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Regulatory Policy Reform for the Transition to Fully Competitive Voice Markets

White Paper #2

Interconnection Policy

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* This report was commissioned by Comcast. The methodology, analysis, and conclusions are the author's own.

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Executive Summary

This White Paper, the second in a series of policy white papers, focuses on the continuing need for regulation of the terms and conditions of interconnection between telecommunications networks. Incumbent local exchange carriers (ILECs) will continue to hold the balance of power in interconnection negotiations with their competitors, so long as they retain a majority of the voice customers within a local market. Absent regulation, the ILECs potentially will have the incentive and ability to raise their competitors' costs by raising the price or degrading the quality of interconnection.

The ILECs are bound by the interconnection obligations contained in the Telecommunications Act of 1996, which requires them to provide interconnection "for the transmission and routing of telephone exchange service and exchange access" and satisfy conditions relating to: (1) *where* in the network the interconnection must be allowed; (2) *what quality* of interconnection must be provided; and (3) *how much* is to be charged to the competitor for interconnection.

FCC rules implementing these provisions of the 1996 Act have enabled local voice competitors to interconnect with the ILECs under reasonable terms and conditions. As a result, facilities-based competitors have been able to penetrate the local voice market and acquire customers at a relatively rapid pace, especially in the last two years. But the progress achieved to date is in jeopardy from a number of ILEC initiatives to free themselves from interconnection obligations, including: (1) unilaterally making new interpretations of the current rules; (2) seeking forbearance from regulation of interconnection obligations in major metropolitan areas; (3) "reforming" intercarrier compensation rates to impose greater costs on competitors.

Evidence of the ILECs' intentions or proposals to increase the cost of interconnection includes:

- Limiting the points of interconnection on the ILEC networks made available to the competitors.
- Imposing financial obligations on competitive voice providers for provisioning interconnection transport to carry local traffic <u>both to and from</u> a point deep in rural local exchange carriers' networks.
- Denying interconnection and traffic exchange obligations under Sections 251 and 252 for managed-packet technology, which is replacing traditional network architecture.

- Removing tandem transit traffic from the category of regulated interconnection services. This exposes the competitive voice providers to large increases in the rates for part of the essential network fabric used to connect all carriers together.

These and other proposals made by the ILECs would undermine the competitors' interconnection rights and disrupt the smooth and rapid transition now occurring to a fully effective competitive market for local voice service. In response to these initiatives, we recommend that the following four principles should govern future public debates on interconnection policy and practices.

Policy Principle No. 1:

(a) Incumbent local exchange carriers must provide interconnection at any point or points as determined solely by the requesting provider.

(b) The originating carrier is obligated to deliver traffic to the POI it selects on the terminating carrier's network, and pay cost-based rates for termination of the traffic to the called party.

Policy Principle No. 2:

(a) Incumbent local exchange carriers must provide interconnection for voice traffic on nondiscriminatory terms and conditions.

(b) Incumbent local exchange carriers must provide interconnection in any format or protocol currently in use by the ILEC within its own network.

(c) Interconnection must be provided to telecommunications carriers, regardless of the statutory classification of the end-user service.

Policy Principle No. 3:

Call termination rates must not discriminate across users or usage. Cost-based price levels should be instituted as soon as possible.

Policy Principle No. 4:

Tandem transit must be offered as an interconnection service by the ILECs at forward-looking cost-based rates under Section 215(c)(2) of the Communications Act.

Regulatory Policy Reform for the Transition to Fully Competitive Voice Markets
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Interconnection Policy

This White Paper, the second in a series of policy white papers, focuses on the continuing need for regulation of the terms and conditions of interconnection between telecommunications networks. As explained in White Paper #1, incumbent local exchange carriers (ILECs) will continue to hold the balance of power in interconnection negotiations with their competitors, so long as they retain a major share of the voice customers within a local market. Absent regulation, the ILECs potentially will have the incentive and ability to raise their competitors' costs by raising the price or degrading the quality of interconnection. We will explain below existing rules and regulations that govern interconnection, describe recent proposals by the ILECs to eviscerate essential protections contained in these rules, and discuss proposals to reform interconnection rules. Then, we recommend conditions that should apply to interconnection arrangements between ILECs and competing providers so long as the incumbents possess market power in the provision of local exchange and exchange access services.[1]

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[1] In addition to interconnection, the ILECs provide several other essential inputs to their competitors, including inputs needed to facilitate efficient and timely migration of customers switching between carriers. For example, ILECs must relinquish a migrating customer's telephone number and facilitate the efficient porting of the number to the customer's new local voice provider. The ILECs and electric utilities control access to poles, to which the competitors must attach their own wires. Cable competitors now face a threat that the fees they pay for pole attachments will increase substantially and impose costs in excess of the costs borne by the ILECs for their own use of poles. Our forthcoming white papers will provide an in depth treatment of these issues.

I. Regulatory Practices Governing Interconnection

Interconnection is essential in any communications marketplace where customers are served by multiple, competing carriers. Without interconnection, one network's customers are unable to communicate with another carrier's customers. In markets where one firm has a disproportionate share of the market, however, the dominant firm will have the upper-hand in any interconnection negotiation. Indeed, under the conditions now present in voice markets, the ILECs have the incentive and ability to raise the price and degrade the quality of interconnection provided to their competitors. Regulatory authorities must prevent this from happening by requiring the dominant firms to establish fair and reasonable interconnection policies. This is the most important role for government in this transition between the old monopoly world and the competitive market of the future.

1. Statutory and Regulatory Basis for Requiring Interconnection

Congress was well aware of the importance of this issue when it adopted the Telecommunications Act of 1996 (1996 Act), the first comprehensive reform of the Communications Act of 1934, as amended (Communications Act). This legislation established basic interconnection obligations for all telecommunications carriers requiring that they "interconnect directly or indirectly with the facilities and equipment of other telecommunications carriers."[2] Carriers without market power have complied with these obligations without any need for government intervention.

Congress recognized, however, that the incumbent local exchange carriers must be bound by a much more detailed set of interconnection obligations to prevent the disruption of the soon-to-be evolving competitive market. The Communications

[2] 47 U.S.C. § 251(a)(1).

Act requires ILECs to provide interconnection "for the transmission and routing of telephone exchange service and exchange access" and satisfy conditions relating to: (1) *where* in the network the interconnection must be allowed; (2) *what quality* of interconnection must be provided; and (3) *how much* is to be charged to the competitor for interconnection.[3]

In August 1996, the FCC established rules implementing the 1996 Act's provisions, including the new interconnection requirements imposed on the ILECs.[4] These rules have served as the blueprint for all future state and federal review of the terms and conditions governing interconnection agreements and tariffs.

Interconnection Condition #1: The "where" of interconnection is stipulated in the Act in a requirement that the ILEC provide interconnection "at any technically feasible point within [its] network."[5] The FCC interpreted this requirement as a reference "solely to technical or operational concerns, rather than economic, space, or site considerations,"[6] and identified a list of interconnection points that were "critical to facilitating entry by competitive local service providers."[7] The FCC's rules continue to play a major role in reducing barriers to entry by carriers without ubiquitous networks.

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[3] 47 U.S.C. § 251(c)(2).

[4] *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket Nos. 96-98, 95-185, First Report and Order, 11 FCC Rcd 15499, 15846-50, paras. 679-89 (1996) (*Local Competition Order*)), *aff'd in part and vacated in part sub nom. Competitive Telecommunications Ass'n v. FCC*, 117 F.3d 1068 (8th Cir. 1997) and *Iowa Utils. Bd. v. FCC*, 120 F.3d 753 (8th Cir. 1997), *aff'd in part and remanded, AT&T v. Iowa Utils. Bd.*, 525 U.S. 366 (1999) (*Iowa Utils. Bd.*), *on remand, Iowa Utils. Bd. v. FCC*, 219 F.3d 744 (8th Cir. 2000), *reversed in part sub nom. Verizon Communications Inc. v. FCC*, 535 U.S. 467 (2002) (*Verizon*).

[5] 47 U.S.C. § 251(c)(2)(B).

[6] Local Competition Order, ¶198

[7] Id., ¶209

Interconnection Condition #2: The "what quality" of interconnection is defined in the Act as "at least equal in quality to that provided by the local exchange carrier to itself or … [to] any other party to which the carrier provides interconnection."[8] The FCC interpreted this provision to require the ILEC "to design interconnection facilities to meet the same technical criteria and service standards, such as probability of blocking in peak hours and transmission standards, that are used within their own networks."[9] In practice, this has required the ILECs to demonstrate that a competitor's ability to provide service to its own customers is not compromised by delays or disruption in provisioning of interconnection facilities.

Interconnection Condition #3: The "how much" must be paid condition requires the ILEC to provide interconnection "on rates, terms, and conditions that are just reasonable, and nondiscriminatory."[10] The FCC established a forward looking economic cost standard for these rates on the grounds that this was equal to the cost that the ILEC "imposes on itself" for the same functionality. The FCC's decision to create minimum national pricing standards was based on the belief that these "will tend to offset the imbalance in bargaining power between incumbent LECs and competitors and encourage fair agreements in the marketplace…"[11]

2. PROGRESS AND PITFALLS IN REGULATING INTERCONNECTION

For the most part, the FCC's rules have succeeded in requiring the ILECs to set reasonable terms and conditions for interconnecting with other carriers for the exchange of voice traffic within the same local area. The benefits of this policy,

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[8] 47 U.S.C. § 251(c)(2)(C).)

[9] Local Competition Order, ¶224.

[10] Telecommunications Act, Section 251(c)(2)(D)

[11] Local Competition Order , ¶216

however, have been compromised by the failure of the FCC and state regulators to undertake a comprehensive reform of intercarrier compensation for all traffic exchanged by other carriers with the ILECs, including interstate long distance, intrastate long distance, and wireless traffic. Moreover, reforming intercarrier compensation policy has taken on greater importance as the technology and marketing practices of the industry have changed. With the advent of "all-you-can-eat" voice calling plans, the jurisdictional differences in intercarrier compensation rates are no longer reflected in the rates paid by many retail customers. Also, the widespread use of nomadic voice services – voice services and phone numbers that the caller carries from one location to another -- make it even harder to preserve a jurisdiction-based approach to intercarrier compensation.[12]

Not only has reform of intercarrier compensation stalled, but progress achieved to date is in jeopardy from a number of the ILECs' initiatives to free themselves from interconnection obligations, including: (1) unilaterally making new interpretations of the current rules, for example by trying to remove tandem transit traffic from the category of regulated interconnection services[13] and limiting interconnection obligations to the older transmission technologies; (2) seeking forbearance from regulation of interconnection obligations in major metropolitan areas; (3) "reforming" intercarrier compensation rates to impose greater costs on competitors. This paper responds to these ILEC proposals and demonstrates the importance of

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[12] Wireless phone service is the best known of the nomadic services. The VoIP services provided by Vonage and other "over-the-top" Internet phone companies also allow customers to port their phone device and telephone number to any location where a broadband Internet connection is available.

[13] AT&T has argued that the Commission has no authority to require ILECs to provide transit service pursuant to Section 251 interconnection agreements. *Petition for Interconnection of Neutral Tandem, Inc.*, WC Docket No. 06-159, AT&T Reply Comments at 8-9 (filed September 25, 2006).

maintaining pro-competitive interconnection practices until the ILECs' control over end-users has diminished substantially.

3. DISTINGUISHING INTERCONNECTION FROM OTHER REGULATORY ISSUES

Interconnection is a very unique policy issue because of the long-lasting impact of the historic local telephone monopoly. This argues for very aggressive and strict regulation of the terms of interconnection. A danger exists, however, that parties will seek to import the policy recommendations made in this paper into other contexts that bear superficial or partial resemblance to interconnection. In order to prevent this paper from being misconstrued, we wish to clarify that the analysis and policy recommendations are limited to the issue of traffic exchange between two or more telecommunications networks.

As we mentioned at the outset, the "free market" bargaining over the exchange of traffic between two networks of unequal size will often not lead to a pro-competitive outcome, because the larger network potentially has a powerful incentive to raise prices or degrade the quality of interconnection in order to raise its rival's costs and increase its own profits. And as explained in White Paper #1, the larger network will have the incentive and ability to deny or degrade interconnection, even if its market share slips considerably below the current shares of the ILECs. Thus, even though competitors can overcome all other barriers to entry and do not depend on the ILECs for any network components, they are still dependent on interconnection in order to provide a competitive service to the ILECs.

We contrast the interconnection issue of this paper to other policy issues that have been mistakenly labeled as interconnection, including "net neutrality" and access to network components of the ILECs or their competitors. The net neutrality issue concerns markets that are vertical or complementary to each other, i.e. the network

platform market and the content market. Economic analysis of net neutrality must focus on issues of competition in the platform market, incentives of platform providers to integrate into content markets, and the ability of platform providers to discriminate against competing content providers if they integrate. These are complex issues that cannot be sidestepped by declaring net neutrality to be an open-and-shut case of interconnection between two unequally sized networks.

Access to network elements or components (e.g. unbundled loops, building wiring, PEG origination points) entails a vertical relationship between input and output markets. In this case, a key economic issue is whether the competitor can overcome barriers to entry into the input market. If these entry barriers are overcome, the incumbent firm loses the ability to leverage its market power from one market to the other.

In summary, the interconnection (traffic exchange) issue discussed in this paper is *sui generis*, because of the large network's unambiguous incentive and ability to deny or degrade interconnection under the conditions now present in the marketplace. Moreover, interconnection is required by law and has already been fully implemented by regulators. It stands alone in passing the cost-benefit test for regulation by a wide margin.

II. Designating the "Where" of Interconnection

The first step in an interconnection agreement is to designate the physical location where traffic is handed-off by one carrier to the other. The location where this handoff occurs is termed the point of interconnection ("POI"). The POI is where one carrier's financial and operational responsibility for carrying the traffic ends and the other carrier's responsibility begins.[14]

Under current FCC regulations, competitive carriers have the option to interconnect at any technically feasible point in the ILEC network. In almost all cases where a direct interconnection is requested, the CLEC will interconnect at one of three places: (1) the ILEC's tandem office, (2) the ILEC's end office, or (3) a mid-span fiber meet point.

These POI options are shown in the figure below, which depicts a hypothetical ILEC-competitor interconnection arrangement within a local market. This hypothetical area is served by four ILEC end offices, one ILEC tandem, and one competitor "soft" switch.[15] Each ILEC voice service customer is connected to one of the four end offices. By contrast, the competitor's customers, regardless of where they are situated within this geographic area, are served by the competitor's single soft switch. Finally, the ILEC tandem connects the ILEC's end offices with each

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[14] See Federal Communications Commission, *Developing a Unified Intercarier Compensation Regime*, CC Docket No. 01-92, Notice of Proposed Rulemaking, 16 FCC Rcd 9610 (2001), ¶112.

[15] A soft switch is a software-only call processing computer used to route traffic in a packet-switched network. When a call is placed using VoIP, a request is sent to the soft switch asking which endpoint is associated with the dialed phone number and what that endpoint's current IP address is. The soft switch contains a database of users and phone numbers.

other, routing calls from an ILEC customer served by one end office to a second ILEC customer served by a different end office within this local calling area.[16]

The figure illustrates several possible points of interconnection in this geographic area. A competing carrier can establish a POI at each of the ILEC's end offices or at the ILEC's tandem office.[17]

Another alternative is to establish a POI in a "neutral" location outside of either carrier's end office or soft switch location, where the fiber optic cables of the two carriers would be joined. This option can be economical if the competitor owns fiber facilities that pass nearby the ILEC's facilities. The mid-span fiber meet is accomplished by splicing together the fiber optic cable of the two carriers. Each carrier would be obligated to bring all outgoing traffic to the POI and to accept all incoming traffic at the POI. A mid-span fiber meet is also shown in the accompanying figure.

Two carriers may also interconnect indirectly, using a third carrier as an intermediary. For example, a rural carrier and a CLEC may connect at the closest large ILEC tandem rather than establish direct trunking between their two networks. This enables greater use of larger trunk groups, which are less costly on average than the small trunk groups that would be needed for a direct connection between a rural LEC and a CLEC. Rural carriers do not oppose these arrangements. As we discuss below, however, they have sought to impose the entire cost of the interconnection trunks on the CLECs.

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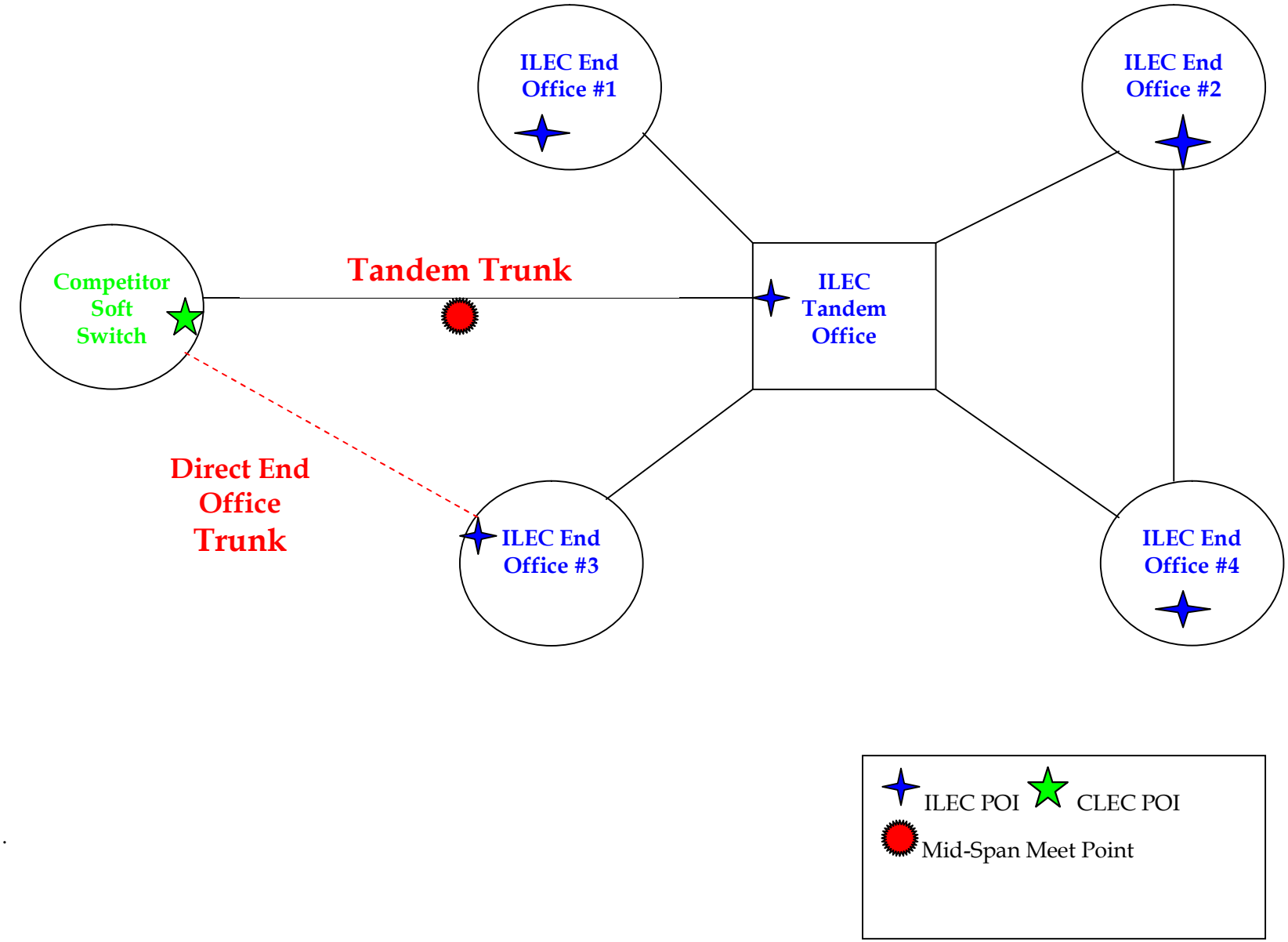
[16] ILEC end offices with a sufficient volume of interoffice traffic are also connected directly with each other.

[17] The figure also shows the possibility of creating a POI at the competitor's soft switch.


ILEC End Office #1
ILEC End Office #2
Competitor Soft Switch
Tandem Trunk
ILEC Tandem Office
Direct End Office Trunk
ILEC End Office #3
ILEC End Office #4
ILEC POI
CLEC POI
Mid-Span Meet Point

At present, cable companies and other competitive carriers utilize all of these options. In urban areas the competitors interconnect at some end offices and at the tandem. A competitor will interconnect directly at an ILEC end office only if the volume of calling between the competitor's customers and the ILEC's customers served by that end office is large enough to justify the cost of the dedicated facility between the end office and the competitor's network. Otherwise, it will be much more economical to interconnect at the ILEC's tandem office, which can distribute the traffic to all end offices to which it is connected. Further, a connection to the tandem can also be used to handle the overflow of traffic from the direct end office connections during times of peak demand.

It would be inefficient to require interconnection at the ILEC's end office if the volume of traffic is too low. For example, if a cable company's customers exchange a total of 200,000 minutes a month of traffic with the ILEC customers served by a particular end office, the size of the efficient trunk group needed to handle that traffic would be approximately 1 DS1.[18] This is a relatively small trunk group, much smaller than the size needed to take advantage of scale economies. Compelling the competitor to connect directly to this end office would impose unnecessary costs, because the competitor would have to dedicate trunk ports on its own switch for this thin route and also lease expensive interoffice trunks. The efficient solution for this situation is to establish the point of interconnection at the ILEC's tandem office. This approach would allow the competitor to utilize more efficient trunking facilities -- between its soft switch and the tandem and by sharing the trunks between the ILEC tandem office and the ILEC end office with other providers' traffic. Properly priced, the per-minute rate for use of the ILEC tandem and the

[18] A DS1 trunk carries traffic at 1.54 Mbps, which is sufficient to handle 24 simultaneous voice calls. This calculation assumes a 1% blocking rate, which would allow 23 CCS ("Centum Call Seconds") per trunk, and 30% average occupancy daily.

interoffice ILEC trunking facilities should be in the range of $0.00054 per minute.[19] By comparison, a direct DS1 interoffice trunk that leases for $500 per month would cost the CLEC on a per-unit basis $.00250 per minute in this example, which is about five times higher than the alternative tandem arrangement.

The most cost-effective option in any particular case depends on many factors, including, for example, the extent and location of the interconnecting networks, and the availability and pricing of collocation space in the ILEC switching centers. In any event, the interconnecting parties must be willing to engage in good faith efforts to use the most efficient arrangements. Should the ILEC refuse to participate in an efficient interconnection arrangement, it should be compelled to cooperate under the provisions of Section 251(c) (2). Moreover, interconnection at any feasible point in an ILEC's network should be subject to the pricing standard established by Section 252(d) (1).

A large coalition of ILECs, along with some other carriers, recently sponsored the "Missoula Reform Plan" to reform interconnection policy. Under this Plan, each ILEC would designate a point or points – called a network "Edge" -- where a competitor would hand off terminating traffic. [20] The large ILECs would be free to require interconnection at all access tandems in a LATA, and the rural telephone companies would be free to designate an Edge at each of its end offices.

This proposal would undermine the efficient interconnection architecture set forth in the Commission's rules, under which competitive carriers have chosen among all

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[19] This is the rate set by the Michigan Public Service Commission for AT&T's tandem termination, including the tandem switching, tandem transport termination and 25 miles of tandem transport facility. See, *In the Matter on the Commission's Own Motion to Review the Costs of Telecommunications Services Provided by SBC Michigan*, Case No. U-13531, Final Order at Exhibit A, p.11 (Mich. PSC January 25, 2005)

[20] "The Missoula Intercarrier Compensation Reform Plan," filed at the FCC in CC Docket No. 01-92, July 24, 2006. .

technically feasible points of interconnection on the ILECs' network. The Missoula Plan acknowledges that the competitor has a right to interconnect at any point in the ILEC's network, but subverts this statutory requirement by authorizing the ILECs to charge extra when a competitor chooses a POI at any location other than the Edge selected by the ILEC. This would force the competitors to either buy costly transport from the ILEC or build their own network facilities to move traffic between the POI selected by the competitors and the POI designated by the ILEC. As explained by CTIA (the association of wireless carriers) in their comments on the Missoula Plan, this would impose a unique burden on the competitive carriers:

> Competitive carriers, however, cannot match the vast, ubiquitous networks of the RBOCs. The tremendous costs of installing costly transport links to multiple Edges of every terminating ILEC, described above, would typically be borne only by interconnecting competitive carriers, most of whom could not afford the required massive network reconfiguration.[21]

It is important that all options now available to interconnecting carriers continue to be made available in the future. Any effort to undermine these rights places the transition to a competitive market at risk and therefore must be denied by policymakers.

The proposed transport regime of the Missoula Plan includes unwarranted benefits to rural carriers by reducing or eliminating their obligations to pay for the transport and termination of traffic originated by their own customers. The Plan proposes to impose on the competitive carriers the financial obligation for provisioning interconnection transport to carry local traffic both to and from a point deep in a rural local exchange carrier's network.[22] In general, the Plan requires an originating carrier to deliver local traffic to the terminating carrier's Edge. However it exempts

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[21] *Comments of CTIA – The Wireless Association on the Missoula Plan*, Federal Communications Commission, CC Docket No. 01-92, October 25, 2006, at 20.

[22] Missoula Plan, at 33-35.

rural carriers from this obligation to carry traffic to the Edge designated by other carriers. As a result the rural carriers must only deliver traffic to the network demarcation point – the Edge on their own network and thus receive free transport from their network Edge to the Edge of a terminating large carrier's network.

These examples demonstrate that the ILECs will seek to impose additional costs on competing carriers by changing or eliminating the necessary protection incorporated in the existing interconnection rules. These rules, which have prevented the ILECs from artificially raising their competitors' costs, must be maintained so long as the ILECs have the upper-hand in any "free market" negotiations with competitors.

In conclusion, we present as our first policy recommendation on this topic:

Policy Principle No. 1:

(a) Incumbent local exchange carriers must provide interconnection at any point or points as determined solely by the requesting provider.

(b) The originating carrier is obligated to deliver traffic to the POI it selects on the terminating carrier's network, and pay cost-based rates for termination of the traffic to the called party.

III. Determining the "What Quality" of Interconnection

The Act requires that interconnection must be "equal in quality to that provided by the local exchange carrier to itself." The ILECs can undermine this requirement by degrading the quality of interconnection or by imposing artificial limitations on the format or protocol of the traffic exchanged with the competing provider.

These problems can arise regardless of where the physical interconnection takes place. A call made by a competitor's customer to an ILEC's customer must be handed off by the competitor to the ILEC at some physical point. If the quality of the call is degraded, e.g. these calls are blocked with greater frequency than comparable calls from an ILEC customer to an ILEC customer, then the competitor's reputation will be harmed and it will lose customers. Also, delays in provisioning interconnection facilities will prevent the competitor from adding customers and increase its costs of doing business.

One area of great concern to the rapidly growing competitors is the ILEC's willingness to make available sufficient trunk port capacity on its end office and tandem switches to handle the competitor's traffic volume requirements. Trunk port capacity determines the amount of traffic that can be exchanged (at the network's busiest hour) between the ILEC and the interconnecting competitive voice provider. In light of Comcast's and possibly other competitors' plans to continue to market heavily to residential and small business customers in many new markets, the ILECs will have the incentive to constrain capacity and delay provisioning of sufficient trunking capacity. Therefore, it is absolutely essential for the ILECs to be able to meet the competitors' trunking needs in sufficient capacities and to provision the trunks on a timely basis.

Another area of increasing concern to the competitors is the ILECs' suggestion that Sections 251 and 252 of the Communications Act do not apply to interconnection with competing IP-voice networks that wish to hand off traffic utilizing the same managed-packet technology, which they use within their own networks. Voice networks are in transition to new managed-packet technology and competitors (cable companies and CLECs) are investing in managed-packet networks for their provision of IP-voice services. These networks use highly efficient and robust packet technology to replace legacy circuit-switched systems, which can waste network resources by assigning a fixed amount of network capacity to a voice call for the entire duration of the call.[23]

The ILECs also are rapidly replacing their own legacy circuit switched voice networks with managed-packet technology. Therefore, the next logical step in networking is for the ILECs' and competitive providers' managed-packet networks to interconnect with one another to exchange voice traffic. This interconnection must be efficient and allow voice providers to meet consumer expectations for service quality and security.

Changes in voice network technology, however, do not eliminate ILEC market power over interconnection. Rather, the ILECs' market power stems from their large share of voice market customers and their ability to deny or degrade interconnection for competitors that must terminate calls to the ILECs' customers. Their market power does not disappear simply because the underlying transport networks evolve to new managed-packet technology. Competing voice providers must still be able to interconnect their networks with the ILEC networks to terminate a large percentage of their own customers' voice calls. Absent such

[23] Managed-packet networks are specifically engineered to assure quality voice service, and do not rely on the "best efforts" public Internet.

interconnection arrangements, new voice providers like Comcast will not be able to offer an effective competitive alternative to the ILECs.

Some ILECs have suggested that their interconnection and traffic exchange obligations under Sections 251 and 252 should be eliminated when they move their transport technology to managed-packet architecture.[24] They attempt to characterize their obligations as regulation of the Internet, which is clearly not the case in a managed-packet environment. Other ILECs have suggested that CLECs may not interconnect under Sections 251 and 252 to exchange traffic that originates on the network of an uncertificated voice service provider. However, this position is inconsistent with the FCC's recent decision that wholesale telecommunications carriers are entitled to interconnect and exchange traffic with incumbent LECs pursuant to Section 251(a) and 251(b) of the Act regardless of the statutory classification of the end-user service, including VoIP services.[25]

Failure of the ILECs to provide efficient interconnection arrangements would be a violation of the Act and disruptive to competition. Indeed, so long as the ILECs have the incentive and ability to raise their rivals' costs, regulators must remain vigilant to discriminatory behavior and act decisively to prevent it from happening.

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[24] *Opposition of Verizon,* Federal Communications Commission, WC Docket No. 04-440, n. 19, August 13, 2007

[25] *Memorandum Opinion and Order,* Federal Communications Commission, WC Docket No. 06-55, March 1, 2007. (Time Warner Cable Request for Declaratory Ruling)

This leads to our second recommended policy principle.

Policy Principle No. 2:

(a) Incumbent local exchange carriers must provide interconnection for voice traffic on nondiscriminatory terms and conditions.

(b) Incumbent local exchange carriers must provide interconnection in any format or protocol currently in use by the ILEC within its own network.

(c) Interconnection must be provided to telecommunications carriers, regardless of the statutory classification of the end-user service.

IV. Determining the "How Much" of Interconnection: Pricing Issues

Interconnection fees are a cost of doing business for competitive voice service providers. Therefore, if interconnection fees are set above cost, the voice providers will have to increase prices to consumers.[26] This will harm consumers directly and potentially disrupt the transition to fully effective competition in the voice market.

We analyze four problems created by above-cost pricing of interconnection. The first and most fundamental problem is that above-cost pricing will flow through to higher retail prices than would prevail in a free competitive market. This harms consumers directly, even though there may be no deleterious effect on competition. The second problem is caused by pricing the *exact same physical product*, i.e. terminating a minute of traffic, at different prices depending on the regulatory classification of the traffic that the ILEC terminates. These regulatory distinctions create incentives for carriers to circumvent the rules, as well as cause distortions in consumer purchases in the marketplace. Third, we consider the risk to competition created if the ILECs can impose above-cost call termination prices on their competitors, but not incur similar costs for their own retail voice services. Fourth, we consider the exposure of competitors to excess pricing of tandem transit service by the ILECs. Competitors are dependent upon the ILECs' tandem transit service to interconnect indirectly with other voice providers, such as wireless carriers, rural ILECs, and other competitive carriers. If the ILECs are free to price these vital interconnection services, called "tandem transit," unconstrained by marketplace forces or regulatory requirements, competition will be distorted and consumers will be harmed.

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[26] A voice provider will also receive revenue from an ILEC for terminating traffic originated by the ILEC's end users, or a credit to offset termination fee obligations. In some cases, such as when the CLEC serves a proportionately greater share of residential customers, the net of the two obligations would require the competitor to pay the incumbent ILEC.

1. ABOVE-COST PRICING OF CALL TERMINATION

The most important pricing element of interconnection is the rate charged for call termination. Economic theory dictates that this rate should be set at the incremental cost imposed on the terminating network by carriage of the originating carrier's traffic. Terminating an additional voice call typically imposes little or no additional cost on a network. Once a call is delivered to the called-party's end-office, the switch must set up the call and keep an active voice path while the call is in progress. Terminating such a call imposes virtually no incremental cost if the call does not occur during the end-office "busy hour." The reason is that a carrier constructs its network to ensure that it will have adequate capacity to handle originating and terminating traffic volumes at the peak hour of demand and, consequently, no additional costs must be incurred to originate and terminate traffic during off-peak periods.

Even if the terminating traffic adds to the busy-hour demand on the switch, it will have little effect on the cost of the switch. Switches are generally sized to have more than enough capacity to handle expected calling volumes. This would imply that incremental demand on the switch does not increase total cost. Moreover, even on an *ex ante* basis – prior to the switch being installed, the cost of a switch is at most only slightly sensitive to the expected peak-hour traffic demands.

Many studies have been conducted to estimate the cost of call termination on an ILEC's network. Among the most recent studies are findings of switching costs ranging from zero to 0.0295 cents per minute.[27]

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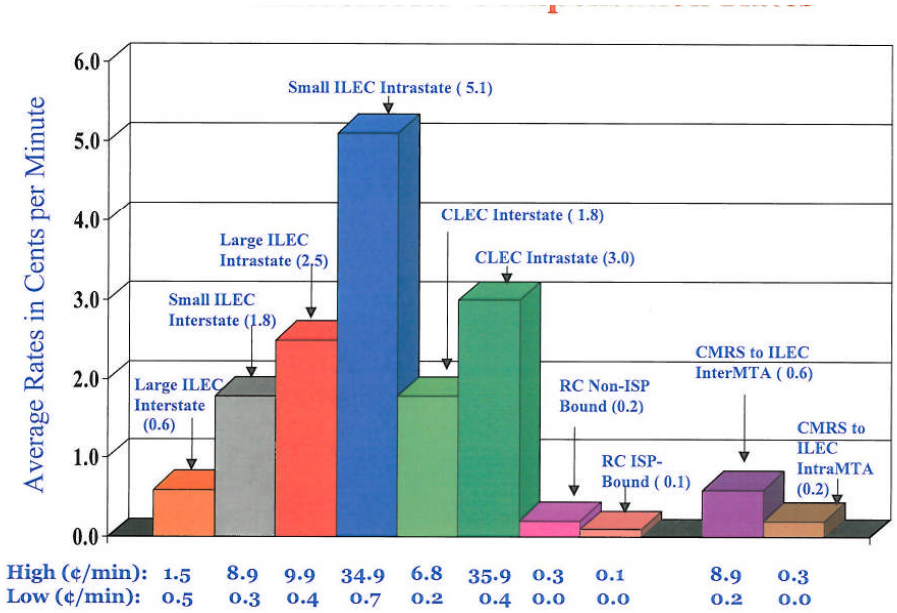
[27] Minnesota Public Utilities Commission, Staff Briefing Papers, August 7, 2003, http://www.puc.state.mn.us/docs/briefing_papers/b03-0088.pdf

This document discusses a decision by the Minnesota PUC to set call termination rates at zero based on the determination that carriers "do not incur usage-based costs for switching." (at 4) It also reports the call termination costs on a minute of use basis, derived from the HAI 5.2a cost model. (at 6)

The rates charged for call termination, however, are well above this cost benchmark for most calls, in most jurisdictions. With the exception of the prices established for reciprocal compensation (local call termination) in some jurisdictions, termination rates for calls such as long distance range from 0.07 cents per minute to 36 cents per minute for rural local exchange carriers.[28] Examples of termination rates paid by for different types of traffic are shown in the table below. Even if we accept the high-end incremental cost estimate of 0.0295¢/minute, therefore, prices for terminating many calls will be from 2.5 to 1,200 times cost. This will force put upward pressure on retail prices for voice services offered by providers paying those charges and directly harm consumers.

Intercarrier Compensation Rates[29]



[28] Some local interconnection agreements between wireline carriers, and between wireline and wireless carriers, establish "bill and keep" arrangements, whereby the interconnecting carriers exchange traffic without making any explicit payments. Depending on the nature of the agreement, this can result in a zero price for additional increments of call termination.

[29] *Ex Parte Brief of the Intercarrier Compensation Forum in Support of the Intercarrier Compensation and Universal Service Reform Plan*, FCC, CC Docket No. 01-92, October 5, 2004, Appendix C, at 2. This table does not reflect the interstate access rate charged by ILECs that "mirror" the ISP rate of 0.07¢/minute.

2. DISCRIMINATORY PRICING OF CALL TERMINATION

Regardless of the actual level of termination rates, it is important to recognize that the costs are the same regardless of the origin of the call. All traffic that enters the ILEC's network in the same manner (at the same point of interconnection and with similar peak-hour characteristics) will impose identical costs on network. Therefore, there is no cost basis for setting different rates for traffic that is assigned to different classifications (e.g. local, intrastate access, interstate access) by regulatory authorities.

Pricing of call termination, however, is far from uniform for a number of reasons, including regulatory inertia. There are varied and complex regulations governing the major types of terminating traffic, and as the FCC recognized in its Notice of Proposed Rulemaking on Intercarrier Compensation:

> Many commenters observe that the current rules make distinctions based on artificial regulatory classifications that cannot be sustained in today's telecommunications marketplace. Under the current rules, the rate for intercarrier compensation depends on three factors: (1) the type of traffic at issue; (2) the types of carriers involved; and (3) the end points of the communication.[30]

We elaborate briefly on the factors listed by the FCC as responsible for the artificial distinctions in compensation rates.

1. Local vs. Long Distance: Local termination rates have been set based on Section 251 of the Act, which requires rates to be set at the "additional costs of terminating such calls." The FCC has interpreted this provision to be synonymous with forward looking economic costs. By contrast, long distance access charges have been determined over many years, based on a large number of considerations other than the economic efficiency principles underlying forward looking cost. As a result, rates for local termination –

[30] Federal Communications Commission, Notice of Proposed Rulemaking, CC Docket No. 01-92, Released March 3, 2005, ¶3

often referred to as "reciprocal compensation" rates -- are generally much lower than for long distance termination.[31]

2. Intrastate vs. Interstate Long Distance: The FCC sets the rates for termination of interstate long distance calls and the state regulatory authority sets rates for termination of intrastate long distance calls. Over time, interstate rates have been reduced significantly and now average about 0.54¢/minute.[32] Rates for termination of intrastate long distance traffic are much higher in many states, averaging about 2.5¢/minute.[33]

3. Wireline vs. Wireless: Wireline voice providers must pay access charges on calls that terminate outside the ILEC's local calling area. By contrast, wireless carriers pay access charges only when calls terminate outside the much larger Major Trading Areas (MTAs). Since local termination rates are typically lower than access charges, this will give wireless carriers an artificial cost advantage. This rate discrimination will affect significant amounts of voice traffic, since there are only 51 MTAs nationwide, compared to thousands of local calling areas. For example, the Los Angeles-San Diego MTA covers almost half the State of California, as well as portions of Nevada, Utah and Arizona, with a population of over 22 million. Within this single MTA, there are hundreds of local calling areas.[34]

4. Rural vs. Non-rural: Small rural carriers' rates for call termination typically are several times higher than non-rural carriers. This is a result primarily of differences in regulatory treatment of the two classes of carriers, and not

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[31] Local transport and termination rates are especially complicated because they may be established by the state commission on the basis of the forward-looking costs of the ILEC. (State commissions also may set rates on the basis of a bill-and-keep arrangement. See, 47 C.F.R. § 51.705). Alternatively, the ILEC has the option to adopt the rate cap for ISP-bound traffic, which was established in 2001 by the FCC. This is referred to as the "mirroring" rule, which was adopted by the FCC to prevent the ILECs from picking and choosing among intercarrier compensation regimes, because of the Commission's concern about the "superior bargaining power of the incumbent LECs." (ISP Remand Order) The rate for ISP-bound traffic is capped by FCC rule at $0.0007 per minute of use, but ILECs must offer to exchange all local traffic at the mirroring rate if they wish to exchange ISP-bound traffic at that rate.

[32] Federal Communications Commission, *Trends in Telephone Service*, February 2007, Table 1.2

[33] *Ex Parte Brief of the Intercarrier Compensation Forum in Support of the Intercarrier Compensation and Universal Service Reform Plan*, FCC, CC Docket No. 01-92, October 5, 2004, Appendix C, at 2

[34] Another anomaly can be found in the FCC's decision that effectively precludes CMRS (wireless) providers from collecting access charges for terminating long distance traffic. See, Declaratory Ruling, Petitions of Sprint PCS and AT&T Corp. for Declaratory Ruling Regarding CMRS Access Charges, 17 FCC Rcd 13192

differences in costs.[35] Regulators have permitted the rural carriers to retain inefficient pricing mechanisms, such as recovering non-usage based costs from usage charges, such as access charges.

The existing discriminatory rate structure for traffic termination is irrational and cannot be sustained. As the FCC recognized "a regulatory scheme based on these distinctions is increasingly unworkable in the current environment and creates distortions in the marketplace at the expense of healthy competition."[36] As the FCC also noted, intercarrier compensation reform should "encourage the efficient use of, and investment in, telecommunications networks… Indeed one of the Commission's most important policies is to promote facilities-based competition."[37]

There have been many industry-wide efforts over the last several years to institute comprehensive reform of intercarrier compensation. These efforts appear to have stalled, and the current patchwork regulatory mechanisms still govern termination charges. With the acceleration in facilities-based competition from cable companies, however, it is no longer possible to wait for comprehensive reform of intercarrier compensation to remedy the most dangerous pricing distortions. The "perfect" solution may indeed be the enemy of the "good." While some inefficient intercarrier pricing practices can be tolerated for now, other practices must be eliminated or prevented, or they risk disrupting the transition to a fully effective voice market.

3. COMPETITIVE HARM FROM ABOVE-COST CALL TERMINATION RATES

An ILEC will gain a competitive advantage if it is free to charge above-cost termination fees, which are not offset by the termination fees that it must pay to its competitors. This is a classic example of "raising rivals' costs," which has been shown in the economics literature to be a powerful mechanism to gain an unfair

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[35] Rural carriers use similar switching technology as non-rural carriers, and as we explained earlier, these modern switches rarely face capacity constraints on usage. Moreover, designing a switch with additional busy hour call handling capacity does not impose much cost.

[36] Intercarrier Compensation Further Notice, ¶ 3

[37] Id., ¶ 31

advantage and increase its profits at the expense of its rivals.[38] We contrast this with a more "benign" pricing distortion, whereby above-cost interconnection fees are reciprocal and fully offsetting. In those circumstances, neither carrier may be given an artificial advantage, although prices will still be distorted and consumers will be sent incorrect pricing signals. The examples given below illustrate two examples of a "benign distortion" and several other examples of situations where above-cost interconnection fees will create competitive harm.

Examples of "benign" price distortions

Case #1 - Reciprocal above-cost interconnection fees, with traffic in-balance

If an ILEC and CLEC have reciprocal, but above-cost, termination rates and traffic is in balance between the carriers, then no money will change hands and neither carrier will be given an artificial advantage. Nevertheless, consumers will be harmed to extent that carriers impose higher retail usage charges out of the concern that traffic could go out of balance and the provider would need to pay high termination rates on the incremental out-of-balance traffic.

Case #2 - Above-cost termination fees in a closed market

If a local exchange carrier were to set above-cost termination fees, but not face competition within its territory, there would be no competitive distortion. Retail customers of other providers would be distorted, however, because their retail rates would have to be set higher in order to cover these excessive call termination fees.

[38] Steven C. Salop and David T. Scheffman, "Cost-Raising Strategies," *Journal of Industrial Economics* 36:19-34 (1987)

Examples of price distortions with competitive effects

Case #3 - Above-cost, non reciprocal interconnection fees, traffic in or out of balance

One situation where termination charges imposed by the ILEC and the competitor are not reciprocal would be if a rural ILEC and a cable competitor exchanged traffic at different rates. In particular, if the rural ILEC was permitted to charge rates in excess of forward-looking costs and the cable company was not, then the cable company would be paying a subsidy to its direct competitor. We mention this possibility because under the Missoula Plan, which was sponsored by many rural ILECs, cable companies would be categorized differently from rural ILECs even when they serve the same geographic area.[39] This would permit the rural ILEC to impose higher termination fees than the cable companies may impose for traffic originated and terminated in the same geographic area, thereby turning interconnection into a profit center for the ILEC. There is no justification for separate "tracks" for interconnection. Rather, regulation should establish symmetrical interconnection obligations and fees for all carriers. This should include symmetrical obligations for indirect interconnection, including the rural ILEC's responsibility to bear tandem transit expense for traffic it originates.

Case #4 - Reciprocal above-cost interconnection fees, with traffic out-of-balance

Traffic exchanged by two local exchange competitors may not be balanced for a number of reasons. For example, a competitor's customers may place more calls than they receive. This may result from the greater sensitivity of high volume callers to price and their greater interest in seeking service from the ILEC's competitor. Unless the ILEC's termination fees are cost-based, the cable companies would be disadvantaged.

[39] Missoula Plan at 33

Case #5 - Discriminatory termination fees paid for out-of-region calling

A competitive distortion can occur where a competing ILEC and CLEC pay different amounts to terminate "out of region" calling. As the biggest ILECs have gotten bigger, above-cost access charges have become a greater competitive threat to the cable companies and CLECs. The reason is that within the large geographic regions served by one of the mega-ILECs (Verizon and AT&T), access charges are a real cost only for the competitors and not for the ILEC itself. For example, if a Comcast customer in Philadelphia calls a Verizon customer in Erie, Comcast will pay Verizon an intrastate terminating access charge of approximately 0.6¢ per minute. This tariffed termination rate represents the actual economic termination cost incurred by Comcast. By contrast, when Verizon serves a local customer in Philadelphia, its actual cost of terminating the call to the Verizon customer in Erie is the economic cost imposed on its network, not the tariffed access charge, which is only "imputed" from one pocket to another within the Verizon operation.

The simplest solution to these problems is to reform intercarrier compensation and require all call termination at cost-based, nondiscriminatory rates. This is the proverbial and proper "minute is a minute" policy dictate. Another highly-efficient way to reform intercarrier compensation is to establish a "bill and keep" regime, whereby local voice providers would not charge other carriers to terminate traffic, but would recover all termination costs from their own customers.[40] This has the potential for simplifying the regulatory process and eliminating the use of interconnection pricing as an anti-competitive weapon.

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[40] DeGraba, Patrick, 2002, "Central Office Bill and Keep as a Unified Inter-Carrier Compensation Regime," *Yale Journal on Regulation*, 19 (1) pp. 39-84; DeGraba, Patrick, "Efficient Intercarrier Compensation for Competing Networks When Customers Share the Value of A Call," *Journal of Economics & Management Strategy*, 2003, vol. 12, issue 2, pages 207-230

If comprehensive reform of intercarrier compensation remains politically unachievable, however, regulators must be attuned to changes to the status quo that facilitate anti-competitive pricing. ILECs may propose these changes either as part of a reform plan or as a petition to forbear from regulating certain interconnection services. These proposals for deregulation should be scrutinized to prevent anticompetitive abuse. The touchstone for interconnection pricing policy is non-discrimination, which leads to our third policy recommendation:

Policy Principle No. 3:

Call termination rates must not discriminate across users or usage. Cost-based price levels should be instituted as soon as possible.

Reform of rural ILECs' interconnection charges will undoubtedly require a longer transition period. Nevertheless, policymakers should recognize that this delay will come at a steep price. Absent this reform, competition will be very slow to come to rural markets, which will deny rural consumers the benefits of choice and lower prices, and impose a greater universal service burden on the general ratepayer.

4. PRICING OF TANDEM TRANSIT SERVICES

Tandem transit service is provided by large ILECs to wireline and wireless voice providers and enables them to interconnect with other competitive voice service providers, including smaller ILECs, wireless carriers and other competitors. Typically, a competing provider interconnects its network at a large ILEC tandem office, and the ILEC routes traffic delivered to the tandem over its own network to other carriers. Tandem transit service enables a competitor to offer universal connectivity to its own customers, which means that its customers can make and receive local calls from any other telephone subscriber. Today, tandem transit service in many states is used to carry most calls between competitive wireline providers that originate and terminate in the same local calling area and to calls between competitive wireline and wireless providers that originate and terminate in

the same Major Trading Area (MTA). Tandem transit service is needed except under the limited circumstances where competitors exchange enough local traffic to make direct interconnection with each other cost effective.

Competitors are dependent upon the large ILECs for transit service in most areas. The ILEC can provide transit far more cheaply and efficiently than most of its rivals can for themselves. The reason is that the ILEC already interconnects with all other local providers in large geographic areas (a state or large multi-state metropolitan area), and by virtue of its incumbent position and legacy ubiquitous network, it is the only entity that is able for the foreseeable future to provide tandem transit service capable of enabling indirect interconnection and universal connectivity between and among all competitive carriers in the state.

There are no competitive transit providers that can provide this service ubiquitously, although there has been entry into some of the more densely traveled routes by companies such as Neutral Tandem. This does not constrain the ILECs for two reasons. First, for the foreseeable future, competitive transit providers will not be able to afford to build networks that cover every geographic route. The reason is that telecommunications networks are subject to large economies of scope and scales. Second, competitive transit providers cannot provide ubiquitous connections unless every terminating carrier agrees to connect with them. This has not always been the case, which limits the benefits of competition from non-ILEC tandem providers. For now, due to their historic monopoly position and the fact that every competitive provider must interconnect with the ILEC in order to obtain numbering resources, a large ILEC is the only option for ubiquitous tandem transit.

Policy Principle No. 4:
Tandem transit must be offered as an interconnection service by the ILECs at forward-looking cost-based rates under Section 251(c)(2) of the Communications Act.

V. Conclusion

Regulation of interconnection by Federal and state commissions will continue to be needed for some time, in order to ensure that progress continues towards a fully competitive market in voice communications. Even after the entrants have overcome all other barriers to entry, they may still be at a disadvantage in interconnection negotiations with the incumbents. So long as the incumbents serve a major share of customers in a local market, they potentially will have an incentive to raise their rivals' costs by raising the price or degrading the quality of interconnection.

We propose four major principles to guide interconnection policy over the next several years. These policies are intended to preserve the market-opening initiatives of the Telecommunications Act of 1996, by guaranteeing the entrants the ability to interconnect with the incumbents on a cost-based and non-discriminatory basis.