ATTACHMENT: CLEC INTEGRATED ACCESS ANALYSIS

December 10, 2003

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1. INTRODUCTION

The FCC has defined the mass market as including residence, single line business and multi-line customers below the threshold established by the state for the DS1 enterprise market. The FCC directed each state to establish a maximum number of DS0s[1] that CLECs can serve through unbundled switching when serving multi-line end users at a single location. In establishing this threshold, the FCC rules state that the state commission should take into account the increased revenue opportunity at a single location and the threshold at which multi-line end users could be served in an economic fashion by higher capacity loops and a CLEC's own switching and thus be considered as part of the DS1 enterprise market. The FCC includes in the enterprise market not only those customers currently served by DS1 lines to the customers' premises, but also those multi-line customers currently served by DS0 lines that could be economically served by DS1.[2]

The purpose of this analysis is to provide the Commission an appropriate economic analysis for establishing the maximum number of DS0s that constitute the mass market as defined by the FCC. This attachment is organized as follows: it describes how CLECs operate and identifies and describes the network components used by an efficient CLEC to provide a DS1 line; it describes the services provided and how the appropriate network arrangement works; and it describes the piece-parts and costs of each component. Calculations are shown on the attached spreadsheet.

2. BUSINESS OPPORTUNITY FOR CLECS TO PROVIDE BROADBAND DATA SERVICES TO SMALL BUSINESS

2.1. THE CLEC MARKET

In this analysis, the CLEC is assumed to serve mass market business and residential customers. It offers local, long-distance and vertical services. When providing integrated access service it offers business-grade broadband Internet access. As the Internet access provider the CLEC may

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[1] For the purposes of this analysis, a DS0 line is defined as an analog voice grade loop or sub-loop to a customer's premises. In this context, DS0 does not mean one of the 24 digitized channels making up a DS1 line to a customer's premises. The FCC defines the mass market at ¶ 459 as follows: "The mass market for local services consists primarily of consumers of analog 'plain old telephone service' or 'POTS' that purchase only a limited number of POTS lines and can only economically be served via analog DS0 loops."

[2] The FCC determined that multi-line customers currently served by DS0 "could be served in an economic fashion by higher capacity loops and a carrier's own switching and thus be considered as part of the DS1 enterprise market." [See 47 CFR 51.319(d)(2)(iii)(B)(4).]

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also provide other data services including hosting the customer's web site on a virtual private server, providing IP addresses, supporting DNS and providing the customer's email server.

Integrated Access Service allows multiple voice, data and Internet combinations over a single access loop, saving customers money on their overall telecom bills. CLECs report a very rapid growth of this product.[3] This analysis models combinations of voice and data access and other data services that make the CLEC provision of DS1 access service viable to small business customers.[4] The analysis compares the business case for the CLEC's providing "only-voice" with that of the CLEC's providing both data and voice via a single DS1 loop.

2.2. CUSTOMER-PREMISE COMPONENTS

CLECs' Integrated Access Service requires the installation of multiplexing/routing equipment on the customer premise to carry voice and data traffic over a single T-1 line. Most CLECs deploy integrated access devices ("IADs") that integrate analog voice and high-speed data without conversion of voice to VoIP.[5] The most widely used IAD is the Adtran 850.

At the customer premise, individual business lines and the premise router connect to voice and data ports on the IAD. The IAD uses TDM technology to create the number of DS0 channels specified by the customer, and establishes a broadband channel at a specified data speed. The IAD connects to the CLEC's 4-wire DS1 loop which terminates at the customer's serving central office, where the CLEC establishes its remote terminal location, as described below.

2.3. CLEC NETWORK COMPONENTS REQUIRED TO PROVIDE INTEGRATED ACCESS

The facilities-based CLEC establishes remote terminals at ILEC COs where the CLEC is collocated. It provides its own digital-loop-carrier ("DLC") equipment. The DLC equipment separates voice and data traffic, concentrates the voice and data loops, so that fewer outgoing voice and data channels are required for transport across the local area network to the CLEC's POP.

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[3] Allegiance reports that during the quarter ended September 30, 2003, its "Integrated Access Service represented approximately 37% of net lines sold for the quarter (and when including all services delivered via T1 circuits, 54% of our net lines sold for the quarter)." (10Q for period ending 9-03) Allegiance's lowest-priced small business service provides up to six business lines and a 256 kbps data line for $330 per month.
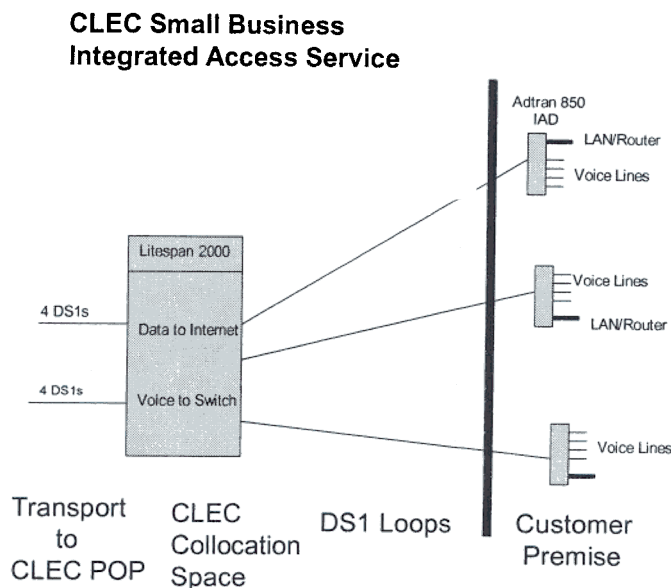
[4] Large corporate businesses are migrating from circuit switched voice services to Voice over Internet Protocol ("VoIP") for internal voice communications, integrating voice and data over the corporate data network. Significant savings are possible through the elimination of separate voice and data access lines. VoIP is less practical for the mass market in the short term, because most CLECs already invested in circuit switches. For small and medium-size businesses, CLECs have introduced Integrated Access Service which provides substantial benefits without the need to convert voice to VoIP

[5] One exception is Cbeyond Communications which uses VoIP technology throughout its network., and media gateways that convert packet VoIP to analog voice when connecting to the PSTN.

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A CLEC POP has one or more voice switches depending on the number of DS0 voice lines it has relative to the number that can be handled by one switch. If the CLEC provides data services, it also has data LANs, servers and routers in the POP. As the customer's Internet access provider, the CLEC concentrates individual customer data traffic for routing to the Internet backbone.

The DLC in a remote terminal configuration can accommodate voice analog loops, 4-wire DS1 loops, or some combination of the two.[6] For voice lines, the CLEC can achieve a concentration ratio of four DS0 lines to one VG channel of a DS1 trunk. We estimate that twenty-five data lines may be concentrated at the DLC onto one data DS1 trunk.[7] Assume, for example, that a CLEC combines data and four business lines at each of 84 establishments served from its remote terminal. These 84 T1s could be concentrated onto only 8 DLC outgoing T1s from the DLC to the CLEC's POP as represented in the diagram below.

**CLEC Small Business
Integrated Access Service**

| Transport to CLEC POP | CLEC Collocation Space | DS1 Loops | Customer Premise |

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[6] For example, the Alcatel Litespan 2000 DLC, in a remote terminal configuration, can accommodate a maximum of 2,016 DS0s or 84 DS1s.

[7] According to Covad, one 512Kbps data line can serve 50 data users. It follows that a DS1 can serve 150 users. Assuming an average of six employees per business connecting to the Internet, the CLEC could serve 25 firms with just one outgoing DS1 transport channel to its POP.

3. COSTS OF THE NETWORK AND LOOP COMPONENTS

The cost factors that affect the economic cross-over from multiple DS0 lines to a single DS1 line include (1) the estimated cost of customer premise equipment required, (2) the costs of network components used by an efficient carrier to fully realize the potential of a DS1 line, and (3) the non-recurring and recurring charges for both a basic two-wire analog (i.e., DS0) unbundled loop and a DS1 unbundled loop.

Some of these costs are network capital equipment costs subject to depreciable lives, some are non-recurring costs associated with the customer "life" or the reciprocal of the CLEC's expected customer churn rate. Some of these are recurring monthly costs. The analysis describes the procedures used to express these costs on a common basis.

3.1. CUSTOMER PREMISE EQUIPMENT COST

The Adtran 850 IAD is widely available online from different equipment suppliers serving the computer equipment market. We use a simple average of the prices and conservatively exclude any additional discount that the CLEC would receive for bulk purchase. The FXS and FXO cards establish the voice and data channels across the DS1 loop.[8]

Adtran Equipment Prices				
		NexTag.com		cdw.com
Equipment	Average	Low	High	
Chasis Bundle	$1,265.88	$1,008.00	$1,220.00	$1,569.63
Quad FXS Card	$175.67	$146.00	$225.00	$156.00
Quad FXO Card	$245.00	$204.00	$313.00	$218.00
Total	$1,686.54	$1,358.00	$1,758.00	$1,943.63

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[8] Prices reflected in the table of the Adtran 850 components. NexTag.com provides links to many distributors of both the chassis bundle and individual cards. High and low prices of required items appear in the table. CDW.com is an online distributor of these components. The chassis bundle comes preconfigured, with power supply unit and router control unit. Prices reflect single quantity purchases.

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3.2. DLC AND IAD EQUIPMENT CAPITAL COST

The Alcatel Litespan 2000 DLC in a remote terminal configuration provides either a maximum of 2,016 DS0 line-side connections or 84 DS1 connections. We derive the fixed and per-line costs under each configuration from Alcatel prices. [9]

DLC Remote Terminal Cost						
Per Line:	Fixed	Per Line	# Lines	Total Cost	Cost/DS0	Cost/DS1
DS0s	$12,500	$51	2,016	$115,316	$57	
DS1s	$12,500	$389	84	$55,176		$538

Total Capital Cost per DS1 ($)	
IAD	$1,687
DLC	$538
Total	$2,224

3.3. DS1 EQUIPMENT ANNUAL COST ($)

The annual capital costs per DS1 loop are derived from the following analysis: An annual capital cost per DS1 loop was calculated based on income tax, property tax applied as a fraction against net capital, the circuit termination equipment depreciation life specified by the Commission, and the weighted average cost of capital at the state and federal tax rate. A DLC savings per DS0 displaced by the DS1 reflect the reduction in DLC line cards replaced by the DS1 line card. The annual savings per DS1 depends upon the number of DS0s that ride the DS1 loop. Monthly costs are calculated as annual costs divided by twelve.

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[9] Proprietary Alcatel DLC component prices were provided by SBC. Costs were calculated for two system size configurations. Variable costs are derived by calculating the slope per DS0 line. Fixed costs were calculated based the minimum system configuration without any line cards. DS1 variable costs were calculated the same way as DS0 variable costs after replacing DS0 line cards with DS1 line cards.

CLEC INTEGRATED ACCESS ANALYSIS

General Costs	Rates and Costs
Amortization Rate	0.12
Income Tax Rate	0.380
Other Taxes	0.010
Depreciation Life	8
Wtd. Cost of Capital	16.9%
Annual Capital Cost	
IAD+DLC Costs per DS1	$676.35
DLC Savings per DS0	$17.39

3.4. RECURRING LOOP COSTS

The recurring loop costs for DS0 and DS1 loops are as follows:

Loop Type	Zone	Recurring
2-Wire Analog Loop	1	$12.71
	2	$18.64
	3	$19.74
	4	$16.41
4-Wire Digital Loop	1	$91.06
	2	$95.45
	3	$97.10
	4	$91.25

3.5. NONRECURRING LOOP COSTS

The CLEC is assumed to migrate all of the customer's loops from the ILEC at the same time. CLECs incur an internal cost per line for hot cuts of unbundled network element analog loops from ILECs of $10 per line.[10]

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[10] From CLEC statements in the record of the FCC's Triennial Review: *See* Microeconomic Consulting and Research Associates, *The Cost of Serving Residential Customers Using UNE Loops*, January 8, 2003, at 6; and Letter from Joan Marsh, AT&T Government Affairs, to Marlene Dortch, Secretary, FCC, re: Notice of Written Ex Parte Communication, *In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, CC Docket Nos. 01-338, 96-98 and 98-147, February 4, 2003, at 16.

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Other Non-Recurring Costs				
Hot-Cut Costs	Loop Type	Internal Cost	Price per Line	Total Charge
	2-Wire Analog Loop	$10.00	$24.98	$34.98
Non-Recurring Charges	Loop Type	Administrative Charge per Order	Per Additional Line	First Line
	2-Wire Analog	$0.00	$8.32	$19.55
Non-Recurring Charges	Loop Type	Administrative Charge per Order	Customer Connection Charge	Total Charge
	4-Wire Digital	$0.00	$0.00	$102.47

Nonrecurring loop costs are customer costs which should be amortized over the life of the customer. The amortization rate should reflect the churn rate of an efficient CLEC. CLECs that target small business customers have reported monthly churn rates of below one percent per month. Our analysis capitalizes all nonrecurring loop costs at the pre-tax weighted cost of capital rate and amortizes these costs at a rate of 1 percent per month or 0.12 per year.[11]

4. CLEC ADDITIONAL DATA NETWORK COSTS

The appropriate measure of data revenues are net revenues, i.e., net of the costs of providing data services. To provide Internet access service, the CLEC must provide transport from the DLC remote terminal to its own POP. It is likely that the CLEC will aggregate the data DS1s onto higher bandwidth facilities to connect to the Internet. In addition, the CLEC must pay for connections to an Internet backbone provider.

Because data concentration occurs at the DLC, little if any further data concentration is required. It is likely that the CLEC will multiplex the DS1s from the DLC onto higher capacity channels to send to the Internet. Nevertheless, we can estimate the backbone network costs by reference to the profile of a typical U.S. ISP.

[11] *See* Kelly Shafer, "Finding the Leaks" (downloaded from www.fatpipeonline.com/sep2003water.asp, on 9/19/03). Nonrecurring costs per DS0/DS1 per month are summed, and multiplied by the sum of annual weighted cost of capital and amortization rate divided by twelve.

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A typical U.S. ISP dial service operator pays 30 percent of its total costs for Internet backbone network (including POP aggregation).[12] Dial services are available from $7.95 per month per account.[13] This would imply that the upstream costs for backbone connectivity are quite small— at most $2.00-- per dial account. We extrapolate per DS1 access to backbone costs of $12 per DS1 access.[14]

In addition, the CLEC must pay for the DS1 transport interoffice costs to its POP. The DS1s average $150 per interoffice DS1 per month or about $6 per access DS1 per month. We believe that a reasonable estimate of data costs in addition to the DLC aggregation is no more than $20 per DS1 access.[15]

This additional cost of providing data service has been included in the revenue calculations.

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5. RESULTS OF ANALYSIS

The results of the analysis are presented below. The results depend on the UNE density zones. I find that a DS1 line is cost-effective, compared to four DS0s, so long as the customer has at least:

$108.81 per month of data revenues in Zone 1;

$89.48 per month of data revenues in Zone 2; and

$86.73 per month of data revenues in Zone 3; and

$94.20 per month of data revenues in Zone 4

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[12] See Geoff Huston, ISP Survival Guide, Figure 13.4.,p.516.

[13] Frontline Communications Corporation includes two email accounts with the service. See: http://www.fcc.net/Internet_for_Home/Nationwide _Dial-Up/nationwide_dial-up.html.

[14] We assume six users at the premise riding the DS1.

[15] It includes additional customer care costs in addition to services already provided.

INTEGRATED DS0 - DS1 ANALYSIS: RESULTS

Loop Type	Zone	Recurring
2-Wire Analog Loop	1	$12.71
	2	$18.64
	3	$19.74
	4	$16.41
4-Wire Digital Loop	1	$91.06
	2	$95.45
	3	$97.10
	4	$91.25

General Costs	Rates and Costs
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Hot-Cut Costs	Loop Type	Internal Cost	Price per Line	Total Charge
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	2-Wire Analog	$0.00	$8.32	$19.55
Non-Recurring Charges	Loop Type	Administrative Charge per Order	Customer Connection Charge	Total Charge
	4-Wire Digital	$0.00	$0.00	$102.47

DS0/DS1 Costs	1	2	3	4
DS0s/DS1	4	4	4	4
DS0 Recurring	$12.71	$18.64	$19.74	$16.41
Capitalized DS0-NR	$1.11	$1.11	$1.11	$1.11
Total DS0 per Month	$13.82	$19.75	$20.85	$17.52
DS1 Recurring	$91.06	$95.45	$97.10	$91.25
Capitalized DS1-NR	$2.47	$2.47	$2.47	$2.47
Net IAD/DLC Costs	$50.56	$50.56	$50.56	$50.56
Add'l Data Ntwk Costs	$20.00	$20.00	$20.00	$20.00
Total DS1 per Month	$164.09	$168.48	$170.13	$164.28
Required Revenue per DS1/Month	$108.81	$89.48	$86.73	$94.20

INTEGRATED DS0 - DS1 ANALYSIS: EQUIPMENT COSTS

DS1 Equipment Annual Cost ($)	
Capital per DS1	
IAD	$1,687
DLC	$538
Total	$2,224

Adtran Equipment Prices				
	NexTag.com			cdw.com
Equipment	Average	Low	High	
Chassis Bundle	$1,266	1008	1220	1569.63
Quad FXS Card	$176	146	225	156
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Total	$1,687	$1,358	$1,758	$1,944

DLC Remote Terminal Cost						
Per Line:	Fixed	Per Line	# Lines	Total Cost	Cost/DS0	Cost/DS1
DS0s	$12,500	$51	2,016	$115,316	$57	
DS1s	$12,500	$389	84	$45,176		$538

Annual Cost of Capital		
	Percent of Capitalization	Annual Cost
Debt	45%	0.08
Equity	55%	0.15