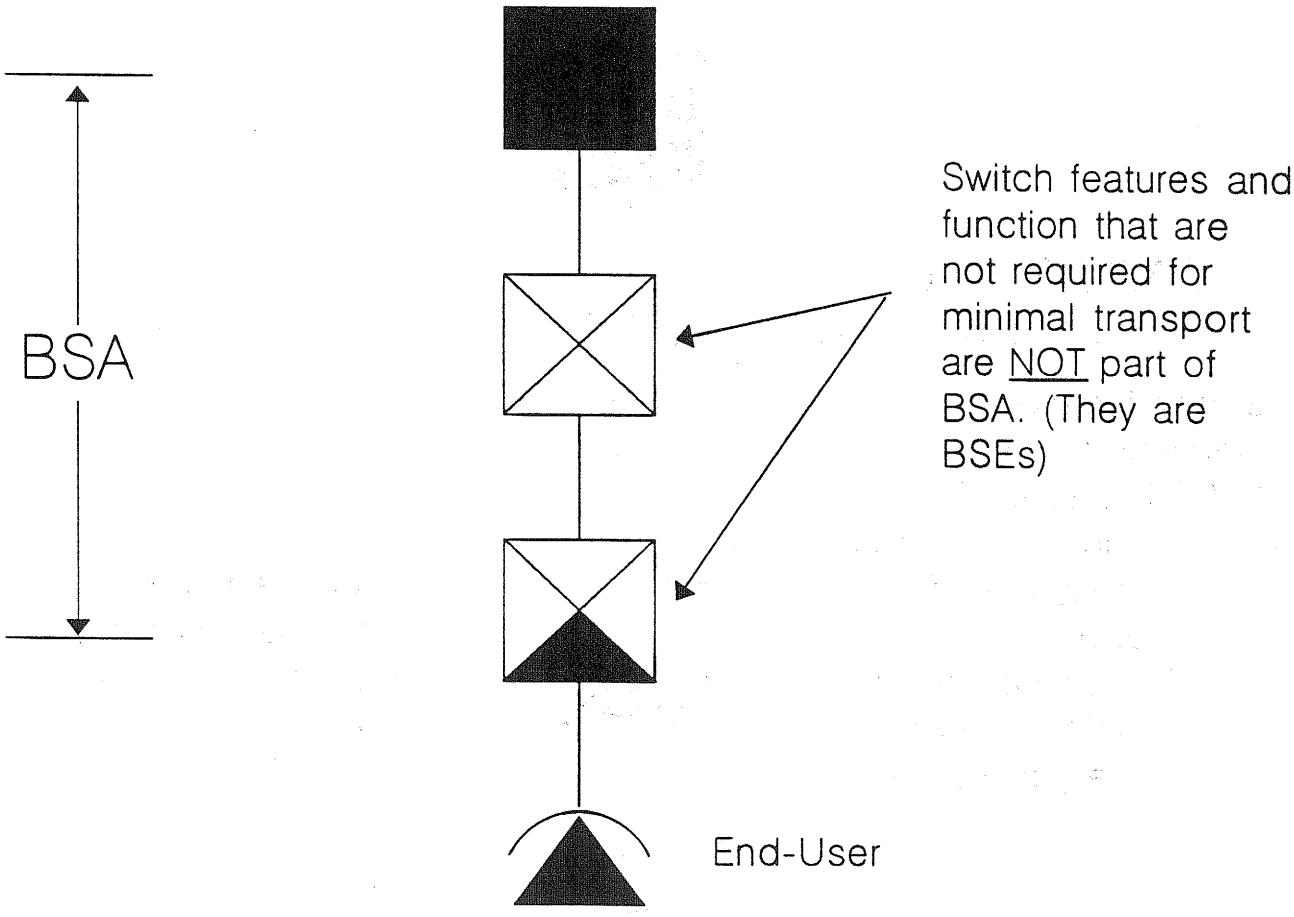

Fig 2-3.

BSE
Basic Service Elements

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

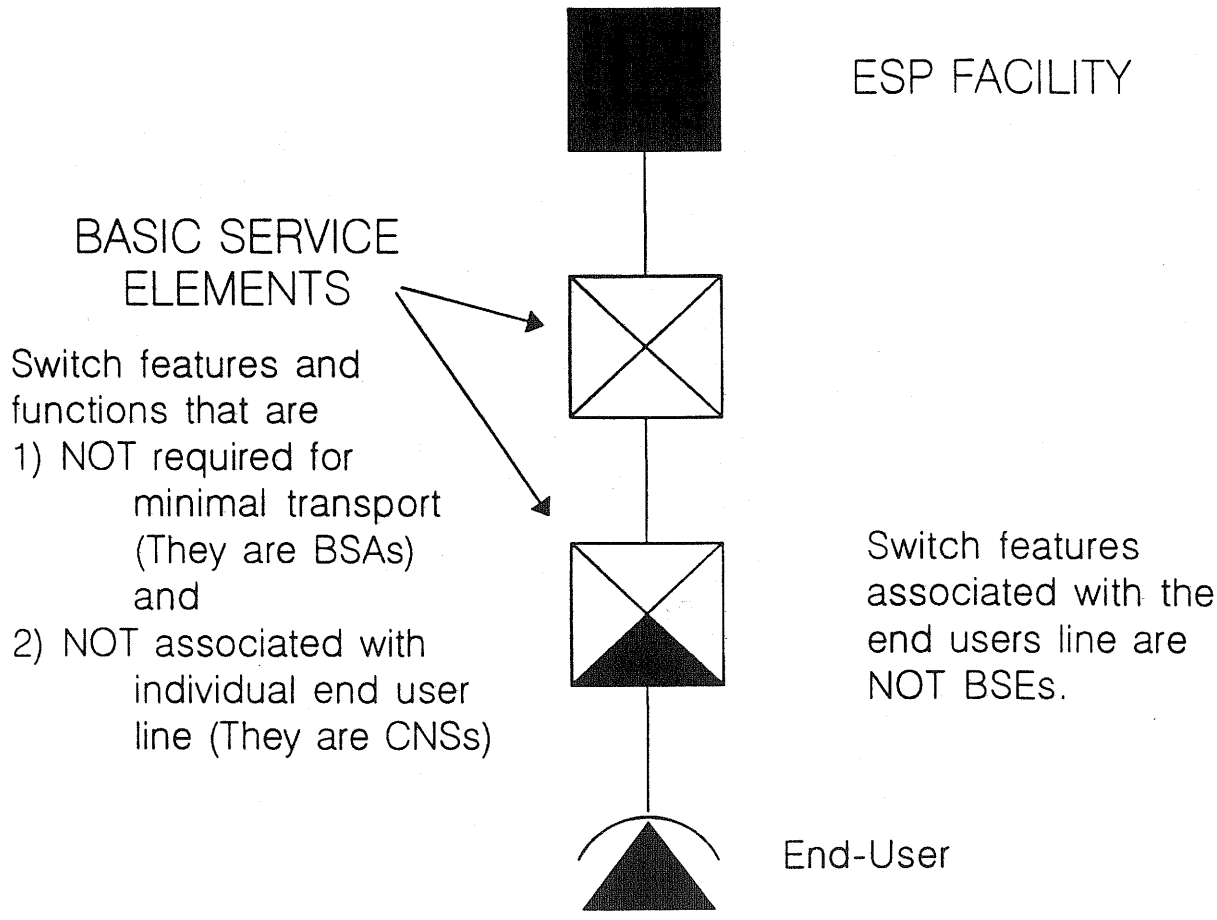

Fig. 2-4.

CNS
Complementary Network Service
A switch based feature or function associated with an end-users line.

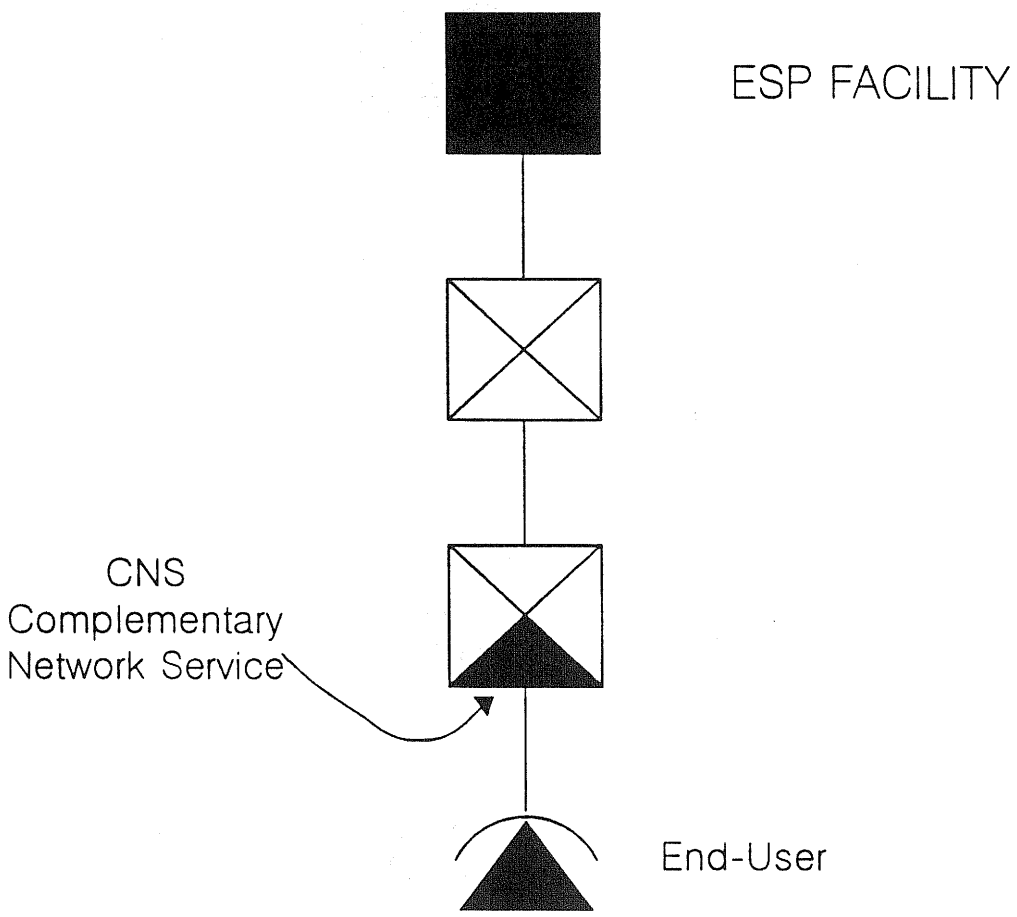

Fig. 2-5.

ANS
Ancillary Services
Other services provided by the LEC that are not involved in the transport or provision of the service itself.

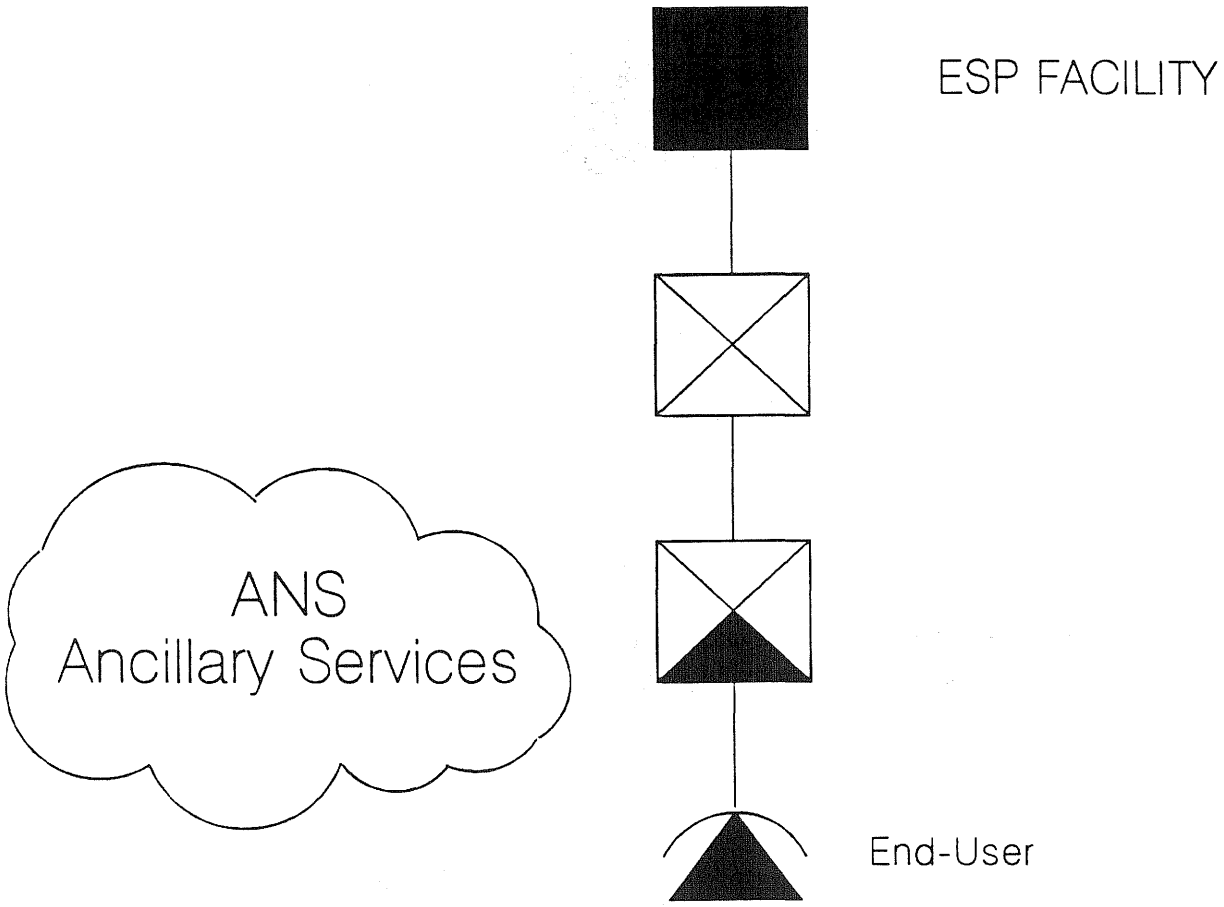

Fig. 2-6.

CHAPTER THREE

AFFECTS OF ONA ON USERS AND PROVIDERS OF SERVICES

There is nothing unique in the physical network that identifies it as providing Open Network Architecture services. ONA is not initially about the physical architecture of the network, but about the tariff architecture. However, the tariff architecture influences the physical network by defining the ways in which the physical network can be used. A tariff that offers a service must be backed by the physical facilities to provide that service and the use of services results in traffic which the network must physically support. There will be circumstances in which the provision of a service requires additions to or rearrangement of the facilities of the network and there will be circumstances where use of a service drives a facilities deployment decision.

The local exchange carriers who provide and operate the network will be affected by ONA. They will introduce changes in the service offerings and in the facilities of the network. Users will be affected by these changes. NonLEC service providers which use the network will be affected by new opportunities to create and sell services to end-users. End-users will be affected by the new services offered by the providers.

The provision of ONA services by the LECs will not be costless. The costliness of the services clearly affects the providers and users of the network services. The cost implications of the ONA services will be seen in the prices for those services. Potentially, since ONA services are produced jointly with other services of the network, the costs of the LEC's operations under the influence of ONA could affect the prices for nonONA services. The LEC's prices affect the non-LEC participants while both cost and price affect the LECs.

Some of the principal affects of ONA implementation are identified in this chapter. The discussion is organized by participant class, that is the end-users, the

LECs and the nonLEC service providers. All of these participants are partners in the overall telecommunication system so that each is affected in some way by the others.

Affects of ONA on BOCs

Open Network Architecture will have substantial affects on the BOCs. It will:

1) affect their revenue streams,
2) require the introduction of new services,
3) cause tariff restructuring for existing services,
4) bring new service suppliers into the market, and
5) create new opportunities for BOC provided services.

Some of these affects will be helpful to the BOC and some will not. Whether the net effect on the BOCs will be positive or negative is not known.

Open Network Architecture will cause the BOCs to offer new services and reconfigure some existing services. ONA services generally will be "unbundled" which will give the user the ability to choose only that level of service needed to accomplish its objectives. Unbundled services give the user greater control over the costs. For example, flat-rate local service is a bundled service; an unbundled equivalent is a usage-sensitive local service. Flat-rate service combines the ability to access the public switched network and the use of that network, offering both functions for a single price. Usage-sensitive local service pricing is an unbundling of the function of network access from the use of the network. In this example, usage is not fully separated from access, because to use the service, access must be purchased. Graniere introduces the term "joined" to describe the situation where the unbundling retains the necessity of taking one service to get another.[1] As a result, usage--sensitive, local service is a joined, unbundled service.

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[1] Robert J. Graniere and Roger Musgrave, forthcoming publication, *ONA Tariffing Policies* (Columbus, OH: The National Regulatory Research Institute, 1991).

The services that will be provided under ONA will be joined to an access arrangement, but the add-on features and functions will be tariffed separately. This is a joined, unbundled circumstance, with the BOC offering many services (basic service elements) which are compatible (can be used) with the basic access arrangement. Re-structuring the tariffs to unbundle the service capability needed by the enhanced service providers will have an immediate affect on the BOCs.

The three dominant revenue implications for BOCs of ONA are: (1) the loss of revenues as existing customers move from bundled constrained service offerings to less sophisticated (and less costly) unbundled alternatives, (2) the revenue increases that will occur because of stimulated use of the network by nonBOC service suppliers, and (3) the direct revenue increases expected from RBOC participation in a growing number of enhanced services.

Focusing on the services already provided by the BOCs on an unbundled basis and the customers who now use those services, the implementation of revised tariffing will reduce BOC revenue, unless revenue maintenance is explicitly considered as a legitimate goal of tariff restructuring. This is because, for customers who use the full capability of the present bundled service, there will be an interest in maintaining current prices. Other customers will find it preferable to use less than the total capability of the current bundled service. Given a choice, some of these customers will opt to purchase less than the full complement of services currently bundled together. These choices will result in less revenues from the customers selecting services with fewer features than the bundled services.

Offering services on an unbundled basis may be a more efficient way to package network capability. This efficiency could result in more use of the network. More services that are useful at prices attractive to users should appear as a result of the improved ONA tariffs. Clearly this is a secondary effect requiring time to develop, and is an uncertain consequence of the introduction of ONA. Assuming that such an increased use does materialize, the BOC can expect to participate in the resulting increased revenues. The concept of the BOC sharing in increased efficiency in use of the network is an attractive view of the future of ONA. Certainly the BOCs will strive to achieve this--and other--objectives.

The regulatory issue is that there are potentials for both increased and decreased revenues for the BOCs as a result of implementing ONA. Most of the threats of decreased revenues result from customers exploiting new tariff freedoms to find cheaper ways of obtaining existing services. These results could surface almost immediately with the change to ONA. Containing them will be a principal objective of the BOCs and perhaps the regulators during transition. The longer-term potential of increased business because of growth in the enhanced service industry as well as elasticity-stimulated growth in other services will probably not receive urgent attention during transition, but will show up later in regulatory proceedings involving profitability, deregulation, and competitive practices.

A third BOC revenue effect from ONA will be opportunities to participate directly in the provision of enhanced services. The FCC has prescribed that the ONA BOCs will be able to provide enhanced services on an unseparated basis. Whether this FCC decree will be sustained is not known, but even if it isn't, it is reasonable to expect increased enhanced services activities by the BOCs. The unseparated option and the affiliate operations each provide the opportunity for the financial circumstance of the BOC to be improved by revenues derived from the provision of enhanced services. These opportunities could increase further if information services are added to the services that the BOCs are able to provide.

Perhaps the most fundamental effect on the BOCs of ONA is customer participation in developing network capabilities. Prior to ONA the evaluation of the needs, wants, and willingness to pay for network services was essentially the sole province of the BOC. In a few instances (equal access, for example) forces outside the BOC (regulators working in concert with the IXCs) analyzed what the customers needed and required that the BOCs provide it. As a general proposition, however, it was the BOCs that evaluated the market, decided what services to provide and what capabilities were appropriate for the network. ONA provides explicit means for customers to request additional capabilities. If this is to be meaningful, it would seem that the BOC will be held to a high standard of proof that a requested service is not feasible if denied by the BOC. Such proof would seem to require substantial disclosure of the status of the network and BOC intentions regarding network

development. The specific administrative procedures that will be used to enforce the open planning for new services concept are not known. Expectations are that earlier emphasis will be on re-structuring existing tariffs with little initial emphasis on network development issues. Sooner or later, however, if the full promise of open network architecture is to be realized, the development issue will arise. It is certain that substantially more disclosure of plans by the BOCs will be required than has been the practice in the past. It is conceivable that the process will develop into a full public participation process for planning the network. Regardless of what form this activity takes it will be a substantial change for the BOCs.

Related to the network development issue and springing from the requirement for the BOC to address the individual new service requests of its ESP customers, is the necessity for the BOC to develop and disclose its methods of evaluating the market potential of new service offerings. This is another dimension of opening the BOC's internal decision processes to scrutiny, comment, and (potentially) to change. Again, we do not know the administrative processes that will be used to implement the regulatory oversight of BOC evaluation of the market for requested services, but the objective could result in a higher level of regulatory intrusion into the management decision processes of the BOC's than has been the practice.

In addition to the intrusion of regulation into management prerogatives brought on by examining new service selection criteria, is an explicit recognition of a public interest in developing new services. Prior to ONA, the public interest has been only implicitly--albeit widely--recognized. Few existing regulatory programs have a capability of enforcing network enhancement. With the advent of regulatory-imposed requirements for examining proposed services, a vehicle has been created to influence network development directly.

Finally, the emergence of enhanced service providers may affect the BOCs by contributing to the change in the public perception of the BOC's role. Not long ago, the Bell Company was synonymous with telecommunications. Now people have come generally to recognize that other companies participate in providing long-distance service. As enhanced service providers increase their market presence, the public perception of the "telephone company" will continue to evolve. As the variety of

services and number of providers increases, the telephone company will seem to be a less pervasive force in telecommunications. This change in perception, which will occur only over time, may have significant ramifications for the BOCs in the years ahead.

Beyond these affects on the BOCs, ONA will require a lot of work. Tariffs will have to be revised, litigation pursued, ESP requests evaluated, and regulatory responses prepared. Most of this effort will be in addition to the BOC's operations requirements prior to ONA implementation.

On balance it would appear that ONA will be costly and difficult for the BOCs in the short-run, stretching perhaps two or three years into the future. BOC benefits are likely to realized only in the long-run. To the extent that the interest of BOC customers--particularly POTS customer--is coupled to the circumstance of the BOC, the transition to an ONA environment entails substantial short-term risk.

Affects of ONA on Enhanced Service Providers

Encouraging greater usefulness of the telephone network through the provision of a greater variety of services to end-users is ONA's stated objective. Those services are to be developed by enhanced service providers who use the network capabilities as elements in producing the services. How the ONA program is intended to accomplish this is best understood by the effects that ONA will have on current ESPs and future ESPs.

While there are a great number of examples of enhanced services, the general method by which ONA will encourage ESPs can be described without referring to any particular enhanced service.

The earlier description of the basic ONA model identified the elements to be available to the enhanced service provider. These are access, through the BSAs, network features through the BSEs, features associated with the end user's loop through the CNSs, and nonnetwork services through the ANSs.

Before ONA, an ESP obtained network access through business lines or trunks from the local exchange tariff where the ESP was located. This option is still

available to the ESP, but ONA adds the option of access through the BSA. The first advantage of this option is that the tariffed BSEs will be available on the BSA. Automatic number identification is an example of a BSE that the ESP may not be able to obtain through business line or trunk connections.

The second business advantage that the ESP will gain through ONA is an increase in service offering uniformity among the LECs. Since the features available to a line or trunk connected ESP are solely within the purview of the serving LEC and the state regulator, consistency in service offerings across the country occur primarily because of the use of equipment provided by a small number of vendors to all LECs and the regional nature of the RBOCs. There has been no national regulatory bias favoring consistency in service offerings. While it is unlikely that absolute consistency in the services offered will be imposed federally, none the less, ONA will be a potent force in establishing a bias toward uniformity. An ESP which requires a specific network functionality may find that one RBOC offers a satisfactory BSE. The ESP would request the service from other BOCs. The natural and expected way for the ESP to request that service would be to use the description of the service that already has been established. The BOCs will be required to respond to the request, and because the ESP has set out the specification of the desired service, the response will address that specific configuration. This procedure clearly will create a bias toward uniformity. If the ESP identifies a needed function that no BOC currently offers, an identical request for the service addressed to multiple BOCs by the ESP will establish a similar bias favoring uniformity.

The third effect on the ESPs--and potentially the most significant--is the ESP's ability to request needed services. Prior to ONA, the BOCs were under no particular obligation to respond to requests for additional network features. While they may have had a business interest in considering the service requests of any customer or potential customer, they were free to deal with those requests as they saw fit. The difficulties that an ESP could expect if it chose to try to force a BOC to offer a service was a substantial impediment to ESP service request initiation. Even if the ESP should succeed in getting a desired service in one location, it would benefit only the ESP in that jurisdiction. Facing the prospect of dealing with numerous BOCs in

fifty-one jurisdictions to establish a nationwide service availability would dampen any enthusiasm for championing new service ideas. ONA provides a vehicle for ESPs to influence development of new services. If the methods used to implement this aspect of ONA are efficient from the ESP's perspective, they will participate actively in network development.

If ONA vitalizes the enhanced services industry it will result in an increase in the customer base for enhanced services. Products of all sorts have been observed to follow a pattern of use characterized by a period of slow but accelerating growth, followed by a sustained period of increased usage with a declining rate of acceleration and finally "topping out" at a saturation level. Figure 3-1 shows the "S" curve that is representative of the commonly observed growth phenomena of many products. By all estimates, the potential for enhanced services is early in the cycle, clearly in the development period with customers still learning to use enhanced services. Start-up costs are being incurred with modest penetration of potential markets, yielding high unit costs. Suppliers are yet to fully understand what services will be useful to their clients. The current status of the enhanced services market is that the services are yet to be recognized as valuable by most users and the services are expensive to produce and market. This interplay between production efficiency and customer demand means that no single action will trigger the growth characterized by the knee of the curve where utilization really "takes off." Impediments to either productive efficiency or customer acceptance can prolong the period of development. ONA promises to improve the efficiency of enhanced services production, clearing the way for customer acceptance to drive market development. Synergistic effects will influence customer acceptance. One enhanced service may require that customers obtain some on-premises equipment. The availability of that equipment and the customers familiarity with it may make another enhanced service useful to the customer.

Purely empirical analysis of the history of prices and consumption have led investigators to model quantities of products produced versus time as "S" curves (shown in figure 3-1) and quantity versus price relationship with experience curves (shown on figure 3-2). While both models are challengeable on the basis of their

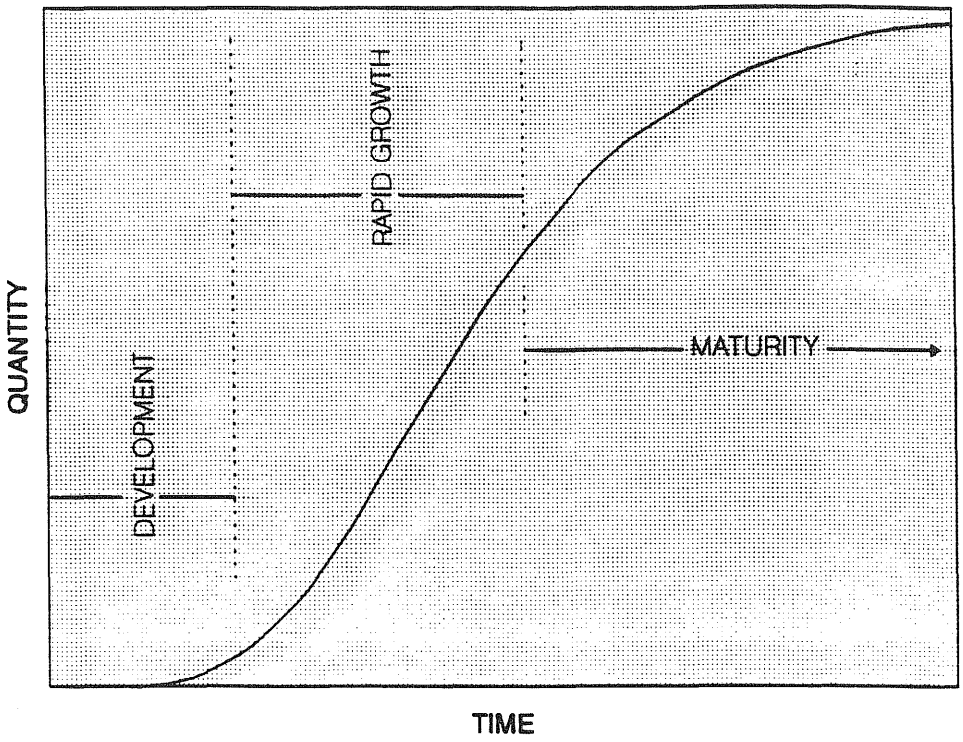

Fig. 3-1. "S" Curve, empirical projection of use.

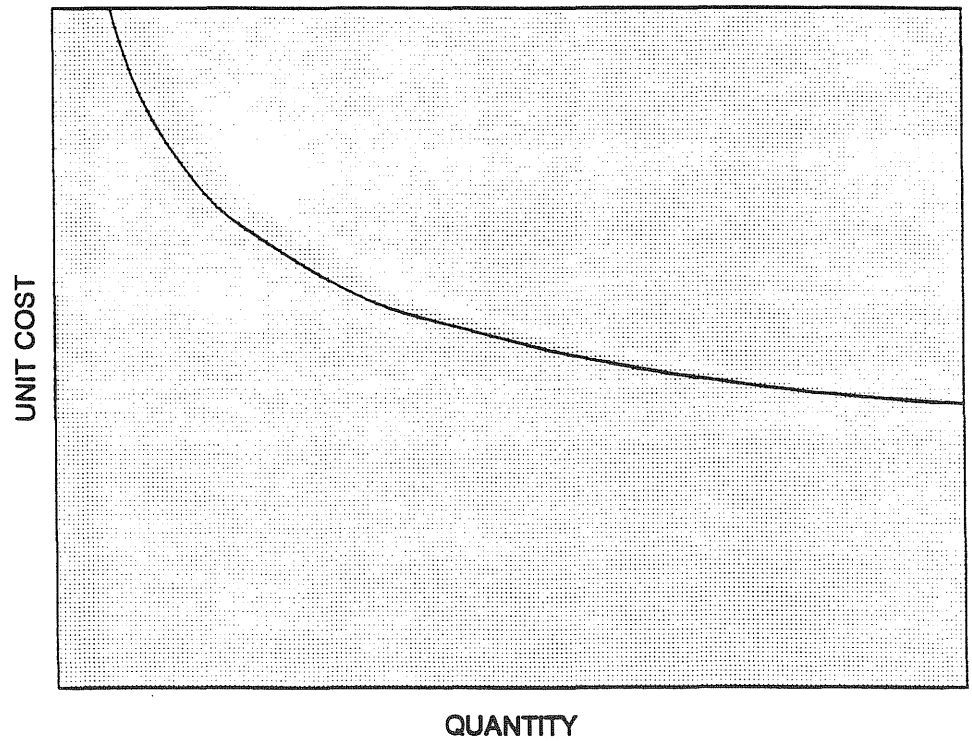

Fig. 3-2. "Experience Curve", empirical projection of cost vs. quantity.

generality and lack of demonstrable connection with causal factors, they are potentially useful in examining reasonable expectations, such as this. The experience curve models unit prices as a declining function of increased production at a declining rate. For example, an 80 percent experience curve predicts a decline in unit price with increasing production such that for each doubling of quantity the price will drop to 80 percent of it previous value. As is the case with the "S" curves, there is intuitive appeal in the experience curve, but no linkage to an identified cause for the predicted relationship.

If both of these empirical models are applicable to enhanced services, providers can expect to see a period of relatively high costs associated with little production experience and relatively low demand. This will be followed by a period of rapid decline in costs as the quantity of the services consumed starts its rapid growth at the knee of the quantity-used curve and the price is rapidly declining with production volumes. The models predict that the short period of rapidly falling costs and rapidly growing volumes will be followed by a long period of stable prices and eventual stability in the demand for services.

The interesting potential suggested by these considerations is that ONA may provide needed impetus to triggering the period of rapid growth in the use of enhanced services.

Affects of ONA on End Users

End-users are the primary public served by regulation. ONA deals primarily with intermediary services, that is those services not used directly by end-users, but by enhanced service providers to construct end-user services. The effect of ONA on end-users depends on how ONA affects the ESPs.

To the extent that ONA facilitates the offering of enhanced services by BOCs or independent ESPs, end-users will benefit from the opportunity to use those enhanced services. When they opt to use offered enhanced services, the services are worth at least as much to the end-user as the charges incurred. Of course, normally the benefits actually exceed the costs.

ONA is structured to encourage competition among enhanced service suppliers. The availability of tariffed ONA services will permit ESPs to enter the market without incurring a heavy price for negotiating with the LEC for the services. A key part of the overall strategy in ONA is the provision that allows BOC entry into the enhanced services market without the burden of a separate subsidiary. The result of these factors may be the emergence of a reasonably competitive enhanced service market. The end-user should benefit from the resulting enhanced-service market discipline. Competition should push service offerings toward more value at lower costs.

To the extent that ONA advances the network capability and increases its use, the end-user will benefit from an enriched telecommunications environment which may have value in addition to that of the enhanced services themselves.

ONA is a regulatory declaration favoring the unbundling of services. ONA may affect how other services are offered by creating at least an expectation that telephone services should be unbundled. The end-user may benefit from an increasing array of LEC service offerings permitting the selection of exactly what services are desired from an increasing availability of network services. The structure of the basic ONA model suggests that BSEs that work with more than one BSA will be identified. Expected tariff structures will identify all BSEs and list those BSAs for which individual BSEs are compatible. Many of the BSEs are currently available to users of local access services and are referred to as vertical services that are generally offered separately for each access arrangement. For example, Centrex features can be purchased in the Centrex tariff and used with Centrex access. Identical features may be available for other access arrangements such as trunks. For those services the customer does not buy the Centrex feature but a trunk feature. The ONA concept offers features such as BSEs which are to be available on all compatible BSAs. While not an immediate requirement of ONA this tariff concept can reasonably be expected to be introduced in local service tariffs. Figures 3-3 and 3-4 depict the change in tariff organization that would result from adoption of ONA principles within the local exchange tariffs.

An increase in the availability of enhanced services, an increasing competitive telecommunications service market, improvements in the technologies available, and

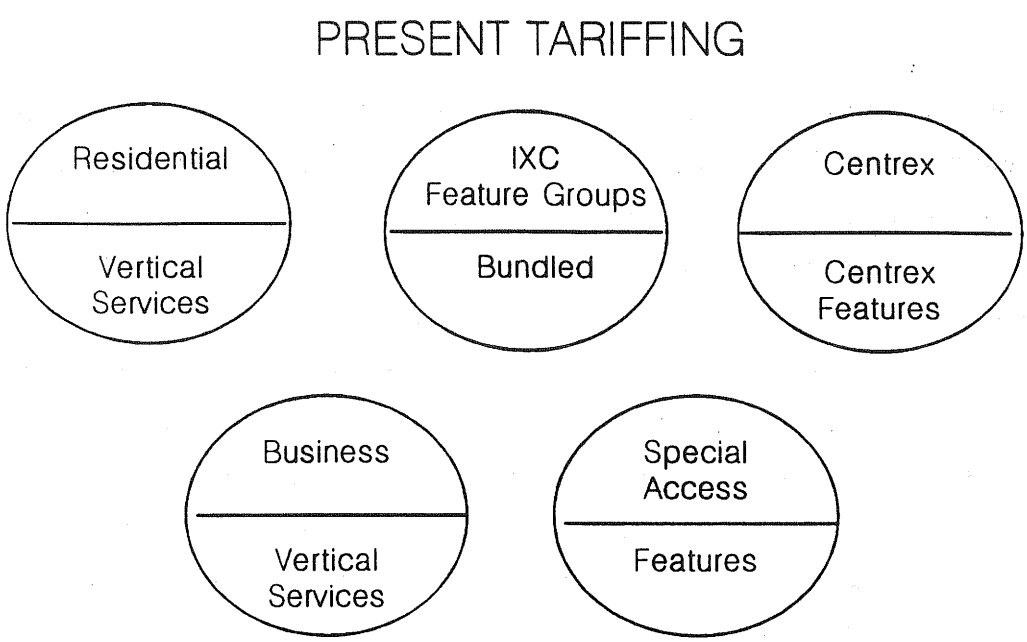

Fig. 3-3. Features and vertical services are unique to access choice.

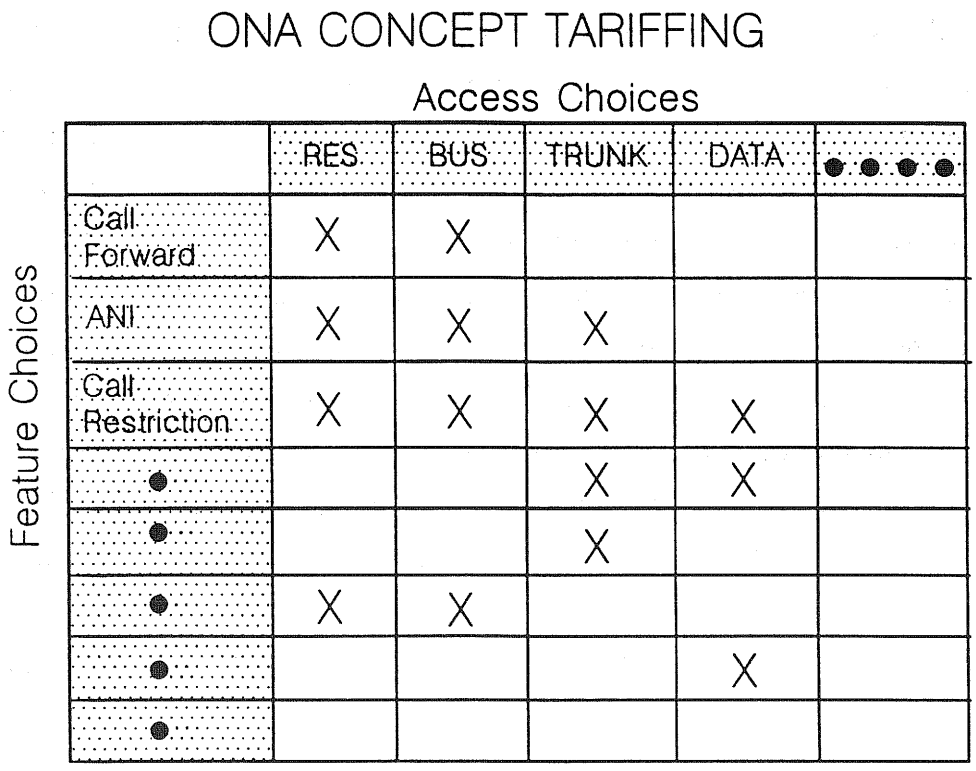

Fig. 3-4. Features available with all compatible access.

unbundling of other services all are possible positive end-user effects that can reasonably be expected from the introduction of ONA. Not all possible effects are necessarily positive for all end-users, however.

Enhanced services will not necessarily become available to all end-users at the same time. If enhanced services that are particularly valuable to some businesses are offered they could provide a business advantage to those choosing them. Competitive businesses that did not use those services, perhaps because they are unavailable in their locations, will be disadvantaged relative to their competitors. Those end-users would not perceive ONA as advantageous.

Implementation of ONA and the offering of specific ONA services can be costly. Demand for the services may lag the investments or may even not develop at all. To the extent that ONA revenues do not cover implementation costs the end-users may be hurt by higher rates for basic services or by service from a financially troubled LEC.

Another cost of change is the necessity of learning about the change and adjusting to it. End-users will need to be taught about the benefits and risks of the new services and then allowed to choose those that are advantageous. Few of the "benefits" of improved telecommunications have been universally applauded. The demise of the end-to-end service responsibility of the Bell System was difficult for many end-users (subscribers as they were called) as they found that their expanded ability to choose carried with it a responsibility to understand more about their telecommunications system. Current debates of the virtues of caller ID services are indicative of the diversity in views that exist in regard to expanding technological capability. With ONA implementation businesses will have to evaluate additional services available from ESPs, otherwise they may let their competitors gain an advantage. If tariffs are restructured for end-users in the ONA mold, they will need to change their telecommunication management practices. Adjusting to ONA is one of the affects on end-users. For many, the adjustment may be more costly than the benefits, at least in the short-run.

Conclusions

It is difficult to assess winners and losers in ONA. Conceptually ONA is promising. Its implementation will be neither costless nor free from controversy. State regulators will be called upon to sponsor aspects of implementation, to arbitrate disputes, and to manage aspects of ONA to protect public as well as individual interests. No one group controls the effects of ONA. An aggressive implementation by the BOCs does not guarantee that ESPs will emerge. End-user acceptance of ESP services is not assured. ONA has the potential to accelerate the emergence of information technology for the general benefit, but to a large extent its success will depend on the simultaneous response of the three sets of principal participants, the LECs, the ESPs and the end-users.

CHAPTER FOUR

ONA ISSUES FOR STATE REGULATORS

The preceding chapters have introduced the ONA concepts, providing a general framework for considering the more specific issues that will arise with implementation. This chapter introduces a number of ONA issues that may require state commission attention.

Each issue is identified and a description of the issue is provided. A discussion follows highlighting some of the considerations appropriate for the issue. These issue sheets do not answer the questions that they pose. Frequently possible resolutions will conflict with some of the goals commonly pursued by the states, while serving other goals. The state commission is the appropriate forum to resolve such conflicts. Other issues are difficult to resolve because so little is known currently about some aspects of implementation that the feasible alternatives are not clear. In other instances, resolving the issue will depend on the degree to which regulated and non-regulated stakeholders are embracing the ONA concepts and the services becoming available. These responses are likely to be localized, therefore no one solution will be best for all states.

State regulatory personnel can use this set of issues to assess the regulatory needs for their state. Possible administrative practices for implementation can be formulated with a better understanding of the subject matter that will need to be handled. Resources, particularly the staff skills necessary to implement the state's program, can be estimated with the knowledge of the regulatory issues to be faced.

The first issue presented is "Establishing State ONA Objectives." The next four issues deal with jurisdictional issues. These are followed by eight tariffing issues and eight addressing costs and prices issues. The final four issues deal with facilities deployment.

List of Issues

Subject:	Issue:
Objectives	Establishing state ONA objectives
Jurisdiction	Determining jurisdiction over enhanced services
	Determining jurisdiction over the local loop
	Preemption of intrastate BSE and BSA regulation
	Determining jurisdiction over BSAs and BSEs
Tariffing	Differences in the regulation of BSAs and BSEs
	Classification of ONA services, BSEs vs. ANSs
	ESP access charge exemption and state ONA tariffs
	Mix-and-match restrictions in state tariffs
	WATS access lines and state ONA tariffs
	Use and user restrictions in state ONA tariffs
	Price discrimination in state ONA tariffs
	BSAs and alternative local exchange carriers
Costs/Prices	Accounting treatment of software upgrades
	Effects of ONA on cost-allocation factors
	Effects of ONA on jurisdictional cost separations
	Effects of ONA on cost-separation rules
	ONA-induced pressures on other service prices
	Residual pricing of BSAs
	Costing methods for cost-based pricing of BSEs
	Feature group replacement pricing and POTS
Deployment	Timing ONA investments and new BSEs
	Evaluating non-availability of specific services
	Identifying desirable services
	Universal ONA services

Issue: Establishing state ONA objectives

Description: ONA is an important concept in telecommunications regulation. The federally imposed requirements on the LECs and the emergence of pressures on the state regulators to follow practices compatible with the ONA framework may lead the state to identify objectives for their responses to the ONA issues.

Discussion: The regulatory practices of an individual state may not be optimal for considering the issues introduced by ONA. Choosing several primary objectives may facilitate the evaluation of existing programs and the design of process improvements. Among candidate objectives are:

1) Insulating basic service prices from support of ONA services;
2) Supporting state economic development objectives through the deployment of advanced telecommunications infra-structure;
3) Maximizing the LEC's financial viability by encouraging increased use of the network;
4) Encouraging the emergence of competition in enhanced services; and
5) Efficient use of scarce regulatory resources.

JURISDICTIONAL ISSUES

Issue: Determining jurisdiction over enhanced services

Description: State and federal regulators can impose different regulatory regimes on enhanced services. An enhanced service could be regulated in one jurisdiction and not another.

Discussion: In the past, it was not necessary to determine which regulatory authority had jurisdiction over an enhanced service because the Federal Communications Commission had preemptively deregulated all enhanced services. All this changed when the Ninth Circuit Court of Appeals issued its *California v. FCC* decision. The states now have the authority to choose the regulatory regime that will apply to intrastate enhanced services. This regime can be different from the one imposed on an identical interstate enhanced service. Because different regulatory regimes can be applied to the same enhanced service, it is necessary now to establish who has the right and responsibility to make this choice. This task will require innovative thinking on the part of state and federal authorities. Enhanced services are not provided in the same way all of the time, and they are not provided in the same ways that interexchange carriers provide basic voice and data services. Yet, the existing methods for determining who has regulatory jurisdiction over a service are based on how basic voice and data services are provided. The voice and data model determines jurisdiction by the location of the calling and the called parties. The problem is that these methods appear inappropriate when used for determining the regulatory jurisdiction over an enhanced service.

Issue: Determining jurisdiction over the local loop

Description: State regulatory authorities have had the primary responsibility of regulating the local loop. This responsibility may be shared after ONA implementation.

Discussion: The local loop may be defined as all of the physical plant and equipment that connects an end-user (such as a residential subscriber) to the telecommunications switch serving that end-user. The local loop does not contain the software and hardware that make up the serving telecommunications switch. Although most BSEs are software features and functions, this does not mean that ONA implementation will not affect jurisdictional responsibility for regulating the local loop. In principle and in actuality, the BSA can reach as far as the end-user. This is the case for interstate BSAs which has three transportation legs--the facilities connecting an ESP to a Bell Operating Company switch, the switch to another Bell Operating Company switch, and this second Bell Operating Company switch to the end user. The third leg of the interstate BSA is what traditionally has been known as the "local loop" or the "last mile" of an interexchange carrier access service. As long as the third leg remains a nonseverable part of a BSA, ONA implementation should not affect too drastically current regulatory responsibility over the local loop. However, the current sharing of this regulatory responsibility between state and federal regulators will be affected significantly if the third leg of the interstate BSA is severed. Then it would be possible for third parties such as alternative local exchange carriers to provide the facilities and services that connect an end-user's premises to the local exchange company's switch serving that customer. Facilities-based competition will have been injected into the heart of the local exchange--the local loop--under the umbrella of the more fundamental unbundling of the interstate BSA.

Issue: Preemption of intrastate BSE and BSA regulation

Description: Federal court cases have established conditions on Federal Communications Commission preemption of state regulation. Regulatory and judicial interpretations of these cases will determine when state jurisdiction over a BSE or BSA can be voided.

Discussion: Four federal court cases are of particular interest. *NARUC I* and *NARUC II* established that state regulations can be preempted when the production and sale of the federally regulated portion of a product or service cannot be severed from the production of the state regulated portion of the product or service. The nonseverability doctrine was upheld in *Louisiana PSC v. FCC.* The United States Supreme Court applied this doctrine to the federal preemption of state depreciation rates and practices and found that these state rates and practices could be severed without harm to the Federal Communication Commission's deprecation policies. Consequently, the intrajurisdictional costs of dual regulated products and services can be determined independently whenever federal policies related to these costs are not placed at risk. The nonseverability doctrine as clarified was applied in *California v. FCC.* The Ninth Circuit Court of Appeals vacated the federal preemption of state regulatory authority over intrastate and intrastate-interstate enhanced services, finding that the dual regulation of these services was feasible. Also, the Federal Communications Commission could not reinstate that preemption until it proved that existing state regulations would thwart or impede relevant federal policies. Furthermore, any federal preemption of state regulations must be focused on the specific state regulations, suggesting that states can adopt new regulations to replace the federally preempted regulations.

Issue: Determining jurisdiction over BSEs and BSAs

Description: BSEs and BSAs are similar to some existing services. The existing method used for determining jurisdiction over these services may not be appropriate for BSEs and BSAs.

Discussion: It is debatable whether BSEs and BSAs are most closely related to local exchange or access services. The Federal Communications Commission has embraced the "access analogy" and redefined interstate access services to conform to the ONA terminology. However, it has not chosen to implement the "access analogy" completely. It did not chose a method for determining jurisdiction over a BSE or BSA. A candidate is the method used to determine jurisdiction over switched- and special-access services. This method is a composite of two rules: A voice call or data message is jurisdictionally interstate when it originates in one state and terminates in another. The jurisdiction of the voice call or data message determines the jurisdiction of the switched- and special-access services. The problem is that these two rules may not be applicable to BSEs and BSAs for two reasons. First, there is no compelling physical reason why the jurisdiction of an enhanced service should determine the jurisdiction of BSEs and BSAs used in its production. Second, the processing of an enhanced service--even though every enhanced service has a voice call or data message foundation--may not be consistent with the application of the originating location-terminating-location approach to jurisdictional determination. The second reason requires further explanation. Many enhanced services are processed in discrete segments, some of which use the background processing functions of verifying passwords and computer access codes. Other segments involve downloading information contained in remotely located, central-data bases to locally located, temporary-memory banks. This distributed processing throws the validity of the existing jurisdictional methods into question.

TARIFFING ISSUES

Issue: Differences in the regulation of BSAs and BSEs

Description: State and federal regulators may want to regulate identical BSEs and BSAs differently. BSEs and BSAs might be local exchange services when tariffed in the state jurisdiction, and access services when tariffed in the federal jurisdiction.

Discussion: State and federal regulatory authorities have asserted jurisdiction over BSEs and BSAs. The *Louisiana PSC v. FCC* decision, issued by the United States Supreme Court, virtually guarantees the legality of this dual regulation. The *California v. FCC* decision, issued by the Ninth Circuit Court of Appeals, establishes the presumption of intrastate, interstate, and interstate-intrastate enhanced services. If intrastate enhanced services are to be produced with intrastate BSEs, BSA, and so on, then state and federal authorities have to determine the conditions under which they have exclusive or shared jurisdiction over BSEs and BSAs. Establishing these conditions prior to or immediately after ONA implementation is important because BSEs and BSAs are new services, logically speaking. These new services will be factors in the evolution of local exchange, interstate access, and intrastate access services. Some difficult regulatory problems are likely to arise if these evolutionary paths are inconsistent because state and federal regulatory authorities choose to regulate BSAs and BSEs differently. Consider, for example, the complications that will arise when interstate BSEs and BSAs are treated as access services and intrastate BSEs and BSAs are treated as local exchange services. Under most current state regulatory rules, interexchange carriers cannot purchase local exchange services. Interexchange carriers, consequently, will be not be able in principle to use BSAs and BSEs to produce intrastate basic and enhanced services; however these carriers will be able to use BSEs and BSAs to produce interstate basic and enhanced services.

Issue: Classification of ONA services, BSEs versus ANSs

Description: Ancillary service may be an alternative classification for what otherwise would be a BSE. This alternative can be a source of strategic advantage to affiliated ESPs.

Discussion: Ancillary services are meant to represent services that can be provided by parties other than the Bell Operating Companies even though they may be unable to provide these services as efficiently. An example is billing and collection services. The Federal Communications Commission has decided that ancillary services are deregulated services, which presumes that other firms can provide these services at least as efficiently as the Bell Operating Companies. A similar decision is still pending in many state jurisdictions. Intrastate ancillary services, as a result, may be services that are unavailable from third parties at the same level of quality provided by the Bell Operating Companies. If state ONA implementation rules are structured to place more stringent requirements on the development, deployment, availability, and pricing of BSEs and BSAs than what is placed on ancillary services, incentives are created that push the Bell Operating Companies to use this classification more and more. Although this classification provides technological flexibility to the Bell Operating Companies, it also provides strategic advantages to affiliated ESPs. On the one hand, Bell Operating Companies would not have to develop technologies to meet bona fide requests for intrastate ancillary services. On the other hand, they would be able to price discriminate in favor of their affiliates if ancillary services are available on a detariffed basis.

Issue: ESP access charge exemption and state ONA tariffs

Description: The ESP access charge exemption allows an ESP to avoid paying interstate access charges. An ESP, however, cannot use interstate BSEs in combination with the access charge exemption. It is an open issue whether an ESP can use intrastate BSEs in combination with the access charge exemption.

Discussion: The access charge exemption enables an ESP to produce an interstate enhanced service without purchasing an interstate BSA. An ESP can purchase a local business service which may be offered on a flat-rate or usage-sensitive basis. While an ESP cannot purchase interstate BSEs when it exercises the access charge exemption, state regulatory authorities may not impose the same restrictions on the use of intrastate BSEs. As a result, an intrastate BSE might be used in combination with the access charge exemption. Such a result is a certainty when an intrastate BSA is a local business service. This raises the question of interjurisdictional tariff shopping. Consider what can happen when an ESP producing an interstate enhanced service compares the total price of a local business service and attendant intrastate BSEs with the total price of a comparable interstate BSA and attendant BSEs. If the total price of the local business service and intrastate BSEs is less than the total price of the interstate BSA and BSEs, then the ESP is expected to exercise the access charge exemption. In doing so, this ESP has engaged in interjurisdictional tariff shopping. There are at least other two ways that state authorities can deter this type of ESP behavior: interjurisdictional price parity can be established between the competing service combinations, or the state tariffs can prohibit the use of intrastate BSEs when an access charge exemption is exercised at the federal level.

Issue: Mix-and-match restrictions in state tariffs

Description: An ESP or interexchange carrier cannot combine interstate BSAs or BSEs with any intrastate service. The objective is to eliminate interjurisdictional tariff-shopping opportunities.

Discussion: The Federal Communications Commission's mix-and-match restriction prevents substituting low-priced interstate BSEs or BSAs for higher-priced intrastate BSAs or BSEs. Except for the "access charge exemption anomaly" (see ESP access charge exemption and state ONA tariffs) and "WATS access-line anomaly" (see WATS access-lines and state tariffs), this restriction also prevents the substitution of low-priced intrastate BSEs for higher-priced interstate BSEs. Consequently, state and federal regulatory authorities can set prices for some interstate and intrastate BSEs and BSAs without concern about interjurisdictional tariff shopping. As a result, state regulatory authorities are often in the position to set prices of intrastate BSAs and BSEs that support universal service and contributions to local services earned from the sale of vertical services such as call forwarding and call waiting. For example, state regulatory authorities can establish "price parity" between vertical services and the intrastate BSEs that compete with these services. Recall that a vertical service (that is, a complementary network service in ONA terminology) is purchased by end-users, while intrastate BSEs are purchased primarily by ESPs and interexchange carriers. Another option which may be available to state regulatory authorities is to ban production of intrastate BSEs that compete with vertical services as long as state authorities allow ESPs and interexchange carriers to purchase vertical services directly for their own use.

Issue: WATS access lines and state ONA tariffs

Description: Special procedures are used to determine the jurisdiction over WATS access lines. These procedures can create incentives to misreport the percent interstate usage of jurisdictionally mixed BSAs to take advantage of interjurisdictional tariff-shopping opportunities.

Discussion: Every WATS access line is assigned either to state or federal jurisdiction. The foundation of this procedure is to determine the percent interstate usage of a WATS access line. If it is 100 percent or zero percent, the WATS access line is assigned to federal or state jurisdiction, respectively. If the usage is more than 10 percent, it is assigned to the federal jurisdiction under the Federal Communications Commission's "contamination" and "di minimis" doctrines. If the same procedures are applied to a BSA (a building block for a WATS access line), then there will be instances where a jurisdictionally mixed BSA is assigned either to the state or federal jurisdiction. If the jurisdiction of a BSE follows the jurisdiction of BSA, there will instances where a jurisdictionally mixed BSE will be assigned either to the state or federal jurisdiction. However, there also will be instances where a jurisdictionally pure BSE will be assigned to the wrong jurisdiction. Consider a situation where a BSA is used to produce WATS service and one intrastate enhanced service. Assume that the production of the intrastate enhanced service requires the purchase of an additional BSE. As long as the percent interstate usage of the BSA is more than 10 percent, the BSA is assigned to the federal jurisdiction. If the BSE assignment follows the BSA assignment, then the BSE also is assigned to the federal jurisdiction even though its usage is 100 percent intrastate. However, the ESP has an incentive to report the percent interstate usage of the BSA as less than 10 percent if the total price of the intrastate BSE and BSA is less than the total price of the interstate BSE and BSA.

Issue: Use and user restrictions in state ONA tariffs

Description: Any entity can use interstate BSAs and BSEs for any purpose. Intrajurisdictional tariff shopping is absent if these BSAs and BSEs replace the existing access services. Intrajurisdictional tariff shopping can arise, however, if these BSEs and BSAs compete with existing access services. The same results hold for intrastate BSEs, BSAs and access services.

Discussion: If intrastate BSEs and BSAs are classified as a local exchange service without use restrictions, current subscribers to intrastate access services then can choose between these BSEs and BSAs and their existing services. If the total price for the BSEs and BSA that replicate the relevant access service is less than the total price of that access service, then the lower priced BSA-BSE equivalent is substituted for higher-priced access service, causing a feedback effect on the prices of other services when additional conditions are met. Assume that the price of the access service does not change after BSEs and BSAs are available for sale. Assume that substituting a BSE-BSA equivalent causes the regulated firm to earn *less* revenues. (The demands for BSEs and BSAs are inelastic.) Assume that the regulated firm's costs are *identical* before and after the substitution of BSEs and BSAs for access services. (The addition of new services and the retention of old services does not result in a decrease in the regulated firm's costs.) Assume that the firm earns the same profit before and after the substitution of BSEs and BSAs for the access services. (Regulation holds the firm harmless from the effects of new service introductions at lower prices.) Then the revenue loss due to service substitution must be made up elsewhere, and the first two assumptions preclude intrastate access services as a candidate. The first assumption prevents intrastate access costs from rising. If the first assumption is violated, the second assumption ensures that the firm will lose more revenue as the price of intrastate access is increased.

Issue: Price discrimination in state ONA tariffs

Description: BSAs and BSEs are produced and sold by regulated firms that are competing in the enhanced services market. Even if the mode of competition for these regulated firms is a fully separated enhanced services subsidiary, there are price discrimination tactics by the regulated firm that disadvantage nonaffiliated ESPs.

Discussion: One form of price discrimination occurs when some buyers pay more for the same service than other buyers. Regulators equipped with price parity rules can prevent this activity; that is, they can ensure that ESPs affiliated and not affiliated with the regulated firm producing BSEs and BSAs pay the same price for the same services. Another form of affiliate-nonaffiliated price discrimination occurs when the prices for BSEs and BSAs used by the nonaffiliated ESPs to produce one set of enhanced services are higher than the prices of the BSEs and BSAs used by the affiliated *and* nonaffiliated ESPs to produce a different set of enhanced services. This result can occur either as a result of the application of rules relating to cost allocation rules or contribution levels above incremental cost for individual BSAs and BSEs. Regulators can prevent this activity by monitoring the regulated firm's pricing and costing behavior. A final form of affiliated versus nonaffiliated price discrimination is when these firms use different BSEs and BSAs to produce the same set of enhanced services. This result also can arise from the application of cost-allocation and contribution-level rules. In this instance, nonaffiliated ESPs care when the prices for their BSEs and BSAs are higher than the prices for the BSEs and BSAs used by the affiliated ESPs. Price parity rules and monitoring procedures are not sufficient to prevent this form of BSA-BSE price discrimination.

Issue: BSAs and alternative local exchange carriers

Description: Under the FCC Part 69 Order, the purchase of BSEs must be joined with the purchase of a bundled BSA from the LEC. These BSAs are mandated to include the local transport between the ESP and the LEC switch and the interconnection of the end-user's premises and the switched network. State commissions may wish to allow alternative local exchange providers to interconnect with the LEC's network and purchase BSEs from the LEC to provide services to ESPs and end-users.

Discussion: The New York Public Service Commission has issued an interconnection order and the FCC has also opened an interconnection docket, both of which begin to address the issue of unbundling BSAs. A state commission may wish to address the issue of unbundling BSAs from the outset of considering ONA. The competitive pressures on the prices of BSAs will raise several additional issues of cross-subsidization and predatory pricing. Residual pricing of BSAs no longer would be possible. Furthermore, some realignment of the prices of BSEs under this regime may result. A commission may also face increased pressure on POTS prices.

COSTS/PRICES ISSUES

Issue: Accounting treatment of software upgrades

Description: Most BSEs are software-derived features and functions of the local switch. Software upgrades for electronic switches are treated as expenses rather than capitalized. Consequently, new BSEs may be derived with no additional investment entering the rate base, but an expense entering the revenue requirement only in the first year the new BSEs are derived. This circumstance creates pricing and equity problems for commissions desiring to match revenues with accounting-based costs.

Discussion: The current accounting practice for switch software is to capitalize initial expenditures for software essential to operating the new switch, and expense all other switch software expenditures, including software upgrades. Accounting theory applies two criteria to the determination of whether an expenditure is capitalized or expensed. First, an expenditure is capitalized if it has benefits beyond the current accounting period. Second, a materiality standard is applied. That is, if the expenditure is less than some percentage of total cost for the accounting period, it is expensed because it does not materially affect the company's capitalization. Since new BSEs generate revenues into future accounting periods, cost-revenue matching suggests that the switch software upgrades that create new BSEs should be capitalized. The materiality standard, on the other hand, may indicate expensing is appropriate.

There is an equity issue of the timing of expenditures and cost recovery. Expenses reflected in initial prices will not be incurred in future periods. Questions regarding the appropriate unit of measure for the materiality standard will arise on an expenditure-by-expenditure basis, or applied in light of the telephone company's strategic plan to upgrade the capabilities of all similar switches.

Issue: Effects of ONA on cost-allocation factors

Description: The nature of technologies and the characteristics of services can be used to select cost-allocation factors. ONA implementation affects the firm's technologies and services, and hence the selection of cost-allocation factors.

Discussion: Usage-based cost-allocation factors dominate the separation of total costs and regulated costs. There are, however, many usage measures that can be used as usage-based cost-allocation factors. Currently, traffic-volume measures such as access minutes of use or conversation minutes of use play the most important roles in the processes used to separate regulated costs from unregulated costs and intrastate costs from interstate costs. ONA implementation casts a long shadow on the continued applicability of traffic-volume measures of usage. Many new and restructured BSEs are computer-based features and functions. It may be that the BSE costs are more influenced by the storage, memory, and processing capabilities of the central and remote telecommunications switches than by the actual volume of traffic handled by these switches. If this conjecture turns out to be true, then milliseconds of processing time, megabytes of storage, and the like could replace access minutes of use and conversation minutes of use as the dominant cost-allocation factors for BSEs. Yet, there are many unanswered questions associated with the widespread use of cost-allocator factors based on the technical characteristics of telecommunications switches. Regulated firms use more than one vintage and more than one type of switch. There are digital and analog switches, stored program controlled switches and mechanical switches. Presumably, switch manufacturers' production-design decisions trade processing speed for memory capabilities. These complications cast substantial doubt on whether computer-based cost-allocation factors can be substituted for usage-based cost-allocation factors on a widespread basis.

Issue: Effects of ONA on jurisdictional cost separations

Description: A portion of ONA implementation is the introduction of new or restructured services. While restructured services have demand histories useful for cost-separations purposes, new services have only untested demand forecasts. This difference will cloud what clarity the jurisdictional cost-separation process currently possesses.

Discussion: Separating the costs of a *partially regulated* telecommunications firm is divided into two stages. The first stage, pursuant to federal rules, is to separate regulated and unregulated costs. The second stage is to separate intrastate regulated costs from interstate regulated costs. The latter is called jurisdictional cost separation. The mechanics of both separations stages are dominated by actual and estimated minutes of use. The domination of the cost separations process by usage measures is entirely acceptable when existing services are seldom restructured and new services are introduced intermittently and deliberately. Then demand histories are long, trends over time are readily identifiable, and forecasts are relatively stable and statistically robust. Consequently, the actual separation of the firm's costs is predictable. These are desireable characteristics for cost-separations purposes. They disappear, however, in direct proportion to the pace at which existing services are restructured and new services are introduced. Restructured services reduce the usefulness of past demand histories because prices and service configurations have changed. It is, therefore, more difficult to identify trends for newly restructured services. New services simply do not have demand histories, and their forecasted demands are untested in the marketplace. Thus, the separation of total costs (and subsequently regulated costs) are less predictable over time. Jurisdictional costs are less likely to equal jurisdictional revenues in the current period and over time. More surprises will occur over time if the two cost-separation stages continue to be dominated by actual and estimated minutes of use.

Issue: Effects of ONA on cost-separation rules

Description: Factors attendant to ONA implementation have damaged the foundation of current cost-separation rules. Significant procedural changes to these rules may be required to repair this damage.

Discussion: Current federal rules require regulated costs to be separated from unregulated costs before intrastate costs are separated from interstate costs. ONA implementation was not meant to affect this sequence. It was presumed that BSEs and BSAs--the substance of ONA implementation--would be regulated and enhanced services would be unregulated. This changed when the Ninth Circuit Court of Appeals issued *California v. FCC.* It no longer could be presumed that enhanced services would be deregulated. Additionally, *California v. FCC* allows partially regulated firms to integrate the production of basic and enhanced services and to fully separate their administration, marketing, and sale. It is possible for unregulated or regulated enhanced services to be offered subject to a fully separate subsidiary constraint, while their production can be subject to nonstructural and accounting safeguards. These possibilities strongly suggest that fundamental changes to the current cost-separation sequence should be considered. It seems that the separation of intrastate costs from interstate costs could occur before the separation of regulated costs from unregulated costs. This sequence reversal would enable state and federal regulatory authorities to follow different policies relating to the regulation of the enhanced services market with minimal effects on the public policies guiding the jurisdictional cost-separation process.

Issue: ONA-induced pressures on other service prices

Description: Intrastate BSAs and BSEs may compete with other intrastate services. Additionally, BSA-BSE combinations may be substitutes for access services. Both possibilities can affect prices and profits.

Discussion: BSAs and BSEs can be used to produce intrastate end-user services. When they are substituted for, but do not replace, existing factors of production such as intrastate switched- and special-access services, end-user prices can change. If the total price of the BSA-BSE substitute is less than the existing price of switched access service, then the price of intrastate message toll service can fall. If the total price of the BSA-BSE substitute is equal to or greater than the existing price of the switched-access service, there should be no change in the price of intrastate message toll service. The same is true for intrastate data, enhanced, and information services, regardless of what existing intrastate service is used as a factor of production. In fact, the BSA-BSE substitute eventually would replace the existing service wherever substitution opportunities are sufficiently widespread. An identical situation arises when BSEs or BSAs compete directly with existing intrastate services such as residential and business service or vertical services such as call forwarding. The prices for the existing services can fall but not rise. Yet, falling and constant prices imply falling revenues and lower profits unless the lower prices sufficiently stimulate new demand or the introduction of BSE-BSA substitutes is associated with a reduction in the firm's total costs. If a reduction in total cost does not occur, then revenue and profit reductions are avoided if and only if demands for existing end user services are sufficiently elastic.

Issue: Residual pricing of BSAs

Description: The FCC ordered that BSAs be residually priced once the prices of BSEs and the expected quantities demanded were determined. The residual pricing was required to meet the FCC's revenue-neutrality constraint. In other words, all revenues not recovered by BSEs are loaded on BSAs. State commissions may wish to adopt other methods of determining the prices of BSAs.

Discussion: Residual pricing of BSAs implies that the prices are not cost based, but instead designed to assure the revenue requirement not recovered by prices for BSEs are captured. Such prices are not necessarily economically efficient in that the price signals sent to IXCs and enhanced service providers may not result in efficient selection of BSAs.

An alternative approach that retains revenue neutrality would be to estimate the costs of BSAs and formulate prices for both BSAs and BSEs on the basis of costs. Under an incremental-costing approach, cost-based pricing of BSAs and BSEs would allow the state commission to scrutinize the loading of shared and common costs to BSAs and BSEs simultaneously. One should expect, in theory, some form of Ramsey pricing to be proposed by the LECs. Under a fully distributed-cost approach, the apportionment of costs to BSAs and BSEs would enable a state commission to evaluate rates of return earned by proposed prices for BSAs as well as BSEs. Furthermore, state commissions that do not require IXCs and enhanced service providers to join LEC-provided BSEs to LEC-provided BSAs may evaluate the price signals given to alternative local exchange providers who supply local transport to IXCs and enhanced service providers.

Issue: Costing methods for cost-based pricing of BSEs

Description: The FCC has dictated that prices for BSEs be cost based, while BSAs be priced residually. However, it left the choice of the costing method up to the telephone company. Costing methods adopted for interstate BSEs may not be compatible with costing methods adopted by state commissions. Consequently, state commissions will have to address the costing methods employed in determining the cost basis for BSE prices.

Discussion: Under the FCC Part 69 Order, the prices of BSEs may be based on incremental costs, based on fully distributed costs, or designed to recover the costs for a grouping of BSEs and other access functions (so called flexible or strategic pricing). With incremental and fully distributed costs, a state commission can assess directly the correspondence on the costing method used at the federal level and costing policies espoused or adopted in the state. In this circumstance, the state commission must decide whether to mirror methods used at the federal level or require the company to perform cost studies in accordance with state practices.

When the telephone company used flexible or strategic pricing to determine the prices of BSEs, the state commission with clearly delineated pricing practices must evaluate the implications of mirroring federal prices for BSEs. Prices in this context are not cost based in the traditional sense. Each price is designed either to recover an overall cost for a grouping of BSEs and other access functions, or to force selection of BSEs based on a strategy of implementing volume discounts. In both cases is it difficult to evaluate the extent of price discrimination and cross-subsidization in the prices for BSEs.

Issue: Feature group replacement pricing and POTS

Description: The FCC dictated that the existing Feature Groups A, B, C, and D be eliminated and be replaced with BSEs and BSAs in a manner that is revenue neutral. Prices for BSEs are to be formulated and BSAs priced residually. There is no assurance, however, the IXCs will select BSEs and BSAs with the new price structure in a way that is revenue neutral. Revenue surpluses and deficiencies will create pressure on the price of POTS.

Discussion: With the ONA concept and associated pricing structures replacing existing feature groups, an IXC can choose various combinations of BSEs and BSAs to configure its access to and from the local switched network. The previous four access tariffs are being unbundled into two BSAs and several BSEs. Conceptually, the LEC would anticipate IXCs' selection of BSEs and BSAs in formulating revenue neutral prices. However, the ultimate price to the IXCs' customers that incorporate the ONA concept will determine the quantity of toll services consumed and, as a result, the usage of BSEs and BSAs. Incorrect demand forecasts and vaguely perceived demand elasticities for BSAs, BSEs, and toll services render the price setting an imprecise science. Revenue surpluses and deficiencies resulting from this new price structure may create pressures on the price of POTS in the future.

State commissions must address their possible reaction to revenue surpluses and deficiencies in the interstate and intrastate jurisdiction. Should POTS or enhanced services bear the burden? What type of mechanisms can be designed to monitor revenue surpluses and deficiencies? If a state commission does not have pricing flexibility under a price-cap plan or similar mechanism, what is the appropriate process to institute?

DEPLOYMENT ISSUES

Issue: Timing ONA investments and new BSEs

Description: Strategic behavior on the part of telephone companies may make it difficult to associate investments with the introduction of new BSEs. The crux of the issue is timing the investments relative to introducing new BSEs. Cost-based prices for BSEs will be distorted relative to actual underlying cost causation when telephone companies engage in this strategic behavior.

Discussion: Many investments in the local network require the telephone company to acquire more capacity than initially required and grow into it over the planning horizon. This occurs because vendors only supply functions of switches in certain sizes or an economic analysis indicates long-term cost savings from installing too much initially rather than retrofitting additionally capacity to existing facilities later. In other words, capacity is lumpy.

By staging the introduction of BSEs strategically, a telephone company can incorporate in prices the expenditures for capacity with a set of BSEs used by IXCs and competing enhanced service providers today and later add BSEs for a new enhanced service the telephone company wishes to introduce and promote. What is clear is that the competing enhanced service providers and IXCs may have paid for a portion of the telephone company's new enhanced service. The dilemma of associating investments to the BSEs for the new enhanced service may be difficult, if not impossible. Is it a direct or indirect cost of the new BSEs and enhanced service? Stated differently, is it an incremental cost of the new enhanced service? State commissions may have to examine the potentialities on new ONA investments more fully than past circumstances may dictate. Accounting conventions for potential strategic investments may have to be developed or standards for incremental-cost analysis adopted.

Issue: Evaluating nonavailability of specific services

Description: Evaluating the non-availability of identified services is a means of oversight of the deployment practices of the LEC by the Commission. The service might not be available either because the LEC does not have the facilities to support the service or it may have chosen not to offer the service, even though its network does have the underlying capability.

Discussion: Since offering a service does have a direct cost, the most obvious reason for not offering the service is that it is too costly. The explanation may be offered in regard to required facilities changes, or may even be offered in regard to the direct cost of creating the tariff, getting approvals and administering its use. Pursuit of an investigation of the alleged costs of providing the service is an application of the standard investigative procedures followed by commissions, however, the investigation of the cost of the initial offering of a single service by a LEC will raise interpretive difficulties peculiar to the telephone industry. A Commission that has routinely required some form of cost justification, or evidence, in instances where the LEC has come forward with new offerings on its own initiative can use the practices and procedures established there as a guide for examining the information provided for the non-offering circumstance. Such a practice is particularly attractive because imposing the same expectation on the company in instances where it wishes to establish a new service that is imposed in instances where it is defending its decision not to offer a service introduces a bias toward candid, relevant presentations of the information. At least, patterning the investigation along the lines of the investigations that have already been conducted maximizes the value of staff experience.

Issue: Identifying desirable services

Description: A traditional regulatory approach has been to leave initiatives for both facilities deployment and service definition (tariffing) to the LEC. Since these are the main elements of a business plan, it is unlikely that the regulator can be assured that the LECs performance is satisfactory without some oversight of deployment and service offering choices.

Discussion: Open Network Architecture as developed at the FCC relies upon two techniques to deal with the business plan problems. The first is to provide incentive for the LEC to provision the network to facilitate enhanced services. That is done by allowing full LEC participation in the marketing of those services. By requiring that any functionality used by the LEC in producing those services be tariffed, the FCC improves the availability of services that may be useful to non-LEC enhanced service providers. The FCC goes a step farther by requiring that services requested by independent enhanced service providers be offered unless there is a good reason not to offer them. The implementation of this concept is difficult and considerable suspicion exists as to whether it will work as intended.

A State Commission may believe that something ought be done to open the network and services planning activities of the LEC to others with a legitimate interest in the capabilities available to them. In order to challenge the choices of the LEC a means must be available to the Commission to identify alternatives. The expertise of the potential users of the network is one resource. A Commission may wish to equip itself to identify potential facilities enhancements or service offerings independently from the proposals of the LECs.

Issue: Universal ONA services

Description: The demand for individual ONA services will be diverse. Providing for service availability throughout the LEC's territory may not be practical even though sufficient demand exists in some areas to make the service viable there. The degree to which ONA services must be made universally available is a determination which must be made by the state commission.

Discussion: ONA deployment is intended to be responsive to the requirements of the ESPs. ESPs are a class of users for which the state commission may not have established comprehensive policies. The state will establish the relevant LEC market area for ONA services by determining the scope of the offering. Universal availability will result in higher estimates of the cost of provision and hence require evidence of higher demands to justify the service. Permitting LEC imposed limits on availability can facilitate the offering of specialized ONA services at only a few locations. While permitting such limitations would lower the requirement for initial offerings it could require several analysis of the same service as the offering area expanded. Toleration of limits on availability would contribute to areas within the state that are disadvantaged in regard to the enhanced services available to the end-users. The state commission must balance its interests in efficient deployment and use of the network with its responsibilities to assure adequate services throughout the state.

Issue: BSAs and alternative local exchange carriers

Description: Under the FCC Part 69 Order, the purchase of BSEs must be joined with the purchase of a bundled BSA from the LEC. These BSAs are mandated to include the local transport between the ESP and the LEC switch and the interconnection of the end-user's premises and the switched network. State commissions may wish to allow alternative local exchange providers to interconnect with the LEC's network and purchase BSEs from the LEC to provide services to ESPs and end-users.

Discussion: The New York Public Service Commission has issued an interconnection order and the FCC has opened an interconnection docket, both of which begin to address the issue of unbundling BSAs. A state commission may wish to address the issue of unbundling BSAs from the outset of considering ONA. The competitive pressures on the prices of BSAs will raise several additional issues of cross-subsidization and predatory pricing. Residual pricing of BSAs no longer would be possible. Furthermore, some realignment of the prices of BSEs under this regime may result. A commission may face increased pressure on POTS prices.

Appendix A
A List of Basic Service Arrangements

Circuit Switched

Circuit Switched Line
Circuit Switched Trunk

Packet Switched

X.25 Packet Switched
X.75 Packet Switched

Dedicated

Dedicated Metallic
Dedicated Telegraph
Dedicated Voice Grade
Dedicated Program Audio
Dedicated Video
Dedicated Digital (<64 kbps)
Dedicated High Capacity Digital (1.544 Mbps)
Dedicated High Capacity Digital (>1.544 Mbps)
Dedicated Alert Transport
Dedicated Derived Channel

Dedicated Network Access

Dedicated Network Access Link

Appendix B
A List of Basic Service Elements

Circuit Switched:

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

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

Packet Switched Serving Arrangements

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

Dedicated Access Serving Arrangements

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

Dedicated Network Access Link Serving Arrangements

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

Legend

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

Appendix C
A List of ESP Requested/Not Available Services

Call Forwarding with Call Waiting
Monitor and Barge In
SMDI with Automatic Ring Back
ESP Notification of Client of BOC Control Action
Suppressed Ringing
Trunk Side Connection with Power Ringing
Provision of Sharing an ESP Client Among ESPs
B-Channel Switched and Dedicated Access
D-Channel Data Delivered on B-Channel
Multiple D-Channels on B-Channel
ESP Access to D-Channel Signalling
Feature Node Service Interface
Service Control Point Databases
Access to Future Intelligent Functions of ISDN
Mapping ANI to User ID
Peak Traffic Handling within Exchange Network
Common Channel Signaling Access
Derived Channels Compatible with ISDN
Enable/Disable Network DTMF Signaling
Passive In-band DTMF Tone Transmission
Extend DTMF Tone Set
Tone to Digital Translation
Remote Access to User Programmable Functions (Packet)
Remote Speed Call Menu Builder (Packet)
Speed Call Menu Builder (Packet)
Network Control by Customer from Customer Premises
Name and Address of Calling Party
Suppression of Audible Click on Call Forwarding Interoffice
Privacy (Classes of non-published service)
User Number Associated with Calling Number and/or Svc ID Code
Programmed Default Call Forwarding
Restriction of Outgoing Calls (Packet)

Appendix D

The History of ONA at the FCC

Introduction:

- ONA was first required in the FCC Computer III proceeding
- Computer III was the third in a series of proceedings which began with Computer I in 1966.
- The Computer inquiries focused on the provision of enhanced services by AT&T, the Bell Operating Companies and independent ESPs.
- Enhanced services are computer-based services such as protocol processing, conventional data processing services such as remote banking transactions and information retrieval services.

Computer II (1980)

- Commission distinguished between "basic" services, which are subject to regulation and "enhanced Services" which are unregulated, whether offered by a carrier or non-carrier.
- The question was how to allow large monopoly carriers to offer enhanced services, while ensuring that they do not abuse their regulated monopoly position and act anticompetitively against competing ESPs.
- The answer in 1980 was structural separation.
- AT&T and eventually the BOCs after divestiture objected, saying the conditions were onerous and uneconomical and would impede development of services.

Computer III (1986)

- FCC concluded that there were high cost in imposing separate subsidiaries including lost innovation, inefficiency and delay.

FCC decided to substitute non-structural safeguards, which it decided could work just about as well in preventing discrimination and cross-subsidization, and which would be less costly.

The non-structural safeguards were:

Accounting safeguards to protect against cross-subsidization

Non-discrimination safeguards:

Nondiscriminatory access to basic network services:

Comparatively efficient interconnect (CEI)

Open Network Architecture (ONA)

Nondiscriminatory access to network information

Nondiscriminatory access to customer proprietary network information (CPNI)

ONA -- defined as "the overall design of the carrier's basic network facilities and services to permit users of the basic network, including the enhanced service operations of the carrier and its competitors, to interconnect to specific network functions and interfaces on an unbundled and "equal access" basis." The goals of ONA are two fold: to prevent discrimination, and to promote use of the network by enhanced service providers. ONA will evolve. Initially, ONA has meant tariff unbundling.

ONA includes comparably efficient interconnect requirements:

Technically equal access

CEI pricing, to give incentives for design of low cost connection facilities and realize any true cost efficiencies that the carriers have.

CEI broadly includes regulations against AT&T and BOC discrimination against the ESPs.

Unbundling requirements for the elements of the basic network to meet the needs of the ESPs.

BOCs and AT&T required to file ONA plans.

AT&T subject to less stringent requirements because there are other IXCs.

ONA requirements were not applied to independent telephone companies.

The FCC preempted the states in regard to nonstructural safeguards.

The first ONA plans:

Required to be filed by Feb. 1, 1988

Carriers conducted regional forums for ESPs

The plans were large and detailed.

December, 1988, ONA Plans Order

AT&T plan approved.

BOC plans approved in part, refiling required by May 1989.

FCC accepted the model developed by the BOCs with Bellcore.

BOCs elected to meet transmission cost issue by "price parity".

FCC considered plans a good first step but required explanation of why certain ESP service requests were not met.

FCC, seeking uniformity, directed BOCs to look at each others plans.

A Federal-State Joint Conference was established, to promote cooperation in ONA implementation.

Announced Part 69 rulemaking to integrate ONA services into access charge structure.

FCC declared ONA services "basic" so services should be tariffed at both state and Federal level, except CNSs which are to be tariffed at the state only.

In regard to state tariffing the FCC requested that BOCs keep them advised, but declined to interfere with state tariffs.

Established a 120 day requirement for BOCs to respond to additional ESP service requests.

Established restrictions on access to CPNI by BOC ESP personnel.

Directed BOCs to develop a further set of amendments by 5/89.

May 1990, Reconsideration of ONA Plans Order and ONA Amended Plans Order.

Reconsideration Order:

Basically reaffirmed Dec. 1988 order.

ONA Amended Plans Order:

Approved plans with some further amendments required.

Stated the structural separation would be lifted when initial ONA implementation had occurred. BOCs must:

Be technically prepared to offer ONA services

Have Federal tariffs in effect

Have state tariff applications filed.

June 1990, California v. FCC

Ninth Circuit vacates and remands Computer III

Found FCC had not adequately justified lifting of structural separation.

Found that FCC had not justified preemption.

Effect on ONA, since Computer III is where FCC required ONA, was that the basis for ONA had disappeared.

December 1990, FCC response to California v. FCC

FCC reinstated ONA obligations on BOCs regardless of eventual choice of safeguards.

FCC proposed strengthened non-structural safeguards.

July, 1991, Part 69 Order

FCC required unbundling of Feature Group Access within two years, maintaining FGs through the transition period.

Established pricing parameters for ONA services:

BOC ONA services are subject to price caps.

Adopted a flexible cost-based approach for new services.

Maintained the access charge exemption for ESPs using local exchange (state) tariffs for access.

Affirmed mix and match restrictions.

Separations issues will be handled as they arise.

(Adapted from a presentation by Ruth Milkman, Deputy Bureau Chief, Office of Plans and Policies, the Federal Communications Commission at the NRRI ONA Conference, October 1991, Columbus Ohio. The authors are responsible for any errors or omissions.)