COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

Review of the Federal Communications	**)**	
Commission's Triennial Review Order	**)**	**Case No. 2003-00379**
Regarding Unbundling Requirements	**)**	
for individual Network Elements	**)**	

DIRECT TESTIMONY OF STEVEN E. TURNER

ON BEHALF OF

AT&T COMMUNICATIONS OF THE SOUTH CENTRAL STATES, LLC

FEBRUARY 11, 2004

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I. INTRODUCTION OF WITNESS

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Steven E. Turner. My business address is Kaleo Consulting, 2031 Gold Leaf Parkway, Canton, Georgia 30114.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I own and direct my own telecommunications and financial consulting firm, Kaleo Consulting.

Q. PLEASE DESCRIBE YOUR EDUCATION BACKGROUND.

A. I hold a Bachelor of Science degree in Electrical Engineering from Auburn University in Auburn, Kentucky. I also hold a Masters of Business Administration in Finance from Georgia State University in Atlanta, Georgia.

Q. PLEASE DESCRIBE YOUR WORK EXPERIENCE.

A. From 1986 through 1987, I was a Research Engineer for General Electric in its Advanced Technologies Department developing high-speed graphics simulators. In 1987, I joined AT&T and, during my career there, held a variety of engineering, operations, and management positions. These positions covered the switching, transport, and signaling disciplines within AT&T. From 1995 until 1997, I worked in the Local Infrastructure and Access Management organization within AT&T. In this organization, I gained familiarity with many of the regulatory issues surrounding AT&T's local market entry, including issues concerning the unbundling of incumbent local exchange company ("incumbent" or "ILEC") networks. I was on the AT&T team that negotiated with Southwestern Bell Telephone Company concerning unbundled network element definitions and methods of interconnection. A copy of my resume is provided as Exhibit SET-1.

Q. HAVE YOU PREVIOUSLY TESTIFIED OR FILED TESTIMONY BEFORE A PUBLIC UTILITY OR PUBLIC SERVICE COMMISSION?

A. I have testified or filed testimony before the commissions in the states of Kentucky, Arkansas, California, Colorado, Delaware, Florida, Georgia, Hawaii, Illinois, Indiana, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Hampshire, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Dakota, Texas, Washington, and Wisconsin. Additionally, I have filed testimony before the Federal Communications Commission ("FCC").

II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My testimony describes and quantifies the significant cost disadvantages that an efficient competitive local exchange carrier ("CLEC") would confront in attempting to serve mass market customers if continued access to unbundled local switching and the unbundled network element platform ("UNE-P") were denied. My testimony demonstrates that in the absence of unbundled local switching, CLECs face practically insurmountable cost disadvantages relative to the Incumbent Local Exchange Carriers ("ILECs") if unbundled network element loops ("UNE-L") used in conjunction with their own (or a third party provider's) switching is the sole option for providing local services to mass market customers.[1] The FCC's Triennial Review Order ("TRO") recognized that the "absolute cost advantages" enjoyed by an ILEC can constitute a barrier to entry that would satisfy the impairment standard.[2]

Q. GENERALLY, WHAT COSTS COMPRISE THE COST DISADVANTAGE THAT AN EFFICIENT CLEC WOULD INCUR TO SERVE ITS CUSTOMERS USING UNE-L?

A. A CLEC seeking to serve mass market customers using its own switches would incur the costs for backhauling a customer loop from the ILEC central office to the CLEC's switch (i.e., "backhaul costs") as well as attendant costs for transitioning the customer's service from the ILEC to the CLEC (i.e., hot cut costs, number portability).

To accomplish this, the CLEC must first deploy a costly "backhaul"[3] infrastructure between the ILEC central office where it seeks to serve mass market customers and the physical locations where its switches are located. As described in the accompanying Testimony of AT&T's witness Jay Bradbury, creation of this backhaul infrastructure typically entails (1) the cost of preparing the loop for transport out of the ILEC's central offices, and (2) the cost of

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1 The significant disadvantages I describe apply whether a CLEC uses self-provided switching or switching that is provided by a separate non-ILEC entity. For simplicity in presentation, I will discuss these cost disadvantages in the context of self-provided switching. However, they would also apply if a CLEC attempted to provide service to mass-market customers using "wholesale" switching provided by another carrier.

2 *In the Matter of Review of Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capacity*, CC Docket Nos. 01-338, 96-98, and 98-147 (FCC, Rel. August 21, 2003) ("*TRO*"), ¶ 90.

3 Backhaul is the term used to describe the process and equipment needed to haul the customer's loop from the ILEC's central office where the customer loop terminates to the CLEC's switch in another location so that voice service can be provided to the customer.

transporting the traffic back to the CLEC's switch location.[4] In addition, a CLEC must incur the costs of "hot cuts"[5] and number portability. Number portability is a critical capability established as a result of the Act. Number porting permits the customer to retain and freely move his/her telephone number amongst competing networks.[6] My testimony focuses upon these components of the absolute cost disadvantages associated with this CLEC "backhaul,"[7] and hot cut costs associated with connecting a customer's loop with the CLEC switch which are highly significant and contribute to the impairment a CLEC faces in using self-provided switches to serve mass-market customers.

Q. HOW HAVE YOU QUANTIFIED THIS ABSOLUTE COST DISADVANTAGE?

A. The "impairment analysis tools" that underlie my testimony quantify these *additional* costs of loop connectivity incurred by CLECs, but not by the ILEC, if CLECs are required to provide facilities-based mass-market local services based upon a voice grade UNE-L architecture.[8] In performing this analysis, I have

4 The cost of preparing the loop for transport out of the ILEC's central office includes: (1) the costs of acquiring collocation space in the offices in question; and (2) the deployment of electronic equipment in that space (a) to convert an end user's traffic from the analog signals generated by standard telephone sets to digital signals, and (b) to concentrate and multiplex those digital signals.

5 "Hot cuts", as an example, are the transfer of the customer's active service with the ILEC to the CLEC by transferring the customer's loop from the ILEC switch to the CLEC switch with as minimal an interruption to the customer's service as possible.

6 *See* Direct Testimony of AT&T Witness Mark Van De Water.

7 Other cost disadvantages may also exist for the CLEC, such as in customer acquisition cost or in OSS platform fixed costs that I do not address but which may also add to the CLEC's disadvantage beyond the level that I quantify.

8 As discussed in the Direct Testimony filed by Jay Bradbury, these costs are a product of the "closed" legacy network architecture employed by the ILEC.

followed the FCC's admonition not to examine results for a specific CLEC;[9] instead, my analysis focuses on a hypothetical, efficient CLEC. I also have made a conscious effort to be conservative with respect to inputs and assumptions. As will become clear from the results of this analysis, the most conservative assumption, given current conditions, is the working premise that a CLEC would enter the market using a facilities based and voice grade UNE-L architecture to serve the mass market at all because there are no offsetting absolute CLEC cost advantages available to offset these CLEC cost disadvantages.

As a result, the tools I use calculate the *minimum* level of cost disadvantage an efficient CLEC would face. In order to provide the degree of "granularity" required by the FCC's order, the tools utilize data that is specific to BellSouth's operations in Kentucky.

Q. HOW IS THE REMAINDER OF THIS TESTIMONY ORGANIZED?

A. The remainder of my testimony is organized as follows. Section III provides the background to my analysis and an overview and summary of the results. I provide results based by LATAs in the BellSouth-Kentucky territory.

The discrete analysis of BellSouth's central offices in Kentucky, upon which the LATA results are based, covers a broad range of lines. Not surprisingly, the absolute cost disadvantage per line is highest in those central offices where a CLEC can be expected to serve a relatively small number of mass market lines, and lower in those central offices where a CLEC can be expected to serve a

[9] *TRO* at ¶¶ 115-116, ¶ 517.

relatively larger number of lines. Nevertheless, even when a very substantial number of lines is served in an individual office the unit cost disadvantage experienced by the CLEC for backhaul and hot cuts is substantial. As explained more fully in the accompanying economic testimony of AT&T's witness Don Wood, ILEC cost advantages of the magnitude I have calculated for all wire centers in BellSouth-Kentucky constitute an entry barrier that preclude mass-market local competition without access to unbundled local switching.

Section IV of my testimony describes, in general terms, the tools that I relied upon to measure the CLECs' cost disadvantage and the analysis that has been undertaken for BellSouth-Kentucky LATAs using those tools. A more detailed explanation of the technical aspects of the tools, including an overview of the calculations the tools perform, is set forth in the Technical Appendix that is attached to this testimony as Exhibit SET-2. Exhibit SET-3, which is an electronic exhibit on a CD-ROM, contains the electronic version of the DS0 Impairment Analysis Tools, User Manual, as well as the results by LATA for BellSouth in Kentucky. Finally, in Section V, I present the results for BellSouth in each LATA in Kentucky. These results are supplemented in detail by the information contained in Exhibit SET-3. Included in that discussion is a description of the inputs and sources of the inputs used. The results demonstrate that CLECs cannot practically overcome the significant cost disadvantages identified in this study. Thus, the modeling results for the "hypothetical CLEC" and actual market experience are entirely consistent: there currently is a notable absence of actual, broad based facility-based competition for mass market customers using voice grade UNE-L which corroborates the FCC's national finding of impairment for switching to serve mass market customers.

III. BACKGROUND AND SUMMARY OF RESULTS

A. Impairment Resulting From Absolute Cost Disadvantages Experienced by a CLEC, and the Network Architectures That Create That Impairment

Q. YOU HAVE PREVIOUSLY REFERRED TO AN ABSOLUTE COST DISADVANTAGE THAT A CLEC ENCOUNTERS WHEN USING SELF-PROVIDED SWITCHING TO SERVE MASS MARKET CUSTOMERS. COULD YOU EXPLAIN THIS CONCEPT IN MORE DETAIL?

A. Among the types of barriers to entry that the FCC expressly recognized in the TRO are "absolute cost advantages" enjoyed by the ILEC,[10] or absolute cost disadvantages experienced by the CLEC.[11] That is, competitors will be impaired if, in the absence of unbundling, an efficient CLEC would incur substantially higher costs than do the ILECs in order to self deploy the network facility in question. Thus, as the FCC observed, "[w]hen the incumbent LEC has absolute cost advantages, other firms may be deterred from entering the market."[12]

Q. WOULD A HYPOTHETICAL EFFICIENT CLEC USING SELF-PROVIDED SWTICHING TO SERVE THE MASS MARKET EXPERIENCE ABSOLUTE COST DISADVANTAGES AS COMPARED TO BELLSOUTH?

A. Yes.

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[10] *See*, *e.g.*, *TRO*, ¶ 90.

[11] *Id*. at ¶ 112.

[12] *TRO* at ¶ 90 and n. 302. This is particularly so if the ILEC is providing service at rates close to its average cost. *Id*.

Q. WOULD THIS RESULT IN THE CLEC BEING IMPAIRED IN ITS ABILITY TO PROVIDE SERVICE TO MASS MARKET CUSTOMERS IN KENTUCKY?

A. Yes.

Q. WHY?

A. The absolute cost disadvantages analyzed in my testimony are created by differences in the basic characteristics of the network architectures employed by ILECs, on the one hand, and CLECs on the other. The network architecture testimony presented by Jay Bradbury describes these important differences in the network configurations employed by CLECs and ILECs in detail. These differences, which I summarize briefly below, are generally recognized and were explicitly acknowledged by the FCC in the *TRO*.[13]

Q. GENERALLY, HOW WAS AN ILEC'S NETWORK DESIGNED?

A. The ILECs' local networks were designed in a monopoly environment. As a result, they rely upon an integrated network architecture that does not easily allow for multiple carriers to access a customer's loop to provide voice service.

The ILEC network was designed and built based upon analog (and largely copper-based) technology. Because analog signals degrade over distance, copper loops could not exceed relatively short lengths without the need for expensive equipment to ensure that the voice signal could travel from the caller to the called party. As a result, the ILECs deployed – and by virtue of their historical monopoly position they were able to deploy – a relatively large number of local switches, each of which served a relatively small geographic area limited

[13] *See*, *e.g.*, *TRO* at ¶ 480.

generally to an area determined by the length of copper that could practically support voice services.[14] Furthermore, because a switch was placed at the termination point for these analog loops, ILECs could inexpensively connect their customers' loops to their switches by using a simple set of "jumper" wires across the main distribution frame ("MDF"). And for the vast majority of mass market customers, those jumper pairs are left in place even when a customer moves, so that when a new customer moves in to this same residence or small business location, the ILEC can re-activate service through the use of software commands from a service representative without the need for any physical work.

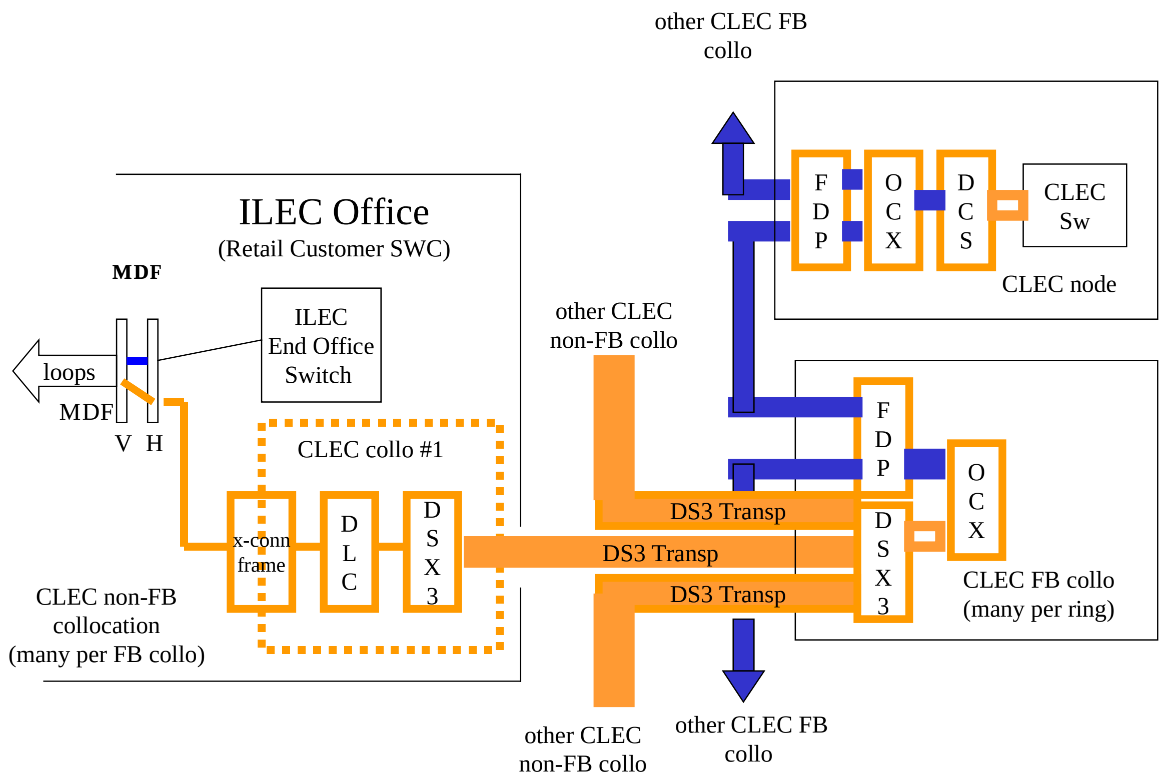
Q. DOES THE CLEC NETWORK DESIGN DIFFER FROM THE ILEC NETWORK?

A. Yes. The diagram below displays the facilities that a CLEC must employ to connect a customer loop to its switch, and compares them to the facilities an ILEC needs to perform the same functions. The DS0 Impairment Analysis Tools quantify the *minimum* equipment and network functionality that a facilities-based efficient hypothetical CLEC (*i.e.*, a CLEC providing its own switching) would need to extend a customer's UNE loop obtained from the ILEC central office where the customer's loop terminates to the CLEC's own switch, which is also depicted in Figure 1 (the larger orange and blue lines running from the MDF to the CLEC Switch).

Figure 1

[14] As the FCC confirms in the TRO, in recent years the ILECs have deployed increasing amounts of fiber optic equipment in the "feeder" portion of the loop, but the "distribution" portion of loop plant – that connecting to the customer's premises – remains almost entirely copper, and the basic architecture characterized by a high density of local offices/switches where customer loops are terminated remains the same.

Comparison of CLEC Backhaul Network
With ILEC Cross-Connect



Q. HOW DOES THE CLEC NETWORK DESIGN DIFFER FROM THE ILEC NETWORK DESIGN?

A. The local network architecture employed by an efficient CLEC that is self-providing switches is very different from the ILEC network. Because CLECs are attempting to enter markets that have long been dominated by a single monopoly provider, they are unlikely – even in the medium to long term – to be able to generate sufficient customer volume for it to make economic sense to place their own switches at locations close to each ILEC central office. Instead, a CLEC must provide service to customers from multiple ILEC central offices with a single switch in order to generate a sufficient volume of customer line terminations and calls per switch that is comparable to the customer line terminations and call volume on a switch that is on average achieved by ILECs.

As a result, the CLEC must deploy extensive equipment – which is a large and substantially demand insensitive cost – to extend each and every loop from collocations located at various ILEC wire centers to its local switches. In order to extend customer loops to its switches, a CLEC must install and maintain Digital Loop Carrier (DLC) equipment in each ILEC central office where the customer's analog loops (voice grade UNE-loops) are located. This DLC equipment, as previously mentioned, is used to digitize, concentrate and multiplex the traffic delivered over these analog loops to permit efficient backhaul from the ILEC central office where the customer's loop terminates to the distant CLEC switch without substantially reducing the quality of the customer's voice service. The DLC deployed by the CLEC must permit the distant CLEC switch port to interoperate with the customers' telephone sets to enable the CLEC to provide such capabilities as dial tone and the ability to ring the customer's telephone set. In addition, the CLEC must have connectivity between the DLC (in the collocation space) and its switch so that the voice signal has a path to travel between those two points.[15] Finally, once this expensive backhaul infrastructure is deployed, the CLEC must arrange for, and pay ILEC charges for a hot cut. In addition, the CLEC may incur charges for number portability when the customer

[15] The need to deploy equipment to "backhaul" the customer's loop to the CLEC switch in connection with UNE-L has been recognized by the FCC: "The need to backhaul the circuit derives from the use of a [CLEC] switch located in a location relatively far from the end user's premises, which effectively requires competitors to deploy much longer loops than the incumbent." *TRO* ¶ 480.

wants to maintain the phone number it previously had with the ILEC for each active customer loop it migrates to its network.

Q. DO THESE DIFFERENCES IN NETWORK DESIGNS RESULT IN DIFFERENT COSTS TO PROVIDE SERVICE TO MASS MARKET CUSTOMERS FOR CLECS USING UNE-L AND ILECS?

A. Yes. The crucial economic fact is that costs to backhaul customer lines to the CLEC switch, hot cuts to provision the migration of service to the CLEC switch with limited service interruption, and number portability to maintain the customer's same telephone number are not faced by the ILEC. Unlike a CLEC seeking to use the UNE-L architecture, the ILEC connects its loops and switching using a simple, inexpensive copper wire pair cross-connection in the central office where its loops terminate. Thus, the ILEC's "backhaul" network consists of only a relatively short pair of jumper wires.

Collectively, the CLEC's costs associated with collecting and backhauling its customers' loops to its switch to create the same functionality as the ILEC's "short pair of jumper wires" represents an absolute cost disadvantage and results in a substantial barrier to market entry using UNE-L in Kentucky. The analytical tools described in my testimony, which I refer to generally as "DS0 Impairment Analysis" tools, identify and quantify the *absolute cost disadvantages* a CLEC would likely face if it sought to broadly serve the mass-market in a particular area with a relatively ubiquitous backhaul network using voice grade UNE-L. Conversely, the backhaul disadvantage represents a significant component of ILEC profit margin that is never eroded even if an efficient CLEC actually entered these markets in the face of such a disadvantage.

B. Overview of Results

Q. WILL YOU GIVE AN OVERVIEW OF THE DS0 IMPAIRMENT TOOLS THAT YOU USED TO QUANTIFY THE ABSOLUTE COST DISADVANTAGE THAT AN EFFICIENT CLEC WOULD EXPERIENCE AS COMPARED TO BELLSOUTH?

A. Yes. However, a more detailed description of the DS0 Impairment Analysis Tools is contained in Section IV and in the accompanying technical appendix (Exhibit SET-2). In addition, the LATA results for Kentucky are set forth in Section V, which also contains a general discussion of the inputs employed (along with the specific inputs used for each LATA analysis).

Broadly speaking, the DS0 Impairment Analysis Tools calculate the costs that CLECs face in three broad categories: (1) preparation of the loop for transport from ILEC central offices (including DS0 equipment infrastructure and collocation); (2) backhaul transport between the ILEC's central offices and the CLEC's switch; and (3) customer transfer costs for hot cuts and number portability. The tools use inputs that are based upon the experience and judgment of subject matter experts (SMEs) as to the costs an efficient CLEC would incur to provide the backhaul and customer transfer functions efficiently.[16] In other instances, the costs are developed using state-approved rates (*e.g.*, for elements of the cost of collocation and hot cuts) or interstate charges (*e.g.*, the cost of high capacity special access facilities, purchased under multi-year term plans). As noted earlier, it is my opinion that the methodology employed and the inputs used produce conservative results. That is, they tend to reflect relatively *low* estimates

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[16] *See* generally *TRO*, ¶ 517, providing that costs should be based on the entry of an efficient CLEC, not any particular CLEC.

of the absolute cost disadvantage that would be experienced by a "hypothetical efficient CLEC" that is attempting to enter the local market using UNE-L. Of course, CLECs could experience far higher costs depending upon their customer base.

Q. CAN YOU PROVIDE AN OVERVIEW OF THE DOLLAR AMOUNT FOR THE COST DISADVANTAGE THAT A CLEC WOULD FACE USING UNE-L?

A. The results of my analysis, which are shown in Section V, support the conclusion that hypothetical efficient CLECs face substantial, absolute cost disadvantages relative to the ILEC in each geographic market in which BellSouth has elected to challenge the FCC's national finding of impairment. Those cost disadvantages range from a high of $35.10 per line per month to a minimum of $18.31 for the Kentucky LATA study areas.[17]

Q. WHAT DOES THE MINIMUM IMPAIRMENT DOLLAR FIGURE REPRESENT?

A. The latter minimum figure in fact provides a shorthand basis – and a conservative one at that (for the reasons I have previously discussed) – for supporting a general finding of economic impairment in Kentucky consistent with the FCC's national finding of impairment. As noted earlier, an important characteristic of impairment is that the number of customer lines a CLEC serves in a given ILEC central office (as distinct from the absolute size of the ILEC central office) is a key determinant of the absolute cost disadvantage. Thus, the cost disadvantage of

[17] These costs *do not include* the monthly recurring charges paid to the incumbent simply to lease an unbundled loop. Thus, to the extent that the TELRIC costs paid by a CLEC to lease the loop are higher than the ILEC's efficient costs for providing the loop to itself, such cost disadvantages are not reflected.

serving 500 lines in a 5,000 line office would be much the same as the cost disadvantage of serving 500 lines in a 50,000 or 100,000 line office. That is because collocation charges and hot cut costs do not vary based on the ILEC office size, and the backhaul cost is largely a fixed cost related to the type of DLC deployed and the designation used by the tools for a particular ILEC central office (*i.e.*, whether it is a "node" or "satellite," *see* infra.). Generally, therefore, the average cost disadvantage per line decreases as the number of lines served in an office increases, but the important point is that it *never* drops below a level of absolute cost disadvantage that would preclude mass-market competition.

Thus, even if a CLEC serves a very substantial number of lines in an individual central office in Kentucky, the minimum cost impairment per line I cite above would nevertheless constitute a cost penalty that is competitively disqualifying under any reasonable measure.

As discussed in the testimony of Don Wood, a CLEC cost disadvantage of the magnitude described above constitutes a clear barrier to entry and should by itself satisfy any reasonable definition of "impairment."

Q. HOW DOES THE IMPAIRMENT FOR CLECS CALCULATED BY THE DS0 IMPAIRMENT TOOL COMPARE TO CLEC IMPAIRMENT COSTS CALCULATED BY ILECS?

A. The types of costs and the general levels of impairment I have identified are consistent with calculations submitted by ILECs during the FCC proceedings leading up to the *TRO*. In January, 2003, for example, SBC Communications, Inc. ("SBC") submitted an Ex Parte letter to Chairman Powell from James C. Smith, a Senior Vice President of SBC ("SBC Ex Parte"). This letter is appended as Exhibit SET-4 to my testimony. Attachment 3 to that letter is a document entitled "SBC's Analysis of the Economic Viability of Facilities-Based UNE-L Residential Serving Arrangements," in which SBC claims that it "compares the cost of a UNE-L-based serving arrangement with the revenue stream a CLEC could reasonably anticipate when serving residential customers." *Id.*, p. 1.

In its ex parte SBC identified a series of cost categories that CLECs might incur in using UNE-L to serve residential customers that would not also be incurred by ILECs. These include:

- payments by CLECs to ILECs for hot cuts (SBC appears, however, to have excluded internal CLEC costs that would be incurred to implement the hot cut process (*Id.* at 3);
- the costs of collocation (*Id.* at 4-5);
- the costs of GR-303 concentration and multiplexing equipment (*Id.* at 5); and
- transport costs (*Id.* at 7).

These are the very same cost elements that are reflected in the tools and calculations that I discuss below.

For the three states that SBC analyzed, *i.e.*, California, Michigan and Texas, SBC developed estimated cost differentials that totaled respectively $10.74, $10.88 and $10.74 per line for these cost components for a central office in which a CLEC would serve 250 lines; and $9.00, $7.85 and $8.80 per line, respectively, for these cost components for a central office in which a CLEC would serve 500 lines.[18]

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18 *See* February 4, 2003 Ex Parte letter from Joan Marsh, AT&T Director of Federal Government Affairs, to Ms. Marlene Dortch, Secretary, Federal Communications Commission in CC Docket Nos. 01-338, 96-98, and 98-147, appended hereto as Exhibit SET-5. Note that for a 100 percent increase in lines served, the impairment per line declines only 16 to 29 percent, depending on the state.

Thus, SBC's own analysis presented to the FCC shows that the cost disadvantage faced by a CLEC – essentially the same cost disadvantage discussed in my testimony – is substantial.

IV. THE DS0 IMPAIRMENT ANALYSIS TOOLS

A. Overview

Q. CAN YOU EXPLAIN HOW THE DS0 IMPAIRMENT TOOLS WORK?

A. Because UNE-L entry requires CLECs to connect ILEC loops to their own switches, the forward-looking cost of such connections is central to any analysis of the economic viability of UNE-L as an entry strategy to serve mass-market customers. The DS0 Impairment Analysis Tools described in this section of my testimony compute the loop-related impairment costs of providing service that would be incurred by an efficient CLEC using UNE-L that are *not* incurred by incumbents. Again, the analysis reflects the anticipated experience of a hypothetical, efficient CLEC seeking to broadly serve the mass market using UNE-L, rather than focusing on the business strategy of any particular competitive carrier.

Q. DO THE DS0 IMPAIRMENT TOOLS MAKE ASSUMPTIONS REGARDING THE CUSTOMER BASE OF AN EFFICIENT CLEC?

A. Yes, there are four important sets of assumptions. *First,* the DS0 Impairment Tools require an assumption about the market share of mass market customers a hypothetical efficient CLEC is expected to achieve. *Second,* it employs assumptions about how rapidly a CLEC will acquire that market share. *Third,* as discussed above, it assumes that transport costs will be defrayed by traffic for both enterprise and mass market customers, which has the effect of reducing backhaul transport costs included as impairment. *Fourth*, it requires estimates of customer "churn," *i.e.*, how long a hypothetical efficient CLEC can expect to keep a customer that it takes from the ILEC or another CLEC.

The DS0 Impairment Tools assume that an efficient hypothetical CLEC will benefit by serving both the enterprise and the mass-market customers, particularly in the area of self-provided transport. Self-provided transport cannot generally be justified solely by local voice demand, particularly if only mass-market customers are considered. If, in particular, data networking and long distance demand of enterprise customers cannot be addressed, there are limited instances where self-provided facilities are economically justifiable. The DS0 Impairment Analysis Tools deploy self-provided facilities between large incumbent offices, and assume that these facilities are also utilized for mass-market backhaul. Thus, the calculations described here assume that the CLEC has an active enterprise business. If it did not, there would be no basis for hypothesizing the existence of self-provided fiber facilities between ILEC offices. Apportioning costs of node-to-node transport between mass market and enterprise customers is one of many ways that the Impairment Analysis Tools assume the efficient sharing of facilities used to serve mass market customers. In addition, where there are facility-based collocations, the DS0 backhaul infrastructure reflects the economies of shared use between mass market and enterprise customers.

Q. DO THE IMPAIRMENT TOOLS MAKE ANY ASSUMPTIONS ABOUT REVENUES GENERATED BY MASS MARKET CUSTOMERS?

A. No. As noted earlier, the DS0 Impairment Tools are designed only to quantify the absolute cost disadvantage experienced by a hypothetical efficient CLEC. Revenues are not relevant to this determination. Revenues would be highly relevant to an analysis of whether entry could be profitable, given the level of cost impairment calculated by the DS0 impairment tool, but that is not the subject of this testimony.

Q. CAN YOU DESCRIBE HOW THE DS0 IMPAIRMENT TOOL IS ORGANIZED?

A. The DS0 Impairment Tools are a collection of spreadsheet models that calculate the cost associated with connecting a customer's loop that terminates in an incumbent's central office to a CLEC's switch, and the associated customer acquisition costs.

One of the spreadsheets is called the Facility Ring Processor Tool, which determines the transport equipment and facilities that are required to efficiently connect collocation arrangements where unbundled loops are collected back to the CLEC switch. This tool essentially identifies the "backhaul" transport architecture that is needed to establish connectivity between a customer's loop that terminates in the ILEC's central office and a CLEC switch.

The output of the Facility Ring Processor is used as an input to the Transport Cost Analysis Tool. The Transport Cost Analysis Tool calculates the transport cost per DS3 as a function of the number of DS3s active at a Network Node, (a collocation that is connected to a fiber CLEC ring used to provide service to customers) based on the transport network determined by the Facility Ring Processor Tool.[19]

Finally, the cost generated by the Transport Cost Analysis Tool is used as an input to the DS0 Impairment Analysis Tool. In addition to the transport costs, the DS0 Impairment Analysis Tool calculates costs associated with (1) digital loop carrier equipment, (2) collocation, including space and power, (3) interconnection arrangements at the collocation and the CLEC switching office, and (4) the cost of hot cuts. The total of these individual cost components at each wire center, divided by the number of lines a hypothetical efficient CLEC is anticipated to acquire in each wire center, yields the DS0 impairment per line for each wire center which can be and was for this proceeding aggregated into LATA results.

Q. DO THE DS0 IMPAIRMENT TOOLS CALCULATE THE TOTAL COSTS THAT AN EFFICIENT CLEC INCURS TO PROVIDE SERVICE TO A CUSTOMER?

A. No. It is important to emphasize that the DS0 Impairment Analysis Tools quantify only certain significant components of the cost disadvantage that would be faced by a hypothetical efficient CLEC using UNE-L, as compared to the ILEC. The tools do *not* calculate the total cost that would be experienced by a hypothetical efficient CLEC to provide service in Kentucky.[20]

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19 A DS3 is equal to 28 DS1s and provides for approximately 45 megabits per second of transport connectivity between two points.

20 For example, a CLEC's costs to acquire customers are appreciably higher than the costs of the monopoly ILEC, *e.g.*, *TRO* ¶ 471, particularly when the likelihood of price discounting is considered. Likewise, customer-servicing operations become most efficient only when they are used to serve very large customer groups. These factors are considered in connection with a "business case" analysis, as are the costs of the local switching and local transport. Any business

B. Costs of Preparing Loops for Transport Out of the ILEC's Central Offices

Q. WHAT COSTS WOULD A CLEC INCUR TO PREPARE CUSTOMER LOOPS FOR TRANSPORT OUT OF THE ILEC CENTRAL OFFICES?

A. As noted earlier, there are two major components of the cost of preparing the signal, *i.e.*, (1) the cost of DLC and related equipment housed within the ILEC's central office (together with associated equipment at the CLEC's central office) used to digitize, concentrate and multiplex the signals on the CLEC's customers' loops, and (2) the CLEC's cost to obtain collocation space in the ILEC's central office in which to place the DLC and related equipment.

Q. COULD YOU DESCRIBE THE TYPES OF EQUIPMENT THAT THE CLEC MUST DEPLOY TO TRANSPORT THE CUSTOMER'S LOOP OUT OF THE ILEC'S CENTRAL OFFICE?

A. The three main types of equipment required by a CLEC to provide voice grade services using UNE-L are: (1) digital loop carrier (DLC) equipment, *i.e.*, the equipment necessary to digitize, multiplex and concentrate the traffic on individual voice grade loops at the originating ILEC central office, and the corresponding equipment at the location of the CLEC switch; (2) facility terminating equipment, *i.e.*, the cross-connection frames within the CLEC's collocation facilities in each ILEC central office on which the incoming voice grade loops terminate, the out-going transport facilities terminate, and equipment cross-connections are made; and (3) supporting infrastructure equipment, *e.g.*, the

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case analysis must take into account the implications of providing local switching and transport to both enterprise and mass market customers, and the benefits the CLEC might realize from deploying fewer, larger switches relative to the ILEC.

battery distribution fuse bay and test equipment, that the CLEC must install in order to make its collocated facilities operational.

1. DLC Infrastructure and Facility Terminating Equipment

Q. DOES THE COST FOR DLC EQUIPMENT VARY BY GEOGRAPHIC LOCATION?

A. Because DLC and related equipment can be purchased on the open market, its cost is the same regardless of the geographic area being served. However, the cost per line for providing such equipment varies significantly as a function of the number of customers actually served out of a given central office. For example, the cost of the collocation in an ILEC central office which the equipment is housed *does* vary by state and incumbent LEC (but typically does not vary by specific central office for comparable configurations). The DS0 Impairment Tools take these characteristics into account.

Q. HOW DOES THE DS0 IMPAIRMENT TOOL SIZE THE DLC AND SUPPORTING INFRASTRUCTURE EQUIPMENT?

A. At a high level, the DS0 Impairment Analysis Tool sizes the required DLC and supporting infrastructure based upon the number of lines the CLEC will serve out of a given central office. For each central office, the tool selects the lowest cost investment option from among three differently sized DLC alternatives. Because the frame space required to house the DLC modules and common units is also known, the DLC frame requirements are calculated for each central office, depending upon the DLC alternative selected.

Q. IS THIS SAME METHOD USED FOR SIZING FACILITY TERMINATING EQUIPMENT?

A. Yes. A similar approach is used to establish the number of cross-connection panels (and corresponding frames required) to provide a connection between the ILEC's MDF and the DLC equipment in the CLEC's collocation area for each line acquired in a central office by the CLEC. Each cross-connection panel has a known capacity of the number of voice lines that can terminate on the panel and each panel consumes a specific amount of frame space. Thus, by knowing the number of lines served (which determines the number of terminations), the number of required cross-connection panels can be calculated; and knowing the number of cross-connection panels determines the number of frames required.

Once the quantity of DLC equipment items required in an ILEC central office is determined (*i.e.*, DLC modules, common units and line cards, and termination panels and frames) – and the installed unit costs are calculated – the tools quantify the gross investment in the infrastructure investment needed for voice grade lines for each central office.

Q. IS THE INVESTMENT FOR DLC AND DLC EQUIPMENT SIZED FOR THE ULTIMATE CUSTOMER DEMAND THE EFFICIENT CLEC IS EXPECTED TO SERVE?

A. No, not for all the equipment. The DLC calculations incorporate the effects of a "ramp up" to reflect the fact that a CLEC would not acquire all of its customers instantaneously. The DLC common equipment is sized to meet ultimate demand (*i.e.*, the tools select the particular DLC alternative, and the corresponding cross-connect panels and frames, based on the *final* CLEC market share and line count assumed in the study).[21] However, due to the size and variable nature of line card[22] investment, the tools incorporate the line card investment only as to the demand sufficient to serve the initial customers that the CLEC acquires.[23] The "ramp up" adjustment reflects the fact that common equipment that must be installed on day one is recovered over a smaller number of customers in the earlier period than in latter periods. In addition, it provides for a sizeable deferral of the line card investments to future periods.

Q. DO THE DS0 IMPAIRMENT TOOLS CALCULATE THE COSTS FOR ANCILLARY DC POWER EQUIPMENT REQUIRED TO OPERATE THE DLC EQUIPMENT?

A. Yes. Ancillary power equipment such DC power distribution equipment (sometimes referred to as a mini-battery distribution fuse bay or mini-BDFB) is also included in the support infrastructure investment. The CLEC's choice to install this equipment within its collocation arrangements allows the CLEC to further divide the power (*e.g.*, from one 60 amp circuit to two 30 amp circuits) and thereby gain flexibility and potentially minimize the need for subsequent (and costly) power augments as the CLEC's customer base increases. Therefore, the tools allow power distribution equipment to be added to the CLEC's collocation arrangement.

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[21] It is economically prudent to initially install the type of DLC common units that will ultimately be required, rather than to start with smaller units and then replace them with larger ones over time.

[22] The line cards are installed in the collocated DLC equipment to actually terminate the unbundled loops into the equipment that will allow for the backhaul to the CLEC's switch.

[23] The tools incorporate a demand "ramp-up" profile that reflects that general experience of new market entry. That is, demand is initially zero, it increases to close to the ultimate level in the first few years and then remains flat for the remainder of the 10-year study period.

2. Collocation Costs

Q. WHERE DOES THE CLEC HOUSE THE DLC AND RELATED EQUIPMENT?

A. Before a CLEC can deploy the equipment required to prepare a loop for transport, it must rent collocation space from BellSouth, in each BellSouth central office where it seeks to provide service. The minimum amount of floor space, including a wide range of collocation elements such as interconnection arrangements based on the particular equipment needs described previously, are computed for each wire center in Kentucky.

Q. HOW ARE THESE COLLOCATION COSTS DETERMINED?

A. Collocation cost is principally a function of the amount of space, cross-connections and power required to provide the backhaul functionality. Because the number of frames required in a central office is developed in the analysis above, and because the average floor space required by a frame is known, the minimum amount of collocation space required in the central office can be calculated. In addition, since the type of DLC and the number of lines served are known, the DC power requirements at the office can be established.

Q. WHAT SOURCE DOES THE DS0 IMPAIRMENT TOOL RELY UPON FOR THE COLLOCATION RATES?

A. The source data for the DS0 Impairment Analysis Tools includes the prevailing collocation rates, by type of collocation, for BellSouth in Kentucky. The tools use current collocation charges for BellSouth for the following components, established by the Kentucky Public Service Commission, to build bottom-up collocation costs for each BellSouth central office that is used to provide service to mass-market customers in Kentucky:

- AC and DC power Cost
- Space occupancy
- Space construction
- Administrative charges
- DS0 connectivity
- Fiber Entrance Facilities

The DS0 Impairment Analysis Tools establishes the collocation costs for each affected central office by applying the state established costs to the equipment space, power and cross-connection requirements of the particular central office (calculated as described above). ILEC collocation charges, both recurring and non-recurring, are calculated on the basis of common collocation measurement units (*e.g.*, square feet of space, DC amps required, and 2-wire cross-connections), and then multiplied by the collocation rate per unit for each central office. If the ILEC requires a CLEC to purchase a minimum block of capacity (such as minimum costs for cage construction, power feeds and/or cable terminations), then the minimum block size just sufficient to address the equipment deployed in the specific office is determined and used in the cost calculation.[24]

For example, DC power charges are based upon the number and size (maximum capacity) of the power feeds and a per amp charge multiplied by the total amps. The DC power computation is based on the calculated power consumption of the required equipment and appropriate BellSouth tariff rates. The tools also include the capability to match the projected equipment power requirement to the basis upon which the incumbent charges are applied. For nodes, the DS0 backhaul is

[24] Because the number of required frames is known, as is the typical "footprint" of each frame, then the total square footage requirement can be determined.

assigned only the proportion of the cost for DC power that is actually required by the equipment deployed. This approach is taken for nodes in that the service to enterprise customers is assumed to consume all existing power (or space, depending on the element being evaluated) not required for the DS0 infrastructure. For satellites, however, the primary purpose for establishing the collocation arrangement is to interconnect with unbundled loops. As such, for these central office collocations, the entire cost for an appropriate sized collocation arrangement (including the cost for DC power) is assigned to the DS0 backhaul.

Q. HOW DOES THE DS0 IMPAIRMENT TOOL DETERMINE THE AMOUNT OF COLLOCATION SPACE THAT IS NEEDED FOR THE EQUIPMENT?

A. The space occupancy and construction charges generally reflect minimum standard sizes and additional incremental blocks of space. Once the relevant charges are selected, the DS0 Impairment Analysis Tools use the actual square footage needed at that central office to compute the relevant costs.[25] The DS0 Impairment Tools calculates the total number of frames deployed (for DLC, termination equipment, and test equipment) and multiplies the total frame count by user-adjustable inputs for the floor space required by each of the different types of frames. The resulting square footage is the minimum amount of collocation space required to serve the anticipated efficient hypothetical CLEC market share at each ILEC central office. The tool effectively calculates the cost

[25] In order to account for all possible variations in ILEC tariff structures, the collocation section of the DS0 Impairment Analysis tool employs a series of logical formulas and lookup tables to select the appropriate collocation charges.

of collocation for space requirements running from zero to 300 square feet in one square foot increments, based upon the charges contained within BellSouth's approved collocation appendix and the increments of space where the charges change. The tool selects the minimum cost alternative given the amount of space required.[26]

Q. HOW DOES THE DS0 IMPAIRMENT TOOL DETERMINE THE COLLOCATION CHARGES FOR LOOP CONNECTIVITY?

A. Connectivity charges are computed separately at the Voice Grade, DS1, or DS3 level or for fiber (depending on the type of transport deployed). The incumbent charges a CLEC to physically cross-connect transport facilities to the CLEC equipment in the collocation. This specific CLEC equipment allows the customer loop to be transported from the ILEC central office back to where the CLEC's switch is located. If leased transport is employed, the cross-connection is at the DS1 or DS3 level. The costs may also include the cost of a cable from the CLEC's collocation to an intermediate cross-connection frame in the ILEC space where the ILEC actually makes its cross-connection.[27] Even when self-provided

[26] For example, an ILEC may offer minimum initial purchases of 100, 200, and 300 square feet. Additional increments may be in 25 square foot increments. If 137 square feet were required in an office, the tool would check to determine if a 150 square foot cage (100 initial + two 25 square foot increments), a 200 square foot or a 300 square foot cage represents the lowest total cost. Regardless of the actual size, the lowest cost alternative is selected.

[27] In a similar manner, charges may apply (in addition to hot cut charges) to install and terminate wire cables between the CLEC collocation and an intermediate frame in ILEC space, where a second cable to the MDF is also terminated. These connections represent pre-wiring to the MDF necessary for the CLEC to access voice grade loops. Tariff charges (in addition to the hot cut charges) may apply to install and terminate cables between the CLEC collocation and an intermediate frame in ILEC space where the ILEC's cable (generally to the MDF (for loop) or a transport frame (for interoffice connections) terminate and a cross-connection is made. If tariff charges exist, they are utilized by the model. On the other hand, if the cables must be installed by an ILEC-certified contractor (*i.e.*, no tariff charge exists but a cost is incurred), the average installed cost of an appropriately sized cable is included.

transport is employed, charges may apply to cross-connect fiber running from the CLEC facility in the street outside the office to the CLEC's collocation space within the central office (commonly referred to as a collocation Entrance Facility).

In general, connectivity charges apply based upon one or more of the following categories: per termination, per block of terminations or conductors, and/or per cable. The tool determines, based upon the number and type of backhaul facilities and the number of customer loops served (and inputs regarding maximum cable sizes), the quantity of each category needed based upon the conditions in each central office out of which the CLEC serves its customers. To the extent that an ILEC does not impose charges for a particular category, the unit price is zero.

Q. ARE THE COLLOCATION COSTS ADJUSTED TO ACCOUNT FOR THE PREVIOUSLY-DESCRIBED "RAMP UP" IN THE NUMBER OF CUSTOMERS AN EFFICIENT CLEC WOULD ULTIMATELY SERVE?

A. Yes. Like the DLC calculations described above, collocation costs associated with DC Power consumption are adjusted to incorporate the effect of a "ramp up" that reflects the fact that an efficient CLEC would not acquire all of its customers instantaneously. For example, power feed related charges are incurred immediately based on the maximum expected lines in service, and collocation space construction is based on the projected number of frames, rather than incrementally as each frame is added. Collocation costs which are not incurred on day one, but only as demand materializes, are treated similar to the line-card investment portion of total DLC investment as described above. In addition, collocation amperage-related charges (including HVAC) as well as DS0 termination charges are incurred only as actual demand materializes, and these receive the same treatment as DLC line cards.

C. Costs of Connecting the Customer's Loop to the CLEC's Switch (Backhaul Infrastructure)

1. Facility Ring Processor Tool

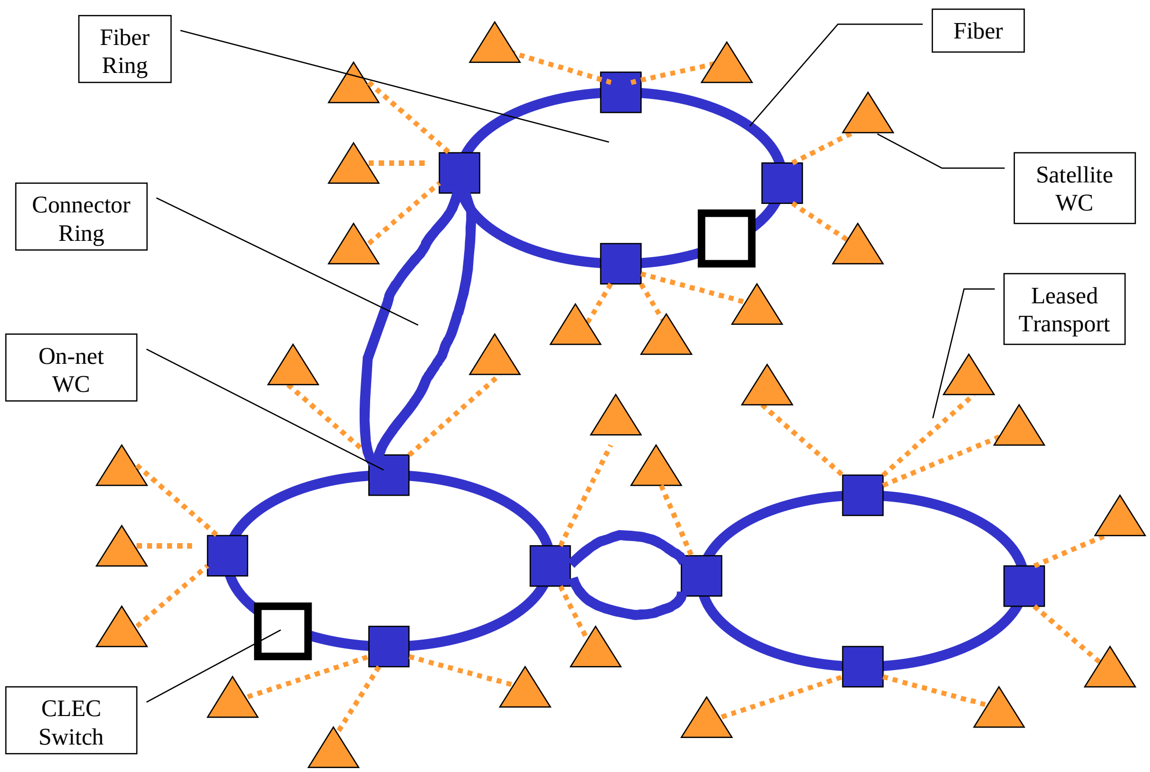
Q. HOW DO THE DS0 IMPAIRMENT TOOLS CALCULATE THE LEVEL OF COST IMPAIRMENT ASSOCIATED WITH BACKHAULING A CUSTOMER'S LOOP FROM AN ILEC CENTRAL OFFICE TO THE CLEC SWITCH?

A. The Facility Ring Processor Tool ("FRP") initially establishes a self-provided CLEC facility network that is linked to the largest ILEC central offices. The CLEC's collocations at those wire centers form the "nodes" of its transport facilities. Each remaining wire center to be served is considered as a satellite location and is then "homed" to the closest node location that is on the CLEC network or "on-net". This process creates the basic backhaul transport network.

Q. CAN YOU PROVIDE A BRIEF DESCRIPTION OF THE FRP TOOL?

A. Yes. The following diagram displays the basic architecture the FRP Tool uses:

Figure 2



The facility architecture designed by the FRP Tool requires the designation of central offices in Kentucky as either Network Nodes (or “core” offices) or Satellite offices. The FRP Tool will connect each network node to another network node using self-provided facilities (nodes connected to at least two other nodes), and “Satellite offices” are connected to the closet node office using facilities leased from the incumbent. As a default mechanism, the FRP ranks all wire centers in Kentucky by number of lines, and then assigns wire centers in declining line count order as Network Nodes until 50 percent of lines have been assigned to nodes. Generally, this mechanism designates approximately 30 percent of the central offices as Network Nodes. However, the user can change the default mechanism or change the designation of any individual node.

Once the Network Node offices are identified, the FRP tool treats all of the incumbent central offices that are *not* designated as node office locations as Satellite offices. The tool separately assigns each Satellite location to its nearest Network Node location.

The FRP tool combines multiple individual physical rings to connect all of the Network Nodes, with each ring serving up to the user-specified maximum number of Network Nodes. The tool uses "ring connectors" to interconnect adjacent rings.[28] An algorithm (written in Visual Basic for Applications code) determines the mix of rings and ring connectors.

Q. HOW DOES THE FRP CALCULATE THE MILEAGE BETWEEN NODES?

A. The FRP tool calculates the mileage (airline and rectilinear) between all Network Nodes in a particular study area, and separately calculates the average miles (airline and rectilinear) per node within the study area.[29] The node-to-node connections are based on a ring architecture that uses SONET rings self-deployed by the CLEC to connect all CLEC node offices. The mileage of fiber that is calculated for a particular SONET ring in the FRP is developed using an algorithm that minimizes the amount of fiber deployed but also accounts for the engineering reality that SONET rings are limited in the number of nodes that can be placed on a particular physical ring and the maximum distance that can exist

[28] "Ring connectors" are effectively two-node rings that connect adjacent rings to one another.

[29] The mileage calculation is based upon the vertical and horizontal coordinates of the paris of network nodes.

between any two nodes. The details of this calculation can be found in the Technical Appendix.

Similar calculations are made for the ring connector distances. Based on these distance calculations, the FRP tool determines where fiber signal “regenerators” (used to “boost” the fiber signal after a certain distance) are required (using the user-specified regenerator spacing input) for rings and ring connectors.

As noted earlier, the FRP tool also “homes” each Satellite location to the nearest Network Node location. The fundamental assumption in the FRP tool is that Satellite offices will connect to nodes using incumbent-supplied interoffice transport (*i.e.*, special access). Because BellSouth’s charges for these types of connectivity are based upon airline distance, the FRP tool determines the closest Network Node to each particular Satellite office on the basis of airline distance. Airline distance is the shortest distance between a satellite and the closest node to that satellite (referred to in tariffs as interoffice transport or special access as “airline mileage”). This distance is used subsequently to determine pricing of incumbent supplied transport (*i.e.*, interoffice transport) in the calculation of backhaul costs in the DS0 Impairment Analysis tool.

2. Transport Cost Analysis Tool

Q. HOW DO THE FACILITY RING PROCESSOR TOOL AND TRANSPORT COST ANALYSIS TOOL RELATE TO ONE ANOTHER?

A. The mileage calculated by the Facility Ring Processor Tool is used as an input to the Transport Cost Analysis Tool to develop the costs of actually constructing or leasing that network.

Q. DOES THE TRANSPORT COST ANALYSIS TOOL DETERMINE THE COSTS TO CONNECT AND OPERATE THE NODES AND SATELLITES?

A. Yes. Satellite-to-node connections are leased facilities from the ILEC and their cost is a function of the established airline distance between those locations which is established by the FRP tool. The SONET ring fiber mileage (referred to as "conductor mileage") that is established in the FRP is used as an input to the Transport Cost Analysis Tool to calculate the facility costs in much the same manner as occurs in the TELRIC studies for ILEC UNE transport. For node (or on-net) offices, the backhaul cost is the self-provided network cost only which is allocated to a typical DS1 or DS3 that would be served on this self-provided network. It is important to understand that this allocation is another of the conservative assumptions made within the model in that the implicit assumption is that the SONET rings built between the nodes will be used for more than just the backhaul of customer loops. As such, by calculating the average cost of a DS1 or DS3 on the self-provided network, this cost will be attributed to the backhaul of customer loops terminating at node collocations assuming that other DS1s or DS3s on the same self-provided network are bearing their share of the network's cost from other enterprise applications. The number and size (DS1 or DS3) of transport required is based on the actual lines being served out of a node collocation.

After the tool has completed the cost development for the "node" locations in the study area, it is necessary to develop the transport cost for "satellite" locations. As noted previously, satellite locations are central offices where the CLEC will need to obtain the customer's unbundled loop, but will not have a fiber network extended to the particular office. As such, the tool must determine the unit cost for DS1 and DS3 leased transport for the connections from the satellite locations, which are not on the CLEC SONET fiber rings, to the nearest node locations, which is on the CLEC SONET fiber ring. The airline mileage between the node and satellite central offices that is developed in the FRP tool is then used in the Transport Cost Analysis Tool to calculate the DS1 or DS3 transport cost using the relevant BellSouth rates for a DS1 connection and a DS3 connection. As with node locations, the actual selection of whether a DS1 connection or a DS3 connection is used is based on the number of unbundled loops that the CLEC expects to serve within a central office. There are specific calculations that take account of the functionality of the DLC that are also used to identify the specific number and size (DS1 or DS3) of connections that are required between the DLC at the satellite central office and the nearest node, but the underlying driver of this determination is the number of lines that the CLEC anticipates serving at the satellite central office. Based on the number and size (DS1 or DS3) of the connections and the mileage between the satellite central office and nearest node central office, the total transport cost calculation for this pair of offices can be made. This same set of calculations is repeated for each satellite central office contained within the study area. For satellite locations, the backhaul cost is the combination of the leased facility cost to the node location and the self-provided transport from the node location to the CLEC switch.[30]

[30] On-net self-provided network transport costs must be included so that the loops may ultimately be

When special access tariffs are used to determine the pricing of such facilities, it may also require knowledge of the specific offices connected, in order to determine whether price cap or pricing flexibility tariffs apply. All these preceding factors are taken into account by the tools' calculations.

Q. EARLIER YOU BRIEFLY DISCUSSED THAT THE ALLOCATION OF THE COSTS FOR THE SONET NETWORKS IS PERFORMED BASED ON THE EXISTENCE OF OTHER SERVICES SHARING THE SAME NETWORK. COULD YOU DESCRIBE THIS ALLOCATION IN MORE DETAIL?

A. Yes. As I noted earlier, such a CLEC self-provided SONET transport infrastructure would rarely if ever be built to handle exclusively transport traffic generated only by mass market customers. In recognition of this fact, the Transport Cost Analysis Tool assumes that there would also be significant enterprise customer traffic moving between Network Node locations on the transport ring.

The Transport Cost Analysis Tool gives effect to this assumption by employing a "utilization" or "fill" factor that effectively allocates the total costs of the self-provided SONET network structure and optical equipment required by the OC-48 ring built to connect all Network Nodes in a study area as follows:

$$\text{Average Cost of Back-Haul per DS3 per Node} = \frac{\text{Total Cost of OC-48 Network}}{\text{48 DS3s per OC-48 * 80\%}}$$

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connected to a CLEC local switch, which is one (or more) of the on-net locations for the self-provided ring network.

Q. HOW WOULD YOUR UTILIZATION BE AFFECTED IF MORE NODES WERE ADDED TO THE NETWORK?

A. Quite simply, the addition of more nodes to the SONET network would cause the utilization level to drop. The precise mechanics of this relationship have not been modeled because it is not possible to know all of the enterprise demand that would exist between the nodes on the SONET network. However, utilization is not a static assumption. If additional nodes were added to the network, these additional nodes on the same SONET rings cause the following to occur: (1) Increase the average cost of back-haul transport per DS3 per mile because more miles of transport have been added to the SONET network to incorporate the additional node; and (2) Decrease the anticipated average utilization of the ring because you would generally be adding nodes with a lower anticipated demand.

D. Costs of Transferring Customers from the ILEC to CLEC Network (Hot Cuts)

Q. THE THIRD MAJOR COMPONENT OF ABSOLUTE CLEC COST DISADVANTAGE YOU IDENTIFIED EARLIER INVOLVES THE COSTS OF TRANSFERRING CUSTOMERS. CAN YOU DESCRIBE HOW THESE COSTS ARE CALCULATED?

A. Yes. The third major component of the CLEC's economic impairment is the costs associated with transitioning customer loops from the ILEC to a CLEC using UNE-L. This customer transfer is referred to in the industry as a "hot cut." The largest component of this cost consists of the charge(s) that BellSouth assesses to transfer each customer's loop from its network facilities to the CLEC's collocation (*i.e.*, the "hot cut" charge). The hot cut cost assessed by BellSouth is a nonrecurring per-line charge imposed on CLECs so they can connect ILEC-supplied loops to CLEC-owned switches.[31]

For Kentucky, BellSouth, for example, today exacts a nonrecurring charge of $86.55, assuming that a coordinated hot cut is employed for a single line order. As the FCC has recognized, charges such as these can "contribute to a significant barrier to entry."[32]

Q. DO HOT CUT COSTS CONSIST ONLY OF THE ILEC IMPOSED COSTS?

A. No. Additional hot cut costs may also include the cost of work that must be performed *internally* by the CLEC in order to accomplish this transfer.[33] Therefore, the DS0 Impairment Analysis tool can include the internal CLEC's costs to manage hot cuts in addition to the charges assessed by the incumbent. The average hot cut costs per month are a function of customer churn, the calculated "per-line" hot cut charges and the internal costs of the CLEC. If customers that choose a CLEC remained that CLEC's customer forever, the CLEC would incur only a single hot cut cost for each customer that it adds to its network. However, customer behavior in a competitive mass-market would be

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31 The hot cut charge may include charges that vary per order and per line on an order (or on a first and additional line basis), with the number of the lines converted for a unique retail customer address typically being the determining factor. As input to the impairment analysis, weighted average costs per line are developed based upon the profile of single and multi-line mass-market customer locations. Separate calculations are made for consumer and business locations.

32 *See* TRO, ¶470.

33 *See, TRO, ¶470.* The FCC recognizes not only economic impairment arising from the hot cut process, but also operational issues. *See, TRO,* ¶465, which discusses operational impairments associated with hot cuts.

characterized by significant churn.[34] For this reason, the calculation of the hot cut charges per customer line must be higher to reflect the effects of this churn on total hot cut activity.[35] This is accounted for in the tool by the combination of the CLEC's net growth in lines and its disconnect rate. Thus if the CLEC grows its overall number of lines by five percent in a year, and it also anticipates a five percent disconnect rate, its hot cut expenses in that year would be the hot cuts associated with the five percent net line growth *plus* the hot cuts associated with replacing the five percent of lines that would otherwise be lost, *i.e.*, a total of 10 percent of the lines in that year would experience a hot cut.

V. TOTAL CLEC DS0 COST DISADVANTAGE

Q. PLEASE SUMMARIZE THE DS0 COST DISADVANTAGE YOU HAVE DEVELOPED FROM THE DS0 IMPAIRMENT ANALYSIS TOOLS.

A. As indicated in the previous discussion, the DS0 Impairment Analysis Tools rely upon specified inputs for each of the calculations leading to the total cost disadvantage faced by a CLEC entering the mass market. Overall, these inputs are conservative because (1) they focus only on major components of impairment and ignore other sources of impairment, (2) assume enterprise customers will defray a significant proportion of the costs of back-haul transport and collocation, and (3) ignore many of the costs that a hypothetical efficient CLEC would spend to effectuate customer acquisition.

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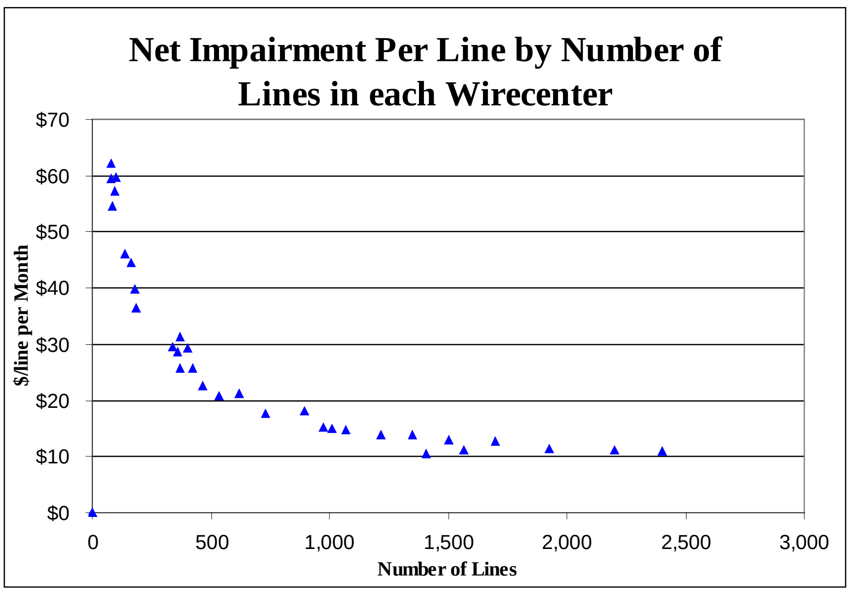
[34] For example, the default churn rate employed is 4.6 percent per month. *See* Banc of America Securities, April 30, 2003, page 10.

[35] *See, e.g.*, TRO ¶ 471: "The evidence in the record demonstrates that customer churn exacerbates the operational and economic barriers to serving mass market customers."

The results of my study, by geographic market, are summarized in the tables set forth below. Market-specific details, including inputs, are shown on Exhibit SET-3.

The lowest average impairment for any Kentucky LATA is $18.31 (for LATA 462). The following graph depicts the total impairment per line for each wire center within that LATA. It demonstrates that the impairment increases rapidly as the number of lines served in an office declines.



Based on the average impairment for LATA 462 (the largest LATA in Kentucky) my analysis shows that CLECs would experience an average cost disadvantage of $18.31 if UNE-L had to be used to serve mass-market customers.

The conclusion is inescapable that cost impairment in the form of an absolute cost disadvantage of this magnitude to the CLEC – and corresponding cost umbrella for the ILEC – constitutes a clear barrier to entry.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.