Henry Hultquist
Vice President
Federal Regulatory

AT&T Services, Inc.
1120 20th St., NW, Suite 1000
Washington, DC 20036
T: 202 457.3821
F: 202.457.3072

October 13, 2008

Electronic Submission

Marlene H. Dortch
Secretary, Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: Developing a Unified Intercarrier Compensation Regime, CC Docket No. 01-92; High-Cost Universal Service Support, WC Docket No. 05-337; Federal-State Joint Board on Universal Service, CC Docket No. 96-45; Intercarrier Compensation for ISP-Bound Traffic, WC Docket No. 99-68; Establishing Just and Reasonable Rates for Local Exchange Carriers, WC Docket No. 07-135

Dear Ms. Dortch:

Section 251(b)(5) of the Communications Act of 1934, as amended, requires local exchange carriers ("LECs") to establish reciprocal compensation ("RC") arrangements for the transport and termination of telecommunications. Section 252(d)(2) states that a State commission shall not consider the terms and conditions for RC to be just and reasonable unless they provide for the "mutual and reciprocal recovery by each carrier" of the "additional costs" of terminating calls that originate on the other carrier's network. In the *Local Competition Order*, the Commission defined "termination" for purposes of section 251(b)(5) to be the "switching of traffic . . . at the terminating carrier's end office switch (or equivalent facility) and delivery of that traffic from that switch to the called party's premises."[1] The Commission further determined that "the 'additional cost' to [a] LEC of terminating a call that originates on [another carrier's network] . . . consists of the traffic-sensitive component of local switching," and therefore that only traffic-sensitive costs could be recovered through termination charges.[2]

In determining RC rates, commissions generally have calculated the traffic-sensitive portion of end-office switching based on the assumption that the terminating carrier employs traditional circuit-switched network technology. However, due to technical advances, local carriers are increasingly deploying next generation packet-based Internet Protocol networks to handle voice telephone calls and other traffic.

In next generation networks, it is likely that end-office switching functions will eventually be performed by general purpose packet routers. Many software-based VoIP services already employ this technology.[3] Indeed, the largest VoIP application worldwide, Skype, relies

[1] *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98, First Report and Order, 11 FCC Rcd 15499, 16015 (1996). The Commission defined "transport" for purposes of section 251(b)(5) as the "transmission of terminating traffic . . . from the interconnection point between the two carriers to the terminating carrier's end office switch that directly serves the called party (or equivalent facility provided by a non-incumbent carrier)." *Id.* Such transport may include traffic-sensitive tandem switching costs.
[2] *Id.* at 16025.
[3] VoIP stands for Voice over Internet Protocol.

completely on the generic packet routers deployed by public and private broadband IP networks to "switch" its voice packets.[4] But while this technology has proven to be adequate to meet certain communication needs for hundreds of millions of customers around the world, regulatory standards for full-fledged local voice telephony service appear to demand several switching functionalities that are not yet supported by general purpose packet routers. These may include the capability to offer CALEA intercepts or to provide E911 services.[5] For this reason, certificated LECs are instead deploying special purpose packet switches, known as "softswitches" — a type of packet router designed specifically to support voice telephony services.[6] To estimate the incremental cost of switching a voice minute using one of these softswitches, it is necessary to establish two crucial parameters. The first is the total investment associated with a softswitch, and the second is the portion of this investment that is traffic-sensitive.

While public information on the actual prices for softswitches is limited, suggestive data are available. There are two potential sources. One is via comparisons between Class 5 switch investment costs and softswitch costs. The other is from direct estimates of softswitch investment costs.

In its *Tenth Report and Order*,[7] the Commission found that fixed costs for Class 5 host switches were $468,700 and such costs for Class 5 remote switches were $161,800.[8] Additional per-line investments for these switches were found to be $87. The Commission's *Trends in Telephone Service* report, Table 17.1 suggests that, in 2000, an average switch served about 10,000 lines.[9] If we assume that 80% of lines were served by host switches and 20% by remotes, then an average Class 5 switch cost about $1,277,320 – or $128 per line in the 1999-2000 time period. If subsequent price reductions in the switching industry have amounted to only a modest 3% per year between 2000 and 2008, this suggests that current Class 5 switch investment is approximately $100 per line.

Literature distributed by switching manufacturers claims substantial softswitch economies over circuit switches. Motorola suggests that "softswitch networks can save 20-30% of the total CAPEX compared with legacy switching networks."[10] Ericsson states that studies "indicate that core network OPEX can be reduced by up to 50%" using softswitches and that "total cost of

---

[4] *See* http://en.wikipedia.org/wiki/Skype for more details on the workings of software-based VoIP technology.
[5] CALEA is the Communications Assistance to Law Enforcement Act. See, http://www.fcc.gov/calea/ for more details.
[6] Softswitching systems being installed by large carriers may be part of more complex systems designed to integrate legacy interfaces along with wireless and broadband services. Such systems are less relevant to this analysis than the simpler systems being installed by rural carriers to replace traditional circuit switches. Note that these simpler softswitch systems are not necessarily "small." These modular softswitches may support 70,000 subscribers in stand-alone installations, or up to 250,000 subscribers in distributed installations. See, http://www.metaswitch.com/products/class45softswitch.htm .
[7] *Federal-State Joint Board on Universal Service, Forward-Looking Mechanism for High Cost Support for Non-Rural LECs*, CC Docket Nos. 96-45, 97-10, Tenth Report and Order, 14 FCC Rcd 20156 (1999), *affirmed, Qwest Corp. v. FCC*, 258 F.3d 1191 (10th Cir. 2001).
[8] Available at: http://www.fcc.gov/Bureaus/Common_Carrier/Orders/1999/fcc99304.zip.
[9] Available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-284932A1.pdf.
[10] *See* http://www.motorola.com/mot/doc/6/6785_MotDoc.doc.

ownership can be reduced by up to 20 percent."[11] Applying the most conservative of these cost-savings' percentage estimates to current Class 5 switch investments suggests that softswitches have investment costs of no more than $80 per line.

These figures are corroborated by analyst reports on VoIP softswitch sales revenues and port volumes. In 2004, Dittberner Associates found that "a total of 38.92 million VoIP ports were shipped during the year 2004" and that "the VoIP market exceeds US$ 1 billion."[12] This suggests a per-port cost in the $26 range. Two years later in 1Q2006, Dittberner reported that 31.5 million softswitch and media gateway units had been shipped in the quarter, with associated revenues of $722 million – yielding a per-unit revenue of $23. And by 3Q2007, Dittberner noted shipments of 36.9 million ports and revenues of $626.5 million – yielding a per-port cost of $17.[13] These direct figures are consistent with the Class 5 comparison figure because it is likely that the "fill" on shipped softswitch ports is less than 100% and that Dittberner figures may exclude some of the softswitch installation services necessary to engineer fully these switching systems.

Thus, based on these two alternative methodologies for establishing softswitch investment costs, it appears that these costs range between $34 and $80 per line.[14] Our next task is to establish the fraction of these investments that are traffic-sensitive. Again, two methodologies may be employed to establish high and low estimates.

Recently, a group of rural LECs in Michigan submitted softswitch cost data in a proceeding before the Michigan Public Service Commission to establish their RC rates.[15] These rural LECs nominated a softswitch produced by a now-defunct manufacturer, CopperCom, to support their argument that forward-looking switching costs are highly traffic-sensitive. However, AT&T witness Dr. Kent Currie analyzed the cost data proffered by the rural LECs and demonstrated that the largest portion of the total cost of this CopperCom switch actually was completely fixed (*i.e.*, not sensitive to lines or traffic).[16] Dr. Currie further showed that "line-related investments are the next largest portion and generally reflect less than 20% of local switching investment," leaving traffic-sensitive investments as the smallest portion – and thus

---

[11] *See* http://www.ericsson.com/solutions/page.asp?ArticleId=CB515311-BF92-4EB5-B293-BB4895BA50B4 and http://www.ericsson.com/technology/whitepapers/8107_efficient_softswitching_a.pdf. Nortel also notes the cost savings associated with its softswitches. See, http://www.nortel.com/products/01/succession/cs/collateral/nn116583.pdf.

[12] *See* http://blog.tmcnet.com/blog/rich-tehrani/uploads/Media-Gateway-Softswitch.pdf.

[13] *See* http://telephonyonline.com/mag/telecom_softswitchmedia_gateway_market/index.html and http://www.dittberner.com/news/press_release.php?id=79.

[14] The $34 lower bound figure assumes a worst case that both a softswitch and a media gateway port (at $17 each) are required to serve each customer line.

[15] *See* Michigan Public Service Commission ("MPSC") Case No. U-14781, http://efile.mpsc.cis.state.mi.us/efile/docs/14781/0001.pdf (February 21, 2006) and http://efile.mpsc.cis.state.mi.us/efile/docs/14781/0052.pdf (August 22, 2006). The MPSC approved a settlement agreement in this case on July 1, 2008, http://efile.mpsc.cis.state.mi.us/efile/docs/14781/0211.pdf.

[16] *See* Currie testimony in U-14781 at ¶¶ 56-57, http://efile.mpsc.cis.state.mi.us/efile/docs/14781/0190.pdf.

must necessarily be below 20% of total switching investment.[17] Hence, 20% appears appropriate as an upper estimate of the percent of softswitching investments that are traffic-sensitive.[18]

But there are other softswitch models (not introduced into the Michigan proceeding by the rural LECs) whose costs appear to be even less sensitive to traffic levels than the CopperCom softswitch. One example of such a softswitch is the Taqua 7000.[19] This switching system, which can serve up to 42,000 subscribers, is completely modular. As Taqua notes, "each interface card (or circuit pack) on the T7000 performs all of the functions required of a Class 5, end-office switch. Dedicated resources for call processing, service logic, switch fabric, media processing and signaling are performed on each card."[20] This "allows a carrier to purchase a single card in the initial system and expand capacity incrementally as the network grows."[21] Furthermore, Taqua states that the switching fabric provided on each card is "non-blocking."[22] Thus, the Taqua softswitch appears to have no traffic-sensitive costs.[23] All of its costs are either fixed, or driven completely by line additions.

If we apply a 20% traffic-sensitive fraction, suggested by the more conservative of these two methodologies, to our range of estimates for softswitch investments per line, traffic-sensitive switching investments per line are shown to range between $6.80 and $16.00. If an annual charge factor of 25% is applied to these investments, monthly switching revenue requirements will range between $0.142 and $0.333.[24] Dividing these monthly revenue requirements by 1400 switching minutes per month yields per-minute softswitching costs of between $0.00010 and $0.00024.[25] These figures are comfortably below the Commission current RC figure of $0.00070 per minute.

---

[17] *Id.*

[18] Although Dr. Currie's analysis showed that less than 20% of the CopperCom switch's costs were traffic-sensitive, the MPSC staff decided in this case to recommend that 41% of rural LECs' local switching costs be deemed traffic-sensitive. But the staff based its recommendation not on the rural LECs' proffered CopperCom softswitch's costs, but rather on a cost study of a traditional circuit switch offered into the record by Upper Peninsula Telephone Company. *See* http://efile.mpsc.cis.state.mi.us/efile/docs/14781/0197.pdf . Note, however, that in its earlier Case U-13531, the MPSC found AT&T-Michigan's local switching costs to be 100% non-traffic-sensitive and ordered that AT&T-Michigan set its full RC rate (including transport) at $0.0008 per minute.

[19] This Taqua softswitch is listed on the Rural Utilities Service's list of acceptable materials. *See* http://www.usda.gov/rus/telecom/materials/pdf_files/5-pc-07-17-2008.pdf.

[20] *See* http://www.taqua.com/images/Taqua%20T7000%20_June07.pdf.

[21] *Id.*

[22] *Id.*.

[23] While there may be some traffic-sensitive costs associated with trunk ports, such costs are usually included in calculations of transport costs and not in switching costs.

[24] Note that this annual charge factor exceeds substantially the roughly 19.1% annual charge factor (capital recovery plus maintenance) adopted by the Commission in its *Tenth Report and Order*, see note 8, *supra*.

[25] Note that monthly DEM switching minutes per line exceeded 2200 in year 2000 (the last year these figures were reported). Because it is believed that this figure has decayed greatly over the past several years as voice minutes have shifted to wireless and broadband technologies, we assume only 1400 minutes per line.

	Low estimate	**High estimate**
Total investment per line	$34.00	$80.00
Percent traffic sensitive	20%	20%
Traffic-sensitive investment per line	$6.80	$16.00
Switching annual charge factor	25%	25%
Monthly TS revenue requirement per line	$0.142	$0.333
Monthly switching minutes per line	1400	1400
Switching cost per minute	$0.00010	$0.00024

Sincerely,

/s/ Henry Hultquist

Henry Hultquist
Vice President-Federal Regulatory
AT&T Services, Inc.

Cc: Don Stockdale
Al Lewis
Bill Sharkey
Jay Atkinson
Dana Shaffer