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**Transforming Network Interconnection and Transport:
Policy Direction Summary**

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Executive Summary

Implementing a regulatory regime that helps to unlock the potential for new network services remains a difficult but crucially important task. Rather than merely stating an abstract commitment to promote competition, regulators should look for simple, significant policy actions that foster a propitious structure for the most beneficial forms of competition. This paper argues that regulators should establish a geographically comprehensive lattice of competing, independently owned network interconnection points from which telephony operators are required to provide zero-price telephony call termination. Other forms of intrusive regulation of inter-company interconnection and access, such as mandatory collocation, loop unbundling, and line sharing, should be avoided or rapidly phased out. These actions would provide a needed framework for telecommunications capacity markets and bandwidth trading, encourage the rapid development and roll-out of new, broadband network services, and foster a more even geographic diffusion of such services.

¹ The opinions and conclusions expressed in this paper are those of the author. They do not necessarily reflect the views of the Federal Communications Commission, its Commissioners, or any staff other than the author. I am grateful for numerous FCC colleagues who have shared their insights and experience with me.

The economic stakes associated with establishing a sound regulatory regime for new network-based services cannot be over-emphasized. The development of new network-based services will drive job creation. From 1988 to 1998, services (not including wholesale and retail trade, government, and utilities) generated 57% of total U.S. employment growth, and through 2008 computer and data processing services is the industry projected to have the most rapid employment growth.² Growth of such services is also crucial to over-all economic growth; in the U.S. between 1995 and 1998, information technology producing industries, which account for only 8% of U.S. GDP, generated 35% of the U.S. real economic growth.³ Policy makers should recognize that policies that improve the framework for the development of new network-based services have huge economy-wide importance.

Capital market valuations also point to the potential for value-creation in the communications industry. Yahoo, an Internet portal that two Stanford University graduate students started in 1994, currently has a market capitalization about \$90 billion. Amazon.com and EBay, two other new Internet-based companies, have a total market capitalization about \$52 billion. Most customers access these companies' services through dial-up Internet connections. Now consider that SBC, a company that has provided local telephone service for over a century and currently owns about one-third of all local access lines in the U.S., has a market capitalization about \$150 billion. It is simply astonishing that SBC's large set of physical assets, which could provide much better quality local connectivity, have value roughly comparable to three major Internet service providers. Current regulatory battles tend to be played as narrow, zero-sum games where parties fight to ensure "revenue neutrality". But capital market values indicate the potential for tremendous value creation. The challenge is to create a regulatory framework that helps make this happen.

To create a better structural framework for network facilities owners and for the creators of new network-based services, regulators should establish a geographically comprehensive lattice of competing, independently owned network interconnection points (which I call certified Service Interconnection Points or certified SIPs).⁴ Key aspects of this proposal are: 1) Certified SIPs are new institutions that place no limits on other organizations. In particular, other communications entities are allowed to organize themselves in any way that they find commercially desirable, subject to antitrust review; 2) Local telephone service providers are required to provide zero-price termination for all telephone calls delivered to chosen certified SIPs in the region associated with the called customer. Thus telephone call termination (including terminating fax and modem calls

² Thomson, Allison, "Industry output and employment projections to 2008," U.S. Bureau of Labor Statistics, *Monthly Labor Review* (Nov. 1999, revised March 2000), pp. 33-50, Tables 1 and 3. Available on the web at <http://stats.bls.gov/opub/mlr/mlrhome.htm>

³ U.S. Department of Commerce, *The Emerging Digital Economy II* (June 1999), pp. 19-20. Available on the web at <http://www.ecommerce.gov/ecomnews/040699.html>

⁴ This paper responds to some issues and questions raised in discussion of a more technical, quantitative paper: Galbi, Douglas, "The Economics of Transforming Network Interconnection and Transport", available on the web at <http://www.erols.com/dgalbi/telpol/think.htm>

over voice channels) becomes a regulatory obligation fulfilled from a limited set of certified SIPs, rather than a variety of regulated, wholesale services provided in a geographically uncoordinated way; 3) Antitrust policy provides the regulatory framework for certified SIPs, ensuring that they provide competing interconnection alternatives for local access providers and wide-area network services. 4) Using forbearance authority, all other regulations concerning relations among network operators and service providers is rapidly phased out. Implementing this proposal would lead to less intrusive regulation, more rapid development of new network services, and more even geographic diffusion of these services.

I. What exactly are these SIPs?

SIPs (Service Interconnection Points) are physical and institutional focal points for network interconnection. From a physical perspective, a SIP is a building, like a tandem switching office or a “telco hotel”, that provides a physical coordinating point for multiple networks. Interconnection at a SIP does not necessarily imply interconnection through a shared bus or switch; interconnection between two networks at a SIP can be done in the same way that it would be done at bilateral network meet points. Because SIPs are common physical nodes for multiple networks, multilateral interconnection of a particular quality and protocol can be established, monitored, and maintained more easily at SIPs than at multiple, geographically dispersed bilateral meet points. From an institutional perspective, a SIP provides a neutral, commercially driven environment for interconnection. Interconnection outsourcing services, multi-network content distribution services, and other such services would be expected to develop at SIPs. In the same way that geographic agglomeration at a city helps to generate economic growth, network agglomeration at SIPs would provide focal points for the growth of trans-network services.

Certified SIPs are SIPs from which telephony providers would be required to provide zero-price telephony call termination. Regulators would partition an area of regulatory authority, such as the whole country or the combined service territories of BOCs, into SIP regions. Regulators would establish 3-5 certified SIPs within each region. To ensure neutrality with respect to network transport providers and competition among certified SIPs, certified SIPs in a given region would be chosen so that they were owned independently of each other and of networks connecting to the particular certified SIP. Telephony termination obligations for customers associated with a SIP region would be required to be fulfilled from at least two certified SIP in that region. Mobile telephony customers could be associated with the SIP region of their primary residence, or mobile companies could be allowed to designate for each of their customers the SIP region at which they will fulfill their termination obligation. Internet service providers would naturally congregate towards having a presence at certified SIPs. Hence the cost of calling an ISP would be determined by the calling party’s telephone company, which would face no externally imposed per minute costs that serve as a barrier to flat-rate calling plans. Most importantly, certified SIPs would compete with each other to attract interconnecting networks. Network operators would thus have a choice among regional

certified SIPs from which they could fulfill their regulatory obligation for telephony termination.

An important policy motivation for certifying a set of SIPs with a privileged position for telephony termination is to provide a geographically comprehensive lattice for the development of telecommunications capacity markets. There has been considerable interest in the development of commodity markets for bandwidth. The huge economies of scale in providing point-to-point bandwidth and the plummeting price of bandwidth suggest that relatively liquid transactions for bandwidth are likely to develop, not on a point-to-point basis, but for networks connecting a relatively small set of points. Given their significance for telephony call termination, certified SIPs would have a network salience that would make them a recognized, standard lattice for the provision of network bandwidth. Competition is likely to develop for bandwidth among geographically comprehensive sets of certified SIPs, with bandwidth differentiated by service quality, protocol, and management services. Such an industry structure would permit a sustainable market for bandwidth among many owners of national network facilities. Such an industry structure would also give providers of new, innovative, network-based services diverse opportunities to purchase networks needed to project a particular service across a wide geographic area.

In terms of investment in local network facilities, certified SIPs provide “value anchor points” that enhance opportunities for local investment in local access facilities. The value of an investment in local network facilities depends on the value of the network services provided and the share of that value that the local facilities investor is able to capture. With certified SIPs serving as a lattice for the roll-out of wide area network-based services, building connectivity to certified SIPs gives a local facilities investor an opportunity to transact for a large and continually growing array of services. The risk of having the value of the local facilities extracted by a particular interconnecting network or a particular service provider is reduced as the scope of possible transactions expands.

The concept of a SIP does not include an assignment of wholesale and retail functions. That’s an important issue for industry experimentation and innovation. A mass-market service provider might want to contract for a network to distribute its service across SIPs and through local access providers. SIPs might evolve from ISPs, bundling local access facilities with wide-area services and thus serving as retail service distributors. One can also imagine local facilities providers selling directly to customers connectivity to different sorts of national services, with SIPs being limited to the functions currently associated with telco hotels. This type of development may distinguish mobile and wireline service connectivity. The sort of arrangements likely to emerge depends on the breadth of demand for a particular service and the significance of localization and customization for that service.

Certifying SIPs does not imply any particular arrangement for “originating access”, i.e. interconnection by which other parties provide retail service to customers connected to a local facilities provider’s network. One extreme would be for the regulator to allow the local facilities provider to charge its customers unregulated, discriminatory rates for

connections to certified SIPs. Doing so would allow local facilities providers to foreclose the ability of other service providers to provide retail services to its customers. Such behavior might make a local facilities provider vulnerable to a long and costly antitrust challenge. Moreover, eliminating other possible retail channels and value-added service providers does not appear to be a propitious business strategy in the context of emerging competition among local facilities providers and a wide array of rapidly developing broadband services. But such a strategy is attractive in the context of current narrow-band services. If telephony originating access were totally unregulated, separate long-distance and dial-up ISP industries could be wiped out while local facilities providers continued to extract from their customers large amounts of telephony and narrow-band service revenue.

Other approaches to telephony “originating access” are also possible. An intermediate approach might require that telephony calls to a certified SIP be priced on non-discriminatory basis relative to telephony calls to end points in the associated telephony calling region. That’s a sensible approach from the perspective of traditional common carrier regulation, but it would make the physical location chosen for certified SIPs very significant. Another intermediate approach would set a special, regulated, per minute rate for calls to service providers located at certified SIPs in the customer’s associated SIP region. Setting such a rate would be a contentious, difficult policy choice, but one that is at least simpler and more structured than similar rate problems that currently confront regulators. One might also imagine a regulator requiring that calls to certified SIPs be considered unmetered local calls. Such an approach would eliminate local facilities as a cost consideration for dial-up ISPs, long distance telephony providers, and other narrow-band service providers. Under such a regime, the return on local facilities investment would be determined by flat-rate network access fees and broadband service revenue. That’s a good regime for fostering local facilities-based competition and the development of new network services, but some transitional arrangements are clearly required to make it feasible.

II. Is this a proposal for structural separation even more dramatic than the AT&T divestiture?

This proposal does not identify any part of the communications industry as non-competitive, nor does it expand sector specific regulations requiring equal access and non-discrimination. The AT&T divestiture, and other similar policies, aimed to separate non-competitive “bottleneck” business segments from competitive segments. Non-competitive segments were then subject to regulatory quarantine and sector-specific requirements to provide non-discriminatory access. Under this proposal, certified SIPs would be required to adhere to certain network facilities ownership restrictions in exchange for being granted a privileged position for terminating telephony traffic. Certified SIPs would not be subject to any sector-specific equal access or non-discrimination requirements. General antitrust policy would be the means for addressing any concerns that certified SIPs were engaging in anti-competitive practices.

This proposal does not focus on breaking up existing network operators. Regulators might consider requiring large network operators to divest some tandem offices in order to generate candidates to be certified SIPs. There are, however, also a wide range of other candidates to be certified SIPs. Independent telco hotels, data centers, web hosting facilities, and application service providers are rapidly being established. Some sophisticated, highly capable ISPs are migrating toward an industry position similar to that of a SIP. The aim of this proposal is to promote the development of a new set of organizations, not to break up existing ones.

This proposal does not preclude any network operator from operating on a vertically integrated basis or negotiating alternative telephony interconnection arrangements. Consistent with reasonable preparation to fulfill their telephony traffic termination obligations from certified SIPs, telephony providers are free to negotiate additional telephony interconnection arrangements. Companies can also establish interconnection points integrated with network transport; these points are simply not eligible to become certified SIPs. The lattice of certified SIPs provides an industry structure that will compete with other vertically integrated business models for providing new, innovative network services.

III. Why shouldn't network operators get paid for terminating telephone calls?

Regulators should encourage network operators to shift customer value from telephony to new advanced services. Telephony is a well-established business model that generates a large amount of current revenue. On the other hand, telephony pricing structures are an artifact of regulation, and the cost of advertising, promoting, and billing telephony products far exceeds the cost of providing plain-old telephone service on an advanced network. Competition that arbitrages legacy telephony pricing structures and focuses innovation on new ways of advertising, promoting, and billing telephony offers relatively limited public benefits.⁵ Regulators need to establish a framework in which network services providers compete to develop, promote, and bill new bundles of communications, content, and commerce services that include unlimited, unmetered telephony service.

Making call termination a zero-price regulatory obligation rather than a commercial service would help bring about this value shift in an aggressive but not unreasonable way. Having a regulatory obligation for zero-price telephony call termination would focus competition for telephony service on acquiring customers who make calls. This is an informationally sensible focus for competition, since the calling party generally pays for telephone calls and hence has the economic motivation to make an appropriate choice between competing providers. Moreover, with zero-price telephony call termination

⁵ The U.S. long distance industry provides a dramatic example of this situation. While U.S. long distance service providers spend about \$5 billion per year on advertising and promotional expenses, the capital cost of network facilities that could provide residential customers free, unlimited long-distance POTS is only about a few billion dollars total. See Galbi, Douglas, "The price of telecom competition," info Vol. 1, no. 2 (April 1999).

from certified SIPs and a well-functioning market for bandwidth among SIPs, local telephony providers would have a telephony cost structure that would allow them to offer unlimited, flat-rate calling to points within the regions that certified SIPs cover.

Regulation that attempts to establish specific cost-based call termination rates has costs that greatly exceeds its benefits. Call termination costs vary significantly depending on network architecture and technology. Experience shows that cost determinations are slow, contentious, and create significant business uncertainty. Most importantly, data services are driving the growth in demand for network bandwidth. Requiring that network operators provision, as a regulatory obligation, sufficient bandwidth for telephony traffic termination is not likely to impede investment in network facilities that also provide broadband data services.

IV. If establishing a lattice of SIPs is such a good idea, why aren't private companies doing it themselves?

Private companies are establishing network-independent, competitor-neutral interconnection points. PAIX has announced plans to build six new highly secure facilities for collocation and interconnection of wireline network transport, switching, and content and service distribution equipment.⁶ Equinix plans to build and operate about 30 similar facilities in business, financial, and Internet hubs around the world.⁷ The Rudin family, owners of one of New York City's largest private real-estate portfolios, is renovating a number of buildings in the New York metro area to serve as hubs for interconnection and information service micro-economies.⁸ These are just some of the pioneering firms in a business that is attracting vigorous entry. Other firms include Colomotion, CO Space, DataCentersNow, Iaxis Ltd., Infocrossing, NeXcomm Capital Partners, Markley Stearns Partners, Switch and Data Facilities Co., Taconic Investors, Telecom Real Estate Service, Telehouse, T-Rex Developers, and Young Woo & Associates.

One also sees a related business model emerging with respect to wireless communications towers. Major wireless service providers originally owned and maintained their own antenna towers. Pressure to focus business activity and to avoid expensive regulatory and political battles over tower access led wireless providers to sell their towers to independent tower management companies. These companies manage antenna sites and sell antenna space on a single tower to multiple, competing wireless service providers. Five publicly traded companies (American Tower, Crown Castle International, Pinnacle Holdings, SBA Communications, and SpectraSite Holdings) currently own about 40% of the world's wireless communications towers.⁹ As wireless data becomes more important, the relationship between tower sites and wireline

⁶ See <http://www.paix.net>

⁷ See <http://www.equinix.com>

⁸ See <http://www.55broadst.com>

⁹ "For Investing Ideas, Just Look Upward," Washington Post, March 19, 2000, p. H1.

interconnection nodes and data centers, i.e. SIP-like institutions, will become an important aspect of the communications industry.

Although private companies are establishing SIP-like institutions, more rapid, more geographically comprehensive development of SIPs is more desirable. Policies that establish a geographically comprehensive set of competing, independently owned SIPs would give policy makers better opportunities to avoid or rapidly phase out other intrusive and costly regulatory policies. Such an industry development might also lessen the risks of socially costly antitrust developments in the future.¹⁰ Most importantly, taking action to ensure that SIPs develop rapidly on a geographically comprehensive basis would be an effective expression of concern about universal service with respect to new, advanced services. SIP-like institutions are currently developing much more rapidly in major urban areas than in small cities and rural areas. A resulting “digital divide” in the availability of new, advanced network services could invoke expensive and relatively ineffective policies narrowly directed at this problem. Private actors are not likely to recognize or internalize the benefits of an industry structure that mitigates the need for such costly policy interventions.

V. Isn't this proposal highly interventionist?

From a realistic, implementation-focused perspective, this proposal is less interventionist than the alternatives. Currently call termination services are differentiated by the location of the parties (local, interLATA, interstate) and the network structure by which the call is terminated (tandem switching elements, transport elements, local switching and local access elements). ISP-bound dial-up traffic appears to be emerging as an additional category. Other relevant regulatory concepts include the requirement that termination rates are reciprocal, and that they are based on cost. Economic logic and accumulating experience with mobile operators and competitive local wireline providers indicates that competition is not likely to be effective in disciplining telephony termination rates given current industry structure.¹¹ Moreover, difficult questions regarding categories and principles for regulating termination rates (How exactly is cost determined? What does the point of origin of traffic or its type have to do with the cost of terminating it? What termination service is reciprocal relative to a given service?) force regulators to make decisions that essentially amount to deciding which companies get how much money.

This proposal would change telephony call termination from a widely varying array of regulated, wholesale offerings to a simple, tightly defined regulatory obligation. Under

¹⁰ The value of getting service through one provider's end-to-end network, rather than via unstructured and dynamic Internet connections, is one factor driving communications industry consolidation. SIPs would provide a competing, more structured framework for interconnection than the Internet.

¹¹ Under calling party pays, considerable controversy has developed in Europe concerning high rates for terminating calls from wireline to mobile telephony providers. See Scott-Joynt, Jeremy, “Mobile operators under fire over rates,” *Communications Week International*, 20 March 2000. Parties have also expressed concern to the FCC about rates that competing local exchange carriers charge for terminating long-distance telephony traffic. See FCC, *Fifth Report and Order and Further Notice of Proposed Rulemaking* (FCC 99-206), CC Docket No. 96-262 (released Aug. 27, 1999), paras. 180-186.

this proposal, local telephone companies must provide zero-price call termination to their customers from at least two certified SIPs in their customers' associated SIP regions. All telephony traffic is treated the same, irrespective of point of origin. All telephony traffic is treated the same, irrespective of the network structure or technology used to terminate the traffic. Moreover, the regulatory obligation exists from a selected number of certified SIPs, not from any other points. Such a regulatory obligation means that companies' telephony revenues and profits will be determined by the services and features that they can offer in competing to attract end users. This form of competition is a less interventionist means for determining outcomes than an unpredictable and unstable regulatory assignment of revenue associated with terminating telephony traffic.

This proposal is also less interventionist in the sense that it allows regulatory decisions to be devolved geographically. A regulatory body covering a large geographic area might establish SIP regions and set out the number and terms for certifying SIPs. Then regulatory bodies covering smaller geographic areas might choose the certified SIPs within the SIP regions in their jurisdictions. Since telephony termination is a zero-price regulatory obligation, high telephony termination rates are not available as a means for shifting rents from parties outside a SIP region to companies or parties within a SIP region.¹² Specific decisions on arrangements for telephony originating access could also be decentralized by SIP regions. Variation in originating access regimes could reflect policy judgements concerning region-specific factors such as the speed of development of facilities-based broadband competition.

VI. The Physical and Institutional Architecture for Telephony Interconnection is a Simple and Significant Policy Lever

Establishing a geographically comprehensive lattice of certified SIPs is a simple, significant policy choice. An largely unappreciated meta-challenge confronting regulators is to identify such policy choices. For example, regulators who have adopted TELRIC pricing have discovered that, given TELRIC pricing, a large number of narrow, complex issues still greatly affect outcomes. Adopting TELRIC in itself does not seem in retrospect to have been a major decision. Similarly, the significance of requiring loop unbundling, requiring collocation, and requiring line sharing depend on many additional interpreting decisions on narrow, complex issues. Such decisions are often made in obscure ways. A close study of regulatory schemes such as price caps or the CALLS plan show specific, implementing details that decision makers cannot be expected to consider nonetheless greatly affect outcomes. Other policy proposals such as "open access" do not even have implementation blueprints that can be studied. One lesson is that regulators need to search for simple, significant policy levers. Decisions about the physical and institutional architecture for telephony interconnection appear to be such a lever.

¹² This situation is most apparent under traditional settlement rates for terminating international telephone traffic. See Galbi, Douglas, "Cross-border rent shifting in international telecommunications," *Information Economic and Policy* 10 (1998) pp. 515-536. The problem occurs in a more subtle form in battles between state and federal regulators over local telephone rates and interstate access charges.