

**POLICIES ON PRICING AND UNIVERSAL SERVICE FOR INTERNET
TRAFFIC ON THE PUBLIC SWITCHED NETWORK**

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EXECUTIVE SUMMARY

Exciting services that benefit the U.S. economy and individual citizens are arriving on the Internet. The growth and promise of this communications platform presents state and federal regulators with new, difficult policy concerns because customers use the public switched network (PSN) to reach the Internet. Among the regulatory concerns are technical capabilities of the PSN that was constructed to carry voice traffic rather than data, costing and pricing that may not send the correct economic signals to all telecommunications players, and uneven availability of advanced telecommunications services throughout the United States.

This report is the product of efforts by members of the National Association of Regulatory Commissioners (NARUC) Communications Committee and Communications Staff Subcommittee to address public policy issues arising from the advent of the Internet. The Committees created the Internet Working Group in 1997 with the initial task of addressing some of the most salient policy issues that affect the states. The Working Group has reached conclusions on a number of technical, pricing, and universal service issues.

The Internet Threatens To Cause Congestion on the Public Switched Network

The Internet is a packet-switched backbone network designed for data transfer, delivery, and retrieval. An important difference between packet-based and circuit-based networks (that is, the traditional, circuit, local portion of the PSN) is that the PSN relies on a continuous connection through the switching and transport networks to transfer voice or data, while the packet network is active only when delivering packets. A continuous packet connection to the Internet does not tie up the Internet as an analog circuit connection would.

There is little doubt that the Internet has caused changes in the capacity used for some PSN calls and in the average duration and number of calls. The Internet has also affected calling patterns for local exchange carriers. While many organizations debate the locus, frequency, and severity of Internet access congestion using the PSN, the technical community is preparing short-term and medium-term solutions.

In the long run, interoffice data services must be relocated from the PSN to a digital packet network. Regulators must actively support technological and competitive neutrality in this process, while keeping themselves informed on alternative technologies and their costs.

The Existing Exemption of Internet Providers from Access Charges Inhibits the Transition To a “Data-Friendly” Network

Although several avenues are open for evolution to networks that support data better than the existing PSN, the current exemption of Internet service providers (ISPs) from access charges inhibits that transition. The comparative price of compatible customer premises equipment and local lines with packet switching capability versus current analog modems and circuit switching is a disincentive for Internet users to migrate to data-friendly technology. The exemption of ISPs from access charges distorts prices and sends incorrect economic signals to end users and the ISPs themselves. Until end user demands for bandwidth force ISPs to use what are probably more expensive data networks, ISPs will continue to purchase analog lines and use modems to change digital messages to analog and back to digital packets for delivery over the packet network. So, to some unknown extent, the exemption is helping to keep the Internet from growing into a mature multimedia network.

The access charge exemption is a preference for a certain class of users of the public switched network, just like the home mortgage payment exemption is a tax preference in the federal income tax system. The exemption influences network deployment decisions and who will win and who will lose in the marketplace for telecommunications services. Policy makers can justly ask how long and to what extent the exemption of ISPs from charges for accessing the PSN should continue.

If the FCC does not bring access charges down and finds that the cost of access to the Internet must continue to be low, care should be taken at least to price the services and/or facilities close to cost. A workable solution may be to apply to ISP traffic only the traffic-sensitive portion of access charges without any common line component.

Reciprocal Compensation Obligations May Be Interpreted in Several Ways

In addition to general concerns about the appropriate pricing for access to the Internet, regulators have recently been faced with the question of the amount of compensation (if any) to be paid between carriers for the exchange of this traffic. Commissions which have dealt with this problem have decided that calls to ISPs are local and subject to reciprocal compensation. Other interpretations are possible.

One solution would be to require that an ISP be assessed a "termination surcharge" when calls reach a specified level that is well above most businesses.

The Proportion of Internet Traffic That Is Interstate and the Proportion That Is Local Cannot Be Discerned at This Time

Any discussion of the appropriate pricing for network access to the Internet must include mention of jurisdiction. The FCC's finding that ISP traffic is exempt from interstate access charges is not readily interpreted as a decision on the jurisdictional nature of the traffic. At this time the Working Group believes that the jurisdiction of Internet traffic is indiscernible. However, the Working Group believes that this is because no one is attempting to record the traffic.

If ISP traffic is interstate, access charges are ripe for reevaluation under jurisdictional separations. If ISP traffic can be interpreted as jurisdictionally local, states may need to consider new options for local service pricing.

The Telecommunications Act of 1996 May Not Adequately Support Deployment of Advanced Telecommunications Services Throughout the United States

In Section 706 of the Telecommunications Act of 1996, "Advanced Telecommunications Incentives," Congress allows three years (until February 1999) to see whether or not the competitive market can provide the facilities needed to bring advanced telecommunications service to all Americans in a timely and reasonable fashion. If the FCC finds that the market mechanisms have failed, it is authorized to remove barriers to investment and promote competition. No funding remedies are authorized.

Section 254(h), on the other hand, authorizes subsidies for advanced telecommunications services for schools, libraries, and rural health care institutions. Other ratepayers may not directly benefit in their homes and businesses from this subsidy. Rural and low-income markets often experience a lag in infrastructure investment that regulators in some states may find intolerably long in the case of Internet services. Regulators must be careful not to over-plan the deployment of advanced services or fund infrastructure investments that would occur anyway.

Nonetheless, universal service planning should address the means to support investments necessary for designated advanced telecommunications services which customer demand will not currently support. This may mean subsidizing, in some areas, infrastructure necessary to provide advanced services or to facilitate Internet access.

ISPs benefit from the subsidies for advanced services to the institutions designated in the Act when the subsidies make it possible for the institutions to use ISP services. In addition, the definitions of data, voice, and video telecommunications applications are blurring.

As beneficiaries of subsidies to institutions accessing the Internet, and due to their public offering characteristics, it can be argued that ISPs should share in the cost of subsidizing services that are deployed to access the ISPs' services.

Awareness of the Interrelationship of Internet and PSN Policy Will Help Policy Makers Craft Appropriate, Adequate Long-Term Solutions

PSN traffic and advanced telecommunications infrastructure are evolving symbiotically. Numerous controversies have arisen regarding jurisdictional cost allocations, application of access charges or other local pricing options, payment of reciprocal compensation, and receipt of and assessment for universal service funding for PSN facilities. These controversies may be resolved equitably for all telecommunications carriers and end users if they are addressed systematically. By enabling regulators to better understand these controversies, the Working Group hopes we have helped to avoid the perpetuation of some of the seemingly endless applications to the evolving PSN of inadequate and piecemeal fixes to often outmoded pricing and policy models. We hope that such refreshed vision engenders innovative options that might not otherwise be considered.

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Lastly, we would like to thank the members of NARUC for asking us to explore these issues and for giving our thoughts sincere consideration. We hope you get from the paper at least a small portion of the benefit we received in doing this project.

Internet Working Group

I. Introduction

Growing use of the public switched network (PSN)¹ to access the Internet presents new, difficult policy concerns for regulators. Promotion of Internet use is consensus public policy nationally and even worldwide. But snowballing Internet growth has costs and allocative implications for Internet relayers (including providers of both the backbone network and access), for intermediate telecommunications carriers, and for end users, including both individuals and businesses.

This report is the product of efforts by members of the National Association of Regulatory Commissioners (NARUC) Communications Committee and Communications Staff Subcommittee to

address current public policy issues on use of the PSN to access Internet services to exchange messages and information, transfer data, and conduct transactions. Some of the issues were first formally raised before the Staff Subcommittee in a provocative panel

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discussion at the NARUC Winter Meetings in Washington, D.C., in February 1997. The Internet Working Group was formed at those meetings, and we sent a questionnaire to parties with an interest in Internet issues in mid-April 1997. The Working Group reviewed technical papers, responses to its questionnaire, comments filed in the FCC Notice of Proposed Rulemaking (NPRM) on Access Charges,² and comments filed in

¹ The FCC has begun to use the term public switched network, or PSN, in place of the public switched telephone network, or PSTN. The term PSN applies to "any common carrier network that provides circuit switching between public users." *Newton's Telecom Dictionary*, 9th edition (New York: Flatiron, 1995), 914.

² FCC 96-488, released December 4, 1996, *Access Charge Reform*, Notice of Proposed Rulemaking, CC Docket 96-262.

response to the FCC Notice of Inquiry (NOI) regarding use of the PSN by Internet service providers.³ A follow-up panel presented further discussion of the issues before the NARUC Communications Committee at its summer meetings in San Francisco in July 1997. The first draft of this paper was presented along with a request for comment at the NARUC Annual Meeting in Boston in November 1997. The final draft was presented at the 1998 Winter Meetings in Washington.

In their comments to the Internet Working Group, AT&T noted estimates that there will be 30 million Internet accounts for 43.2 million households and 2.1 million businesses by the year 2000.⁴ This growth will help people to do such things as bank, learn, and work at home. Demands will also be made of the network to provide greater and greater bandwidth as multimedia, voice and other Internet applications become more commonplace. Intermediate telecommunications carriers (the ones that connect Internet end users to the Internet) are concerned that these increasing costs are not being borne by those causing the investments, thus straining the capabilities of some telecommunications resources previously deployed for other public and private purposes. The FCC's exemption of Internet service providers (ISPs) from access charges may be hindering migration of Internet use to more appropriate technology than the existing PSN, which is currently designed to handle voice traffic rather than data.

The Internet is first being deployed to large businesses and wealthier, more urban residential users. Schools, libraries and rural health care facilities nationwide are receiving subsidies for Internet investments under the Telecommunications Act of 1996 (the 1996 Act), but there is no promise that other rural and low-income customers will receive Internet access any time soon. Planning for universal service has not addressed the means to support a ubiquitous national rollout of advanced telecommunications services maintained at affordable rates.

³ FCC 96-488, released December 4, 1996, *Usage of the Public Switched Network by Information Service and Internet Access Providers*, Notice of Inquiry, CC Docket 96-263.

⁴ AT&T, "AT&T Response to NARUC Internet Working Group Questionnaire," 1997, 8.

In this report, we analyze issues of PSN congestion, local access pricing, and universal service from the perspective of the concerns of state regulators for the public interest, which includes the preferences of U.S. customers of telecommunications and Internet services and the broad range of providers of those services. Internet issues have also been addressed at the national level by the Federal

Issues of PSN congestion, local access pricing, and universal service are analyzed from the perspective of the concerns of state regulators for the public interest. We limit our analysis to consideration of calls dialed to reach the Internet.

Communications Commission (FCC), the Clinton administration, the National Telecommunications and Information Administration — the Administration's policy advisory arm, and the Rural Utilities Service in the Department of Agriculture.

In Section II we discuss, in a qualitative way, the technical impact of the Internet on the PSN. We limit our analysis to consideration of calls dialed to *reach* the Internet. We do not address congestion due to ISP failure to provide a sufficient number of connections for their users, so the users experience busy signals when they attempt to dial in.⁵ Nor do we address a second problem, the phenomenon known as the "worldwide wait," named because of slow responses to user requests while they are online to the Internet. Finally, this paper does not deal with congestion problems that may arise as a result of dial-ups to computers that do not involve connections with the Internet.

We review technical solutions for the problems posed to the PSN and some other vehicles for access to the Internet. The question is posed as to whether the PSN is the appropriate vehicle in the long term for carrying this traffic or whether some other network is better suited. We discuss the various technologies that may be used to provide access to the Internet, and their suitability and likelihood of becoming the

⁵ Many software programs allow the user to instruct the computer to continue to dial until it successfully connects with the other computer. In the worst cases, repeated dialing may last an hour or more when the ISP has insufficient capacity for its customers. If many callers are engaged in repeated redialing, their combined calls could make a large contribution to "busying out" a switch.

preferred method of access in the short term and long term. We provide an initial, broad analysis of the costs of migrating the PSN to a data environment and relate this to currently available and emerging technologies. Many different technologies hold potential for meeting the needs of data traffic over the Internet in the future.

Section III attempts to bridge the gap between the current regime of ISP exemption from access charges and appropriate pricing for the future. We examine the effects of the exemption, exploring the positive and negative results up to now and into the future for Internet use and the PSN. We discuss pricing options that may be suitable for high bandwidth data users as the PSN migrates toward a data environment.

Section IV is a discussion of some universal service issues raised by deployment of Internet services. The burden may fall on states to fund any early diffusion of advanced telecommunications services to high-cost and low-income areas. We examine possible state and federal policies for making Internet service available and affordable throughout the United States.

Having explored all of the issues and provided an analysis of the various dynamics and viewpoints, we summarize the Working Group's conclusions and recommendations in Section V.

II. Technical Sources And Engineering Solutions to Possible Internet Congestion

The Internet is a packet-switched backbone network designed for data transfer, delivery, and retrieval. An important difference between packet-based and circuit-based networks (that is, the traditional, circuit, local portion of the PSN) is that the public switched circuit network relies on a continuous connection through its switching and transport systems to transfer voice or data, while the packet network is active only when delivering packets. In a circuit network, a channel is established for communications between end users, and that channel is maintained until the connection is terminated. Packets can be stored off-network for later access, delivery,

or retrieval by an individual or group of users and need not be transported in sequence or over the same pathway.

Because a continuous connection is maintained, using the analog voice network for data communications over the Internet is much less efficient than using a packet-switched network. In an Internet call, the Internet service provider (ISP) as well as the ISP's customer may be considered end users. ISPs are often connected both to a packet network over high-speed dedicated facilities on one side for communication with the Internet and to the PSN through local business lines on the other side to provide access for end user customers. When an ISP bridges the circuit-switched PSN and its packet-switched network, the mismatch of technology is only partially mitigated by modems. Modems (modulator/demodulators) convert digital data for transmission over the local (or toll) analog network to the interconnection point of an ISP where it is packeted for delivery over the Internet network.

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There is little doubt that the Internet has caused changes in the capacity used for some PSN calls and in the average duration and number of calls. The Internet has also affected the patterns of local use among and within local exchange carriers (LECs). LEC data show that the average duration of Internet calls is considerably longer than that of local voice calls.⁶ The LECs claim that the growth in number and duration of Internet calls has caused facility congestion problems in interoffice trunking common in multi-office exchanges and extended area service arrangements. ISPs, on the other hand, allege that empirical data do not prove the existence of congestion on the Internet. They and other observers believe the PSN, if properly managed, will be able to accommodate the growth with little problem. While many organizations debate the locus, frequency, and severity of Internet access congestion using the PSN, the

⁶ See Comments of U S West, FCC 96-488, CC Docket 96-262.

technical community is preparing short-, medium- and long-term solutions. This section examines some possible directions that PSN access to the Internet network may take.

While many organizations debate the locus, frequency, and severity of Internet access congestion using the PSN, the technical community is preparing short-, medium- and long-term solutions.

The long-term scenario foreseen by all respondents to the Working Group survey is the relocation of interoffice data services from the PSN to a digital packet network. Access to the packet “cloud” could be achieved through many means, including improved resource

management, residential Integrated Services Digital Networks (ISDN), digital subscriber loops (DSLs), or displacement of dial-up over analog modems with cable modems or wireless.

Respondents to the NARUC survey and to the FCC's NOI on usage of the PSN provided valuable insight into specific mechanisms of the congestion problem but not its scope. The primary problem is excessive blocking of calls at originating and egress offices and tandems due to resources in use by calls to ISPs. Sub-problems include:

- Quantities and configuration of (inbound) line control modules
- Insufficient interoffice trunking
- Lack of sufficient terminating customer premises equipment (for example, ISP modems) as blocked users persistently re-dial.

ISPs must work to avoid the third type of problem above, where their modem banks are oversubscribed and caller retries “busy out” the switch. The same “first order” statistics developed by telephone companies can assist ISPs in designing the capacity of their trunks and modem banks.

Two fundamental premises must be presented as background. The first is that all communications networks are designed to meet probabilistic demand calculated at the busiest hour of the day, week, month, and year. They are not designed to provide service to all customers simultaneously. The second is that this busy hour exists during

the work day and consists mostly of voice calls. It is true that, on average, call durations (“holding times”) by modem to ISPs are longer than voice calls (Bellcore recently estimated holding times at 20 minutes compared to three minutes, respectively).⁷ But it is the total traffic offered in centum-call-seconds that is the center of the congestion problem. While many respondents could identify PSN usage attributable to Internet calls, no telephone company contended that the Internet has *in general* caused shifts in the busy hours. At face value, this would indicate (falsely) that the existing voice network is sufficient for Internet callers and that no additional capital equipment is required. Rather, situations arise where additional equipment has been required to maintain quality of service. In their survey responses, PacBell and Bell Atlantic cited examples of congestion in their Santa Clara and Herndon end offices, respectively.

Short Term: Improved Resource Management

The first line of defense to congestion on the access side of the switch is to reconfigure line units. Bellcore viewed the problem of congestion as separate issues of trunking and access and provided different solutions for each.⁸ In the short term, Bellcore noted that the present mode of operations can be managed better, reducing switch stress by de-loading switches and routing Internet calls more intelligently.

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A more complicated task is to rebalance subscribers across existing line concentrators. (There is a range of lines which can share a single line unit based on the number of minutes at any given time the lines are experiencing.) An even more

⁷ Amir Atari and James Gordon, *Impact of Internet Traffic on LEC Networks and Switching Systems* (Red Bank, NJ: Bellcore), 1996.

⁸ Ibid.

interventionist (and costly) step, if rebalancing is unsuccessful, is to regroom the switch by adding line units and reassigning customers.

Interoffice trunking congestion may occur even in the absence of access line overload. One telephone company that has extensive ISP subscribership on primary rate interface (PRI) digital trunks has still had to utilize foreign exchange trunking to process these calls over the interoffice network. While foreign exchange-type trunking can be used to alleviate congestion on the voice trunk groups, it can still result in less efficient use of the trunks themselves.

One solution noted by Bellcore is the installation of equipment "upstream" of the switch that would divert, based on dial number, ISP calls from switch-line concentrators used by voice customers. Pre-switch adjunct equipment and a new class of line concentrators have been introduced by Lucent and Nortel, respectively, manufacturers of the dominant Class 5 switch models. Each of these products has characteristics or limitations that make them less than attractive across the board.

The Internet Access Coalition, which contends that the access congestion issues arise from poor resource management within switches, notes that digital trunking by ISPs is technically feasible but not economical.⁹ Dial-up calls to ISPs that have T-1 or ISDN-PRI would bypass the switch components that are subject to access congestion. Their analysis, however, showed that, in many regions, an ISP would find it cheaper to operate analog lines (prone to congestion) than equivalent ISDN-PRI or T-1 service that is non-blocking.

Medium Term: Technological Solutions

Some emerging products and services have the potential to operate without congestion to the PSN. We will briefly introduce options for DSLs, cable modems, and Internet routers. Other potential Internet access media include powerline carrier

⁹ Internet Access Coalition, "Responses to NARUC Questionnaire," June 12, 1997.

(Norweb) and satellite downlink. While each of these is technically attractive, each also has economic or locational impediments to deployment.

Digital Subscriber Loop

DSL is a potential long-term access technology that would use existing copper pairs to connect customers directly to the packet "cloud." The particular variant of DSL to consider, according to vendor ADC,

is based on speed, operating distance, upstream and downstream speed differential, and suitable applications.¹⁰

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DSL will someday be a high-

performance (T-1 or higher) access solution for the 80 percent of customers within 18,000 feet of an end office, but currently it is not generally available.

Cable Modems

Similarly to DSL, cable modems offer local area network style Internet connections to customers. Cable modems may well become a widespread means to access the Internet, but existing cable infrastructure is suitable only for 15 percent to 20 percent of potential users.

ISDN

Both PRI and basic rate ISDN (BRI) are viable technical solutions for alleviating access congestion. ISDN pricing, however, has been inconsistent, and some respondents, including AT&T, believe that the associated network and customer premises costs and technical limitations mean that widespread deployment is years away, while others, such as Bell Atlantic and U S West, maintained that ISDN is an affordable option that will meet the needs of the market for years to come.

¹⁰ ADC Telecommunications, "The Need for Speed," website <http://www.kentrox.com/product/cellworx/nspeed/xdslprimer.intro.html>, accessed October 27, 1997.

Digital trunks such as PRI and T-1 can link ISP points of presence with ISP modems and alleviate load on switches, but current tariffs are higher than for equivalent plain old telephone lines. Bellcore notes that the packet ("D") channel of BRI or residential ISDN could be used by customers to connect to existing telephone company packet networks. Residential ISDN connections bypass switch components prone to congestion.

Router Development

Internet routers could be the bridge between the current voice telephony and the data network of tomorrow. In the short run, traffic could be routed over a dual network. Some industry observers believe that the dual network may continue in the long run due

Internet routers could be the bridge between the current voice telephony and the data network of tomorrow.

to the sheer expense of converting the PSN to a data-friendly network. Under the dual network concept, voice would be processed according to one set of parameters and traffic destined for an

ISP could be routed onto data facilities. In the long run, the Working Group envisions that all data (including voice) could be processed in a uniform manner. Right now, it appears that packets may be the most likely processing method for backbone networks, with a variety of digital solutions for local access. Some parties assert that a more efficient configuration than today's would be to place routers at all switches. The originating switch could then determine whether a call is addressed to or from an ISP and thus route its traffic onto a data network.

The location of routers is a function of cost. The basic assumption for using a router system is that there would be new costs associated with processing traffic over these facilities. If transport is charged for traffic from the router, then ISPs have a much greater incentive to build their own facilities to the office with a router than to pay the incumbent LEC (ILEC) to transport the traffic. Of course, the placement of its own facilities to a router would require a higher profit threshold for the ISP, so whether it would go into a rural area using its own facilities is unknown. In other words, rural

areas may still have difficulty obtaining Internet service, either because users have to make a toll call (or pay a higher transport cost) because the ISP server is in a distant area, or because providing transport to a closer office with a router involves more facilities placement cost on the part of the ISP. Requiring ILECs to provide the transport from the routers to the ISP does not solve the bandwidth problem unless hi-cap facilities are placed and then priced close to cost. Then the matter simply becomes one for the ISP of revenues versus cost.

Routers could be collocated with tandem offices. However, this does not prevent Internet traffic from entering the PSN. Tandem router placement may be an acceptable medium-term solution, but once bandwidth requirements increase, congestion could become a problem for both the ILEC and the end users' requirements. Tandem placement of a router could be very useful if there is terminating end office switch congestion. Tandems are typically designed to carry significant traffic flows. However, there has been no evidence to contradict the ISP contention that the most common switch congestion problem is associated with the terminating switch. It is before traffic reaches this switch that it must be diverted. Therefore, locating the router at the tandem and then providing hi-cap transport between the router and the ISP server could solve many problems for the terminating switch.

Long Term: Network Evolution of the Internet and Internet Access

The Internet, beginning at the backbone level, has begun the transition to packet technology. The backbone technology chosen by MCI, UUNET, and others is Asynchronous Transfer Mode (ATM). ATM is similar to frame relay and X.25 networks in that it is a shared resource, gaining efficiency by multiplexing many streams together to provide virtual private services.

Bell Atlantic and U S West, in their survey responses, anticipated the full spectrum of ATM and frame relay networks, using DSL and cable modems as well as improved analog dial for access.

BellSouth has outlined a proposed network which the company said would be suitable in the long term.¹¹ BellSouth stated that the FCC's current rules regarding protocol conversion would make it impossible for it to implement such a network, however. Dial-up connections would be routed to the network access server that would, in turn, be connected to a "radius" or routing server. In other words, based on the number dialed by the Internet subscriber, the radius server would identify the Internet provider to which the network access server should establish a data connection. The network access server would then make the connection to the underlying ATM/frame relay network to which the Internet provider would also be connected.

The trend seems clear: with time, the capability of higher speeds of data transport will move closer and closer to the end user.

The possible paths discussed here for long-term Internet evolution are based upon developing technology and media. Given the rapid progress in the fields of communications and electronics, in just a few years the Internet may well use as yet unheard-of technology to speed the transport of data to and from the end user. The trend seems clear: with time, the capability of higher speeds of data transport will move closer and closer to the end user.

Costs of Reducing Congestion

Many levels of solutions can be applied to the general problem of PSN congestion, the ultimate being relocation of data services to broadband packet networks. While the costs of this solution have not been estimated, the costs of some other solutions are more easily calculated. We have figures for the cost of labor to reconfigure switches but lack cost data on line cards themselves and the new category of pre-switch adjuncts, as deployed. Cost data are available for some ways for ISPs to

¹¹ BellSouth, Comments to FCC in CC Docket 96-263, March 24, 1997.

mitigate congestion, including digital T-1 or ISDN-PRI. Regulators must use the information they have and obtain the further information they need to develop pro-competitive strategies to encourage the use of data-friendly infrastructure.

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III. Appropriate Structure and Charges for Local Network Access

To the extent that costs are imposed on the PSN to reach the Internet, those costs should be shared equitably among originators, conveyors, and recipients in a manner that promotes competitive markets, is technologically neutral, and provides an appropriate foundation for serving social goals. Current policies on access charges, jurisdictional cost allocations, and reciprocal compensation may not be accomplishing those goals. In this section we address the shortcomings of existing costing and pricing mechanisms and propose options that might better meet policy objectives as the Internet continues to grow.

Access Charges

Although several avenues are open for evolution to networks that support data better than the existing PSN, the current exemption of ISPs from access charges inhibits that transition. The number of people subscribing to the Internet keeps growing,

The current exemption of ISPs from access charges inhibits transition to a data-friendly network.

but unless the Internet acquires more bandwidth it may encounter an application constraint both on its own backbone and on the PSN. The comparative price of compatible

customer premises equipment and local lines with packet switching capability versus current analog modems and circuit switching is a disincentive for Internet users to

migrate to data-friendly technology. The exemption of ISPs from access charges distorts prices and sends incorrect economic signals to end users and Internet service providers. Until end user demands for bandwidth force ISPs to use what are probably more expensive data networks, ISPs will continue to purchase analog lines and use modems to change digital messages to analog and back to digital packets for delivery over the packet network. So, to some unknown extent, the exemption is helping to keep the Internet from growing into a mature multimedia network.

The ISP exemption grew out of the FCC's Computer II proceedings in the 1970s, in which the Commission introduced a distinction between basic and enhanced communication services. Enhanced services include access to the Internet and other interactive computer networks. In a 1983 access charge order the FCC decided that even though enhanced service providers (ESPs) may use the facilities of LECs to originate and terminate interstate calls, they should not be required to pay interstate access charges.¹² In its 1997 access charge decision, the FCC decided to maintain the exemption. The Commission noted that the term "information services" in the 1996 Act appears to be similar in meaning to "enhanced services."¹³ The 1996 Act establishes a policy "to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by federal or state regulation."¹⁴

The FCC decision means ESPs (including ISPs) may purchase services from ILECs under the same intrastate tariffs available to end users. They pay business line rates and the appropriate subscriber line charge rather than interstate access rates. Business line rates are significantly lower than equivalent interstate access charges because of separations allocations, pervasive flat and message rates for local business

¹² FCC 1996 *Access Charge NPRM*, ¶ 284.

¹³ *Ibid.*, ¶ 284.

¹⁴ 47 USC, ¶ 230(b)(2).

service, and the per-minute rate structure of access charges.¹⁵ On the other hand, interexchange carriers (IXCs) at least for now must pay access charges for similar connections to the PSN.

Most ISPs purchase analog business lines from the LEC at a fixed cost per month. Most households and businesses can purchase access to the Internet through a flat monthly charge from an ISP. The local usage on the lines over which they place calls to access the Internet is generally priced on a flat monthly or message (per-call) basis. These rates are based on local usage rates. The lack of true time-related charges on either end of these calls encourages long call durations. The LECs claim that the long holding times associated with Internet calls burden the PSN and have caused, and may continue to cause, network congestion and blocked calls. If the ESP exemption were discontinued, the LECs argue, a more accurate pricing signal would be sent which would encourage ISPs to seek more efficient methods of serving their end users.

The access charge exemption is a preference for a certain class of users of the public switched network, just like the home mortgage payment exemption is a tax preference in the federal income tax system. A preference acts like a subsidy to a certain group or function, foregoing funds that would otherwise go to common use. It is as an active policy preference that the exemption has been supported — something that will encourage development of the Internet and the many benefits we can see from having this new means of information exchange, plus innovations yet to come. There is a strong public interest argument for government promotion of the Internet. The Internet User Coalition, for example, commented to the Working Group that the Internet provides citizens a venue for political speech and access to information, lifelong learning, communications and commerce.

The Internet provides citizens a venue for political speech and access to information, lifelong learning, communications and commerce.

¹⁵ FCC 1996 Access Charge NPRM, ¶ 285.

ISPs argue that exemptions were justified in the first place and continue to be needed now to support a nascent industry. Many commenters in FCC dockets and the Working Group's survey argued that applying any extra charges to the ISPs would stymie the Internet's growth. ISPs argue that the access charge exemption is an incentive for investment and innovation in information services and thus serves U.S. industrial policy. The ISPs and their supporters say that even though the Internet business has grown, it is still volatile and prospects for success are uncertain.

Another argument for keeping the exemption is that the existing access charge system is fatally flawed and should not be imposed on newcomers. BellSouth maintains that it is better to keep the current access charge exemption than to apply an access charge regime that was designed for circuit-switched voice telephony. Most telecommunications industry analysts agree that access charges are too high. The FCC said it saw no reason to extend the existing imperfect access charge regime to an additional class of users, when it could have detrimental effects on the growth of the information service industry and the existing structure.¹⁶

Those who continue to be opposed to the access charge exemption for ISPs now and in the immediate future claim that Internet use is already causing congestion, particularly in the switch from which the ISP is served. The Alliance for Public Technology, in comments on the FCC access charge NPRM, said ISPs are thus paying less for using the local network than other businesses, even though some claim they impose greater demand for ports, switches, lines and other network elements. Bell Atlantic suggested the exemption creates a financial disincentive to switch to data networks where they are available, encouraging ISPs to purchase circuit-switched services instead of packet-based. The general exemption of ISPs may also ignore differences in traffic patterns among ISPs and even in Internet

Those who continue to be opposed to the access charge exemption for ISPs claim that Internet use is already causing congestion.

¹⁶ FCC 1996 Access Charge NPRM, ¶ 288.

uses, another commenter suggested. Some of these providers may pose a larger immediate burden on the network than others.

Rural Utilities Service told the NARUC Internet Working Group that the ISP exemption means rural telephone companies are losing toll support they would otherwise receive because many calls made to access the Internet are toll calls. Because the rural carriers do not have access to the toll revenues by virtue of the exemption, local rates are forced up as plant must be put into place to handle the increased "local" traffic, and revenues must be generated to recover the cost of this plant. (This issue is discussed further below, in section IV on universal service.)

Whether or not ISPs are causing congestion now on the public switched network, the access charge exemption encourages growth of Internet use that can lead to overloading a network designed for voice communications. Asked whether the exemption influences network deployment decisions, all respondents to the working group survey who answered the question said it does. AT&T said the exemption discourages competitive LECs (CLECs) and ILECs from developing new service offerings that have to compete with below-cost access services used by ISPs. The company said neither competitive nor incumbent LECs are receiving accurate economic signals that would encourage them to upgrade networks or engineer existing ones more efficiently because they are being denied the revenue streams to pay for the upgrades or transition activities. BellSouth and U S West made similar arguments.

The access charge exemption has an influence on who will win and who will lose in the marketplace for telecommunications services.

The access charge exemption has an influence on who will win and who will lose in the marketplace for telecommunications services. Interestingly, many ISPs no longer argue for the exemption on nascent industry grounds, but on competitive grounds. They suggest that independent ISPs are now battling ISPs affiliated with other carriers so the independents need a price break to level the playing field. Some ISPs also suggest that since they have no adequate widespread technological alternative to ILEC networks, to continue the exemption will force ILECs to upgrade. Until that happens,

they claim the exemption is a monetary recognition of the PSN's shortcomings for data transmission. ISPs and others also allege that the revenue from the second line which computer users tend to order has not been considered as an offset to any additional PSN costs. They further point out that many ISPs are phone companies themselves and argue that those ISPs would not be providing Internet service if it imposed unrecoverable costs.

Other telecommunications companies see the exemption as giving unfair competitive advantage to ISPs. AT&T commented that the IXCs are paying "artificially high, non-economic, subsidy-laden charges" and ISPs are paying below costs. AT&T maintained that IXCs are at a competitive disadvantage since ISP services (such as voice over net or faxes) are cross elastic. Bell Atlantic and U S West advanced similar arguments from the perspective of the ILECs. Bell Atlantic suggested that if IXCs moved voice traffic onto the Internet, and the exemption continued, LEC costs would increase without an adequate cost recovery mechanism. Resellers agreed that preferential treatment of ESPs over other telecommunications service providers gives "unwarranted competitive advantage." The Telecommunications Resellers Association said ISPs should be brought under the access charge regime.

Jurisdictional Issues

Any discussion of the appropriate pricing for network access to the Internet must address jurisdiction. The Internet Working Group strongly hopes that any pricing options that are implemented will be applied on both the interstate and intrastate level.

The FCC's finding that ISP traffic is exempt from interstate access charges is not readily interpreted as a decision regarding the jurisdictional nature of the traffic. It does not make it any less an interexchange, and ultimately an interstate and international, connection. BellSouth commented that the exemption should not and does not change the underlying jurisdiction of the traffic. The FCC decision leaves state regulators with

jurisdiction for local rate and policy applications. It is reasonable for them to interpret this traffic as local by default. Yet the reason the FCC can apply its exemption to interstate access in the first place is

that at least some of the traffic traverses state and national boundaries. In general, only the local phone dial-up number makes it appear local. This was true with call traffic into

The FCC's finding that ISP traffic is exempt from interstate access charges is not readily interpreted as a decision regarding the jurisdictional nature of the traffic.

many early toll resale enterprises. If the incoming ISP traffic is on a toll call or 800 number, intra- or interstate access charges are being applied today.

If ISP traffic is interstate, as the FCC's assertion of jurisdiction to apply the ESP exemption indicates, then this issue is ripe for reevaluation under jurisdictional separations. Comprehensive jurisdictional separations reform is currently under investigation and assigned for resolution to the Federal-State Joint Board on Separations.¹⁷ The NPRM does not refer specifically to ISP traffic, but to data traffic generically, in its request for comments on these issues.

If the traffic is interstate, a workable solution was suggested by several parties to apply to ISP traffic only the traffic-sensitive portion of access charges without any common line component. This is the intended ultimate goal of the access reform ordered by the FCC for Tier A LECs' interstate access charges,¹⁸ and a solution recommended by several parties in the FCC's NOI on the Internet.¹⁹

If ISP traffic can, due to the exemption, be interpreted as jurisdictionally local, states do have options for solving the problems associated with this rapidly growing segment of local traffic. The solutions then would have to be with regard to local

¹⁷ FCC, *Jurisdictional Separations Reform and Referral to the Federal-State Joint Board*, CC Docket 86-280, released October 7, 1997.

¹⁸ FCC, *Access Charge Reform*, First Report and Order, FCC 97-158, CC Docket 96-262, released May 16, 1997.

¹⁹ FCC, *Usage of the Public Switched Network by Information Providers*, FCC 96-488, CC Docket 96-263, released December 24, 1996.

service pricing. If the jurisdiction of the traffic is split, identification of the local traffic directed to the Internet would be necessary. This could necessitate the imposition of considerable registration and reporting requirements.

Changes in pattern of use, call duration, and number of calls may make the existing separations (Part 36 methodologies) process inappropriate due to resulting large separations shifts for some companies. Under Part 36 many portions of the network are allocated based on jurisdictional minutes-of-use (MOUs) or weighted jurisdictional MOUs. An increase in usage caused by the Internet calls could vastly increase the allocation of cost to the intrastate jurisdiction due to the ESP exemption. This is because the exemption causes LECs to treat the costs of serving ESPs (which include ISPs) as a cost of serving local end users.

In general, LECs claim the Internet causes their revenue requirement to increase because they may need to install more inter-office and switching facilities to handle the vast increase in traffic caused by the Internet, while a lower percentage of the total cost is allocated to the interstate jurisdiction due to the ESP exemption. Compounding this problem is that the Internet may cause the need for network upgrades all the way to the

At this time the Working Group agrees that the jurisdiction of Internet traffic is indiscernible.

end users as essential service requirements under universal service programs expand to meet basic end user demands. This separations problem causes the company's intrastate jurisdictional allocations to increase,

which may result in requests by some companies for intrastate rate increases claimed to cover costs primarily incurred for a jurisdictionally mixed or interstate service.

At this time the Working Group agrees that the jurisdiction of Internet traffic is indiscernible. However, the Working Group believes that this is because no one is attempting to record the traffic. Much as 800 traffic was originally viewed as indiscernible and later able to be tracked, so too could be the case with Internet traffic.

Options for Pricing Internet Access

Government should not establish a social goal with respect to which technology or network is used to deliver Internet services. However, many parties that stress this fail to acknowledge that government already has influenced the growth of the Internet by extending the ESP exemption to

ISPs. While in the past Internet traffic was not of such magnitude or sophistication to affect the PSN, its continuing growth leads one to question whether the time has come to reconsider how Internet traffic is priced.

Government should not establish a social goal with respect to which technology or network is used to deliver Internet services. However, government already has influenced the growth of the Internet by extending the ESP exemption to ISPs.

Should government continue the preferential rates for ISPs, apply traditional access charges to them, or design a new pricing mechanism? As we discuss the various dynamics associated with pricing PSN access to the Internet, we must keep in mind how the network is changing — whether the result is a single data-friendly PSN or a dual PSN composed of one network (route) for voice and one for data.

Some parties suggest that if the Universal Service Fund (USF) is designed to recover all needed local revenues, typical interstate access rates could decline sharply and would then be more affordable for ISPs. Rates would be close to cost and that would send the correct market signals to ISPs as to whether or not they should obtain another method of access which would give them the data capabilities that their users need or desire.

However, current access charges are based on voice technology. Given the growing data usage of the network, the Working Group is concerned that the traditional rate structure for access charges may not reflect future network usage. Therefore, we have explored rate structures which may be more suited to data traffic. We recognize that this leap in rate structures from the current regime may produce a “gap” between rate structure and actual network deployment of technology, but we believe, at this

juncture, that regulators must begin to prepare for the fundamental change the network will undergo. Most commenters did not offer any pricing options for Internet usage. Basically there were two viewpoints: continuation of the ISP exemption as is or imposing an access rate that is lower than current rates charged to IXCs.

All the commenters to the working group survey agreed that end users should not be required to pay for the ISPs' use of the PSN. If any increased charges are to be paid, the commenters suggested, they should be paid by the ISP directly. However, all parties also recognized that any increased costs to the ISPs will be passed along to end users.

Alternatives to a voice-based pricing scheme were not advanced, although several ISP commenters expressed concern about usage-sensitive pricing. Some sort of flat-rate, cost-based, block-rate pricing might alleviate some ISPs' concerns over their cost volatility. Moreover, many ISPs want the ability to purchase unbundled network elements without being designated a carrier.

One suggestion initially offered by the Working Group was that wireless interconnection rates be used as a surrogate for ISPs' access to the PSN. Only one party commented on this suggestion.²⁰ It may be argued that wireless interconnection rates should not be assessed on ISP providers because while an Internet call is roughly 20 minutes in duration, a wireless call is 2 ½ minutes for cellular and 5 seconds for paging. Therefore, wireless service is not analogous to Internet service and the rate should not be transferred. In short, whereas a wireless customer may view a \$0.20 call to be affordable (based on a rate of \$0.08 a minute for a 2 ½-minute call) an ISP user would not view a \$1.60 call to be reasonable (based on \$0.08 a minute for 20 minutes).

The Working Group also explored the possible development of a special category of end user (if the exemption continues) whereby outgoing call volumes above a certain level would require the end user to be migrated onto a service which is priced and engineered to recover and account for the high call volume. However, the Working Group is mindful that the application of some sort of per-minute local measured service,

²⁰ U S West, "NARUC Internet Questionnaire," May 8, 1997.

in many states and localities, is either statutorily forbidden or politically obstructed. Also, if a pricing scheme were applied to Internet traffic only, it could be challenged as discriminatory and subject to litigation. Another solution could be to charge all customers in markets without local measured service for all incoming local calls above a certain level. This could eliminate the need to separately identify the traffic as Internet directed. If a high enough set amount of incoming traffic were free each month, ISPs would likely be the primary recipients of this charge.

Another idea discussed by the Working Group was the use of the Signaling System 7 (SS7) network and rates to carry Internet traffic. All carrier commenters rejected the idea of using the SS7 network. They argue that the SS7 network is designed and maintained as a signaling network and could not handle Internet traffic, even though it is similar to packet technology. Also, many commenters are concerned that the implementation of local number portability will consume the spare capacity of the SS7 network. Consequently, there is little spare bandwidth on the SS7 network for other traffic.

Most commenters to the survey argue that there should be only one access charge structure since the network is performing the same function regardless of whether voice (analog) or data (packet) is being transmitted. However, if access charges are not brought down to cost and government feels the need to keep the cost of access to the Internet low, care should be taken to at least price the services and/or facilities close to cost.

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This pricing policy would have the effect of incenting the providers of the PSN to deploy a more data-friendly network and of encouraging the use of more data-friendly facilities on the part of end users and ISPs.

Reciprocal Compensation

In addition to general concerns about the appropriate pricing for access to the Internet, regulators have recently been faced with the question of the amount of compensation (if any) to be paid between carriers for the exchange of this traffic. It

What we now address is the question of cost recovery/revenue generation when some ILECs bypass the end user and ISPs and instead focus on intermediate carriers as their revenue source.

should first be noted that although the battle over pricing access to the Internet has spilled over into reciprocal compensation, the general pricing and costing dynamics mentioned above still apply. What we now address is the question of cost recovery/revenue

generation when some ILECs bypass the end user and ISPs and instead focus on intermediate carriers as their revenue source. This section will discuss the various options for resolving the reciprocal compensation question should a state commission assert its jurisdiction in resolving a dispute on this issue, as a number of commissions already have. At its 1997 Annual Meeting, NARUC resolved that Internet traffic on the PSN should be treated as intrastate pending further action by the FCC. All states that have acted to date on this issue have determined to treat this traffic as local or to require parties to abide by treatment as local as accepted in specific interconnection agreements.

The basic allegation in the reciprocal compensation disputes is that all calls to ISPs are long distance. To support this conclusion some carriers are claiming that in order for the FCC to have exempted ISPs from access charges, it must have assumed that the nature of ISP traffic, both to and from the ISP, is long distance, perhaps even interstate. The Internet Working Group asked participants in the group's survey whether the exemption creates an incentive for CLECs to want ISP servers at their end offices in order to recover the terminating, unbundled, local switched rates. AT&T replied that the exemption perpetuates uneconomic behavior in many forms, but that Internet traffic is interstate, not local, so the reciprocal compensation portions of

interconnection agreements do not apply.²¹ We have already discussed the practical difficulties associated with identifying traffic destined to ISPs or large terminating users. We will assume that these end users are somehow identifiable. With that caveat, there are four basic avenues to resolve the compensation issue.

The first avenue would be to agree with the carriers who assert that some or all calls to the ISPs are long distance calls. By reaching this conclusion the commission could simply acknowledge that there is a massive amount of traffic which does not originate and terminate within an ILEC's local calling area. Given that neither the 1996 Act nor the FCC has eliminated the distinction between local and non-local, this could be a solution. However, one would first need to examine whether all of the calls, or at least a majority of them, can be traced to their termination points. After this measurement is done, one could calculate the percentage of interexchange use to assess charges. The difficulty associated with this solution is that regulators would have to undertake a task that they have not typically done. They would have to look behind an end user's private network to determine where traffic is ultimately terminating. Furthermore, regulators may find that such a determination is used to support an ILEC's claim that all end users should be paying access charges, since the existence of the intermediate carrier does not change the nature of the end user's call to the ISP. If a state believes that the service provided by ISPs is a carrier-type (and non-local) service, and the FCC agrees, then a state commission may find this solution a desirable means to correct a perceived incongruity in the treatment of ISPs vis-à-vis IXCs.

Another option is not to look behind an end user's private network, regardless of whether it is open or closed to general public use, and continue to treat such traffic as local, including not applying access charges. While the 1996 Act did continue to distinguish between local and non-local service, one can assert that this applies primarily to the nature of traffic which carriers are processing. Therefore, if traffic processed within only one network would be considered local, then the same traffic

²¹ See U S West, "NARUC Internet Questionnaire," May 8, 1997, 7.

processed within two networks covering the same local calling area should still be considered local. Furthermore, if a state determines that the flat-rate usage packages which are currently being subscribed to by its end users are cost compensatory of all the minutes of traffic the end users are generating, this option is further supported. It may be inappropriate from a public interest viewpoint to assess access charges to a private network for traffic which terminates to it, especially when it has been determined that end users are fully compensating the LEC for traffic which they are generating. If a state were to allow access charges to be assessed in this situation, it might wish to develop an understanding with the ILEC concerning the adequacy of the ILEC's network in processing data transmissions and further steps which may need to be taken to develop that network. Lastly, this option would continue to provide CLECs with a revenue stream to finance the building of their networks.

A third avenue to resolve this dispute is that no compensation be exchanged between carriers for traffic to an ISP. The argument for this option is that so long as no carrier is receiving compensation for calls to ISPs, each will have the same perspective on ISPs. For example, right now many ILECs have a very large majority of their residential customers subscribed to low, flat-rate usage service. This makes it very difficult to obtain additional revenues from their customers for the large amounts of traffic they generate once they start subscribing to the Internet. So, as alluded to earlier in this paper, the ILECs arguably are not being compensated for the usage of their networks. With the existence of an intermediate carrier, not only are the ILECs perhaps not compensated, but they must pay carriers for termination on the other carriers' networks. By not allowing compensation to flow between the carriers, neither carrier would be compensated for this traffic. This is how both carriers would come to view ISPs in a similar manner. The revenue which they could generate from the ISPs would be the charges they directly assess to the ISP.

Complicating implementation of this approach would be treatment of those ILECs and their associated end users who subscribe to local MOU service. In this scenario the ILEC is being compensated by the end user for the use of its network, so the dynamic of the non-recovery of costs through flat rate end user charges does not

exist. The difficulty of distinguishing between Internet minutes that are subject to flat rates and those subject to MOU charges may render this solution unworkable. Another potential adverse effect of this option may be that, once CLECs are no longer compensated for ISP traffic, their traffic imbalances become so great that they are unable to sustain themselves financially. This dynamic would be very difficult to assess currently because if a CLEC is marketing mostly to ISPs, they will intentionally have few other customers. Therefore, assessing whether they can be financially sustainable in the long run may not be readily achievable today.

The fourth avenue open to regulators is more complex. This solution requires that an ISP be assessed a "termination surcharge" when calls attain a certain level. In this manner, non-ISP end users do not have to have any of their rates adjusted. It would be the ISP which would pay for the traffic terminating to it. Complicating this solution is the question of how to deal with the situation where the end user resides on a carrier's network different from the carrier network on which the ISP is located. This is because, technically speaking, the carrier which is owed money from the ISP is the end user's carrier. In such a case it may be that the ISP's carrier becomes the collection agent for the originating carrier. In this scenario, the terminating carrier could still be paid the terminating charges owed to it. The result could be a sort of netting. (For end users who subscribe to MOU service, you would also want to ensure that the same call is not being paid for twice — once by the end user and again by the ISP.)

One option for resolving controversy over reciprocal compensation would be to assess an ISP a "termination surcharge" when calls attain a certain level.

IV. Relationship of Internet Access and Universal Service

Universal service is a complex issue with a seeming myriad of ongoing controversies over setting and achieving objectives for telecommunications subscription levels and infrastructure. The issues relevant to the Internet are the degree to which

advanced telecommunications infrastructure should be ubiquitously available and which services should be included as universal service offerings.

Encouraging Deployment of Internet Access

Many businesses and institutions have turned to virtual private networks to meet their computer and telecommunications needs. This trend is fostered by the availability of virtual channels within the PSN providing bandwidth or capacity reservation at flat rates. Higher-speed PSN offerings are based on an access line charge plus usage charges. Further, video transmissions are handled by the PSN as data. Because of these dynamics, questions arise regarding the appropriateness of differentiating data and video transmissions on the PSN and what type of rates to charge for potentially bursty and voluminous transmissions, particularly in relation to the pricing of voice traffic. Currently, because one can obtain bandwidth at a flat rate and because video-dedicated channels appear more reliable, they are more attractive than typical switched or derived video channels on the PSN.

Universal service planning should address the means to support investments for designated advanced telecommunications services for which customer demand will not immediately support facility placement.

As a result carriers have an incentive to invest in adjunct networks that carry high-speed, high-volume data and video transmissions but do not have the incentive to invest in advanced infrastructure placed in the PSN itself.

This has the undesirable effect of denying or delaying the general offering on the PSN to residential and small business customers of a reasonably priced, high-speed form of access to the Internet.

Universal service planning should address the means to support the concomitantly necessary investments for designated advanced telecommunications services for which customer demand will not garner sufficient revenue to support facility placement. Such concerns encompass the need for regulatory commissions to consider subsidizing, in some areas, infrastructure necessary to provide advanced

services or to facilitate Internet access. Even the current USF rules may inadvertently be slowing the roll-out of advanced telecommunications to the general public. This is because, in some cases, the diversion of educational, health care, and library institutions' usage, and attendant revenues, from the PSN to private two-way video and data networks has and will continue to exacerbate the need for support to keep the rates for advanced telecommunications services low enough to be considered affordable. This problem is particularly acute in rural and low income areas.²²

In addition, there are overlapping and conflicting aspects to the drive for a ubiquitous national roll-out of advanced telecommunications services and the need to define, and maintain at affordable rates, "basic" or "essential" telecommunications services. In this debate, regulators must be careful not to unduly influence the deployment of advanced services. Where regulators believe companies are making significant infrastructure inroads, or are trending to this, they should be careful not to encourage either directly or indirectly infrastructure investments that would have occurred anyway. Many rural and low-income markets often experience a lag in such investment. The question becomes, "When is such a lag intolerably long?"

Of course, universal service is only one of many public policy goals for telecommunications industries, some of which conflict in real world applications.

Additional goals include:

(1) development of competitive markets; (2) deployment of advanced telecommunications infrastructure in all markets; (3) encouragement of technological innovation; (4) use of deregulation, lesser regulation and/or forbearance; and (5) affordable access for essential public institutions.

Many conflicts among public policy goals come to the fore in Section 706 of the 1996 Act, "Advanced Telecommunications Incentives."

²² See Peter Jahn, "Internet Access in Rural Wisconsin," *NRRI Quarterly Bulletin* 18:3, 377-389, for a discussion of barriers that prevent local call access to the Internet from being generally available in rural areas.

Many of the conflicts among goals come to the fore in Section 706 of the 1996 Act, "Advanced Telecommunications Incentives." In Section 706, Congress allows a period of time to see whether or not the competitive market can provide the facilities needed to bring advanced telecommunications service to all Americans in a timely and reasonable fashion. If after three years under the 1996 Act (by February 1999) the FCC finds that the market mechanisms have failed, it is authorized to remove barriers to investment and promote competition.²³ No funding remedies are authorized in this section.

In Section 254(h), on the other hand, subsidies for advanced telecommunications services are supported. The subsidy is limited to specified schools, libraries, and health care institutions. Other ratepayers may not directly benefit in their homes and businesses from this subsidy for higher capacity services to the named institutions. There currently is no provision for direct subsidy for the general public of the higher capacity services when provided to their homes and small businesses. In fact there are price disincentives built into accessing the Internet at low speeds, such as the FCC's newly imposed additional subscriber line charge for a second line that customers often dedicate to modem connections. While this higher subscriber line charge is based on cost and is a means to limit the size of the support funding for basic lines, it is nonetheless an example of how the operationalization of universal service goals for basic and advanced services can result in conflict.

Jurisdictional assignment of Internet traffic also has an impact on universal service funding. Network traffic directed to ISPs is currently exempt from application of interstate access charges regardless of its jurisdictional pattern. Practically, this policy results in the assignment of most ISP traffic to local usage, thereby shifting the relative

²³ Bell Atlantic filed a petition with the FCC on January 26, 1998, requesting that the deregulatory steps authorized under Section 706 of the 1996 Act be taken at this time, due to the slow deployment of the advanced network features like high-speed broadband capacity over packet switched networks. This petition attempts to sidestep the review procedure contemplated in the law and foreshortens the period envisioned by Congress for the provisions that foster local competition to take effect. Bell Atlantic's proposal and other similar proposals could have the effect of allowing RBOCs into interLATA data services. See "Petition of Bell Atlantic Corporation for Relief from Barriers to Deployment of Advanced Telecommunications Services" and "White Paper Supporting Petition under Section 706 of the Telecommunications Act of 1996, January 26, 1998.

usage and jurisdictional costs of this traffic to the states. A more meaningful jurisdictional assignment of Internet traffic should reflect the realities of the shared network facility. Lacking that, there appears to be an implicit subsidy from intrastate service for some ISP traffic when one compares it to treatment of similar IXC traffic. If the FCC continues to exempt ISP traffic from explicit interstate access charges, it must develop an explicit interstate subsidy mechanism, as required under the 1996 Act, to replace the current implicit subsidy based on a jurisdictional shift of the traffic to local.

Consideration of universal service and access charge reform must go hand-in-hand if regulators are to prevent the opportunity for arbitrage inherent in the current mélange of historical pricing policy and forward-looking market objectives.

What we find today in the Internet and its access providers is a hybrid of services and technologies that frustrate application of traditional regulatory paradigms. The Internet and its interplay with local telecommunications

Consideration of universal service and access charge reform must go hand-in-hand if regulators are to prevent the opportunity for arbitrage inherent in the current mélange of historical pricing policy and forward-looking market objectives.

networks displays carrier, ESP, and broadcast media attributes. Therefore, the categorization of ISPs as a distinct class of customers from traditional IXCs may be a necessary interim step to achieving a compensation model that is acceptable today for application to Internet access over the PSN — and possibly, soon thereafter, to all interconnects with the local network for origination and termination of telecommunications transmissions.

Under the 1996 Act, subsidy for advanced telecommunications and information service capabilities is allowed only when they are being deployed in the networks of telecommunications carriers and the services are being subscribed to by a substantial majority of residential customers. Such a subscription level would make these services eligible for consideration for inclusion in the definition of services supported by the federal USF. The demand of the institutions eligible for support under Section 254(h) for such advanced telecommunications services over the PSN is being diverted to

private connections that have been made more affordable by the subsidies under that section. This leaves a smaller total demand on the PSN over which to spread the costs of such services. This results in higher prices which further reduce residential demand for the PSN-based services. To the extent that demand for advanced telecommunications services is diverted from the PSN by private connections, the inclusion of advanced services in the definition of universal service may be delayed. In some rural and low-income or high-cost areas this may postpone access to information technologies and services.

Lastly, states are authorized under Section 254(f) to develop additional definitions and standards to advance universal service within a state as long as funding

Current USF rules appear to leave states to use their own resources to support any general increase beyond what the market will provide in data speed connectivity on the PSN.

does not rely on the federal USF mechanisms. Advancement of Internet accessibility through higher speed connections to homes would require greater bandwidth than is supported under the FCC's current USF rules. This

appears to leave states to use their own resources to support any general increase beyond what the market will provide in data-speed connectivity on the PSN. This burden is exacerbated because states have to bear the cost of infrastructure necessary to process Internet traffic, which in turn has been encouraged by the implicit subsidy inherent in the ISP exemption.

Should ISPs Contribute to the Universal Service Fund?

There is a continuing controversy over using universal service funding to make advanced services for Internet access and information services ubiquitously available at affordable prices. That controversy also spills over into the issue of whether ISPs can and should contribute as "telecommunications carriers" to federal universal service programs. USF funding therefore ties back to the ongoing policy debate regarding the intent of the 1996 Act and the effect of the FCC's exemption of the ISPs from access

charges, effectively declaring them end users rather than telecommunications carriers. The meanings of terms such as “end user,” “service,” “facility,” and “carrier” are evolving. Regardless, ISPs benefit from the subsidies for advanced services to the institutions designated in the 1996 Act when those subsidies make it possible for those institutions to use their services. In addition there is a blurring of the definitions of data, voice, and video when it comes to telecommunications applications. The Internet is capable of carrying voice transmissions, and entrepreneurs are attempting to fully tap that capability and market. As beneficiaries of subsidies to institutions accessing the Internet, and due to their public-offering characteristics, it can be argued that ISPs should share in the cost of subsidizing services that are deployed to access the ISPs’ services.

The 1996 Act states in Section 254(d) that every interstate telecommunications carrier shall contribute to the fund fairly and without discrimination. The FCC did not include ISPs in the designation of

“telecommunications carriers” in the 1996 Act. This made sense at that time, but may prove inconsistent with the application of the 1996 Act’s principles of explicit rather than implicit subsidization of universal service.

Not including ISPs in the designation of “telecommunications carriers” may prove inconsistent with the application of the 1996 Act’s principles of explicit rather than implicit subsidization of universal service.

Redefinition of ISPs as a distinct class of carriers and application of some form of economically based access charges and assessment for USF purposes could end this historical preference to ISPs and make them contributors to the explicit subsidies that promote use of their services. If the legal distinction between carriers cannot be made for purposes of applying access charges, another alternative may be to go ahead and assess ISPs and provide universal service funds directly to the ISPs to offset the charges.

V. Conclusions

At its inception and for many years thereafter, the PSN carried only voice communications. Growth in data transmission in recent years has resulted in a network that is heavily used for different types of communications. The current technology used for transmission of voice does not appear to be optimal for data. It is imperative that all participants in the telecommunications market, including regulators, have a clear understanding of how the PSN interrelates with the data network and how voice and data communications are converging.

From a technical point of view, it is important that data traffic on the PSN start migrating to a network which is data friendly. While it is understood that the PSN of today needs to undergo some fundamental changes to achieve this goal, we should also understand that all of the necessary changes do not have to occur on the existing

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public network. For instance, data traffic could be diverted onto a separate, data-friendly network for delivery to the Internet backbone by adding switch adjuncts into the network. Technology

such as DSL or cable modems could also be employed in the loop to provide the premises connections which would permit high transmission speeds, thus keeping the last mile from being the choke point in data transmission. Many technologies could and will be used to provide quality data transmission capabilities in the future.

To make the transition to the data-friendly network will involve capital outlays. It is not enough that the Internet be able to process data. The loops and switches of the PSN must also be capable of doing so. Given that there is little compensation today for the increased traffic already traversing the network, due at least in part to the ISP access charge exemption, carriers may not be willing to make the investments needed to upgrade the network without a reasonable expectation of capital recovery. Because the FCC has determined that this investment for network upgrades will not be recovered through access charges paid by the ISPs, it is important that regulators

encourage transformation of the PSN from primarily a voice network into one which can process any type of traffic desired, whether it be voice, data, or video. Regulators must always be careful not to fund technological developments which turn out to be inappropriate or would have occurred naturally. However, we must weigh this concern against a countervailing one of whether a large segment of society may not be provided timely access to advanced telecommunications technologies. If competition to provide new telecommunications services does not result in reasonably speedy deployment throughout the United States, funding to support advanced telecommunications services could come from the end users who call the ISPs, the ISPs themselves, or the USF.

It is important that regulators encourage transformation of the PSN from primarily a voice network into one which can process any type of traffic desired, whether it be voice, data, or video.

PSN traffic and advanced telecommunications infrastructure are evolving symbiotically. In recognition of this, costs imposed on the PSN by those accessing the Internet should be equitably shared among the originators, conveyors, and recipients of these communications in a manner that promotes competitive markets, technological innovation, network reliability, service quality, infrastructure investment, and universal service. Numerous controversies have arisen regarding jurisdictional cost allocations, application of access charges or other local pricing options, payment of reciprocal compensation, and receipt of and assessment for universal service funding for PSN facilities. These controversies may be resolved equitably for all telecommunications carriers and end users, if they are addressed systematically. By elucidating the interplay of the problems in this paper, we hope that regulators and public policy makers may be able to avoid the perpetuation of the seemingly endless applications to the evolving PSN of inadequate and piecemeal fixes to often outmoded pricing and policy models. Such refreshed

We hope that regulators and public policy makers may be able to avoid the perpetuation of inadequate and piecemeal fixes to the evolving PSN.

vision may engender innovative options and perspectives that otherwise might not be considered.

It is imperative that the public continue to perceive the network as seamless. While it may be that several networks will be used to deliver the telecommunications services of tomorrow, all of them will have to interact to connect all users. Viewing the networks, their costs, and their social value separately, without taking into account how they relate to each other in a unified communications system, would jeopardize the potential they hold to provide benefits for all consumers and to society as a whole.

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