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REBUTTAL TESTIMONY OF

PAUL W. MEIER

ON BEHALF OF

CINCINNATI BELL TELEPHONE COMPANY

(UNREDACTED VERSION)

April 7, 1999

00-0507

FILED UNDER SEAL

BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Cincinnati Bell Telephone Company for Approval of a Retail Pricing Plan Which May Result In Future Rate Increases and for a New Alternative Regulation Plan	))))))	Case No. 96-899-TP-ALT

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Q. Please state your name, by whom you are employed, and your position.

A. My name is Paul Meier. I am employed by Cincinnati Bell Telephone (CBT) as an Integrated Planning Specialist in the Network Engineering and Construction (NE&C) Department.

Q. Are you the same Paul Meier who originally submitted initial testimony in this docket?

A. Yes, I am.

Q. What is the purpose of your testimony?

A. The primary purpose of this Rebuttal Testimony is to address issues that have been raised by other parties in this proceeding regarding the use of digital loop carrier equipment when providing unbundled loops. In addition, I will address several other miscellaneous issues that arose during the hearing with respect to CBT's provisioning of loops.

Q. *Various witnesses in this proceeding have recommended that CBT develop its costs for an unbundled DS0 loop assuming that Integrated Digital Loop Carrier (IDLC) equipment is used to provision an unbundled loop. Did CBT assume IDLC equipment in its cost studies?*

A. No. CBT used Universal Digital Loop Carrier (UDLC) in its cost studies. CBT's vendor for this equipment is Fujitsu and their name for their DLC equipment is FACTR. This stands for Fujitsu Access Transport system.

Q. Please explain generally how Universal Digital Loop Carrier equipment works.

A. Universal Digital Loop Carrier (UDLC) Equipment comes in modular systems that provide for the transport of 96 channels of Plain Old Telephone Service (POTS) over

four DS1 lines using fiber optic cable facilities. Up to twenty UDLC systems can be provisioned at a given site, for a maximum possibility of 1,920 loops per site. A UDLC system consists of matching sets of electronics located in the central office and in the field near the customers' locations that are connected by fiber. Starting in the central office, 96 channels of analog service are connected to a Central Office Terminal (COT), which is comprised of a Common Shelf (CMS) and a Narrowband Shelf (NBS) in the Fujitsu FACTR Product. This COT converts 24 analog channels to a digital signal in the form of a DS1 line (1.544mb). In CBT's study this DS1 line is transported to a Remote Terminal (RT) site over fiber. At the RT, the digital DS1 line is converted back to 24 analog POTS channels that go to customers over copper sub-feeder and distribution cable pairs. CBT will provision unbundled loops using UDLC for loops that are beyond the copper threshold.

Q. Please explain generally how integrated digital loop carrier equipment works and why CBT installs this equipment for its switched services instead of UDLC equipment.

A. Integrated Digital Loop Carrier (IDLC) is available based on two standards. These are TR-008 and GR-303. IDLC based on the TR-008 standard is the same as UDLC, except that in the central office no analog to digital conversion is required. An IDLC system uses an FLM-150 in the central office to convert the optical signal received over the outside plant fiber into an electrical DS1 in the central office. A DS1 line serving 24 POTS customers is transported from the FLM-150 directly to the digital switch onto a Digital Carrier Line Unit (DCLU) designed to handle CBT's switched DLC customers. The placement of IDLC reduces the costs of a line by eliminating

the use of a central office terminal and the analog line units of the switch. However, to use IDLC, the switch must have a TR-008 interface.

Q. What is GR-303?

A. GR-303 is the newest IDLC technology available and is similar to TR-008, except that the remote terminal must be Next Generation Digital Loop Carrier (NGDLC), like the Fujitsu FACTR product that CBT is now deploying in some areas. This NGDLC system allows concentration of POTS loops over a fewer number of DS1 lines between the NGDLC remote terminal and the GR-303 switch interface. CBT is deploying GR-303 equipment only for switched services beyond the copper threshold.

Q. What capabilities does GR-303 provide?

A. GR-303 allows some concentration for switched POTS services to be moved out of the switch and into the remote terminal. An NGDLC site can still serve up to 1,920 POTS lines. However, the maximum number of DS1's that can be activated across a GR-303 site is 28. For GR-303 to operate correctly, the switch module must constantly communicate with the remote terminal. Because there are fewer call paths available than there are loops connected to the system, each time a call is made the switch and remote terminal must communicate in order to recognize where the call is originating from or terminating to and to assign the call to a particular channel on one of the DS1s. This path assignment can be different for the same customer on different calls.

Q. What options exist for CBT for providing unbundled DS0 loops?

A. The simplest way to provide DS0 loops is to provision them on copper. Where loops are provisioned on UDLC, CBT can handle unbundled loops very much like it

handles unbundled loops on copper, because UDLC presents a DS0 interface in the central office. CBT uses UDLC for its own non-switched lines at a RT site. Where loops are provisioned on IDLC, unbundling those loops becomes much more problematic. In fact, my understanding is that CBT's existing interconnection agreements state that, when a NEC requests a loop serviced on IDLC, as the first option CBT will move the loop to a spare physical loop, where available. If no physical loop is available, the agreements allow NECs to make bona fide requests for the loop to be demultiplexed.

Q. It has been suggested that CBT could provide individual unbundled loops by hairpinning an IDLC system. Please explain how this works.

A. Hairpinning can be used to separate individual DS0 circuits using the central office switch. However, this would require additional switching DS1 lines and switch resources that are dedicated for this purpose and would create additional costs that are not included in CBT's current cost studies. In addition, if the particular switch module serving the IDLC system was full, hairpinning could not be done without significant rearrangement of lines on the switch. Although hairpinning can be used for both TR-008 and GR-303 systems, not all digital switches have this capability or capacity.

Q. Is it possible to provide an unbundled <u>DS0</u> loop directly from a TR-008 or GR-303 integrated digital loop carrier system?

A. No. It is not possible to provide an unbundled DS0 loop directly from a TR-008 or GR-303 digital loop carrier system. Such a system only presents a DS1 interface in the central office.

Q. There has been testimony that CBT could demultiplex DS0 loops from an IDLC system. Could you comment on this approach to unbundling loops?

I must answer this question differently for TR-008 versus GR-303 IDLC systems. I will first discuss TR-008 IDLC systems. As I described earlier, IDLC systems terminate on an FLM-150 in the central office, which presents a DS1 interface to the switch. CBT could conceivably access individual unbundled DS0 loops through demultiplexing of this DS1. To do this, the particular DS1 line containing the loop in question would have to be connected to a 1/0 DACS to allow for grooming the requested loop onto a separate DS1, while returning the remaining channels on the original DS1 to the switch. The DS1 containing the loop to be unbundled would then go to a D4 channel bank to be converted to a DS0 interface. I am concerned, however, that doing this would create operational problems for CBT because the TR-008 switch module expects to see all 24 channels of the DS1s that terminate on the switch. Each DS0 loop that is pulled out of the DS1 would appear to be missing to the switch.

Because of the concentration capabilities of the GR-303 IDLC systems, it is generally not possible to demultiplex a DS1 from the central office FLM-150 into individual channels that are assigned to specific loops at the remote terminal.

Q. How do the costs compare for these options?

A. The extra costs associated with hairpinning IDLC loops out of the switch would be more expensive than CBT's proposal to use UDLC for unbundled loops due to the switch resources and additional DS1 switch lines. I would expect the cost associated

with demultiplexing individual loops from a TR-008 IDLC system to equal or exceed the cost of using UDLC equipment because additional 1/0 DACS and D4 equipment would be necessary to accomplish the same result that UDLC does directly. This is why CBT negotiated its interconnection agreements to call for bona fide requests in cases where IDLC loops must be demultiplexed.

Q. Is it possible to provide a DS1 interface that would provide multiple DS0 unbundled loops?

A. It may be technically possible to provide a DS1 interface. However, this is different than providing unbundled DS0 loops. As I stated, the GR-303 system will only operate when it interfaces with GR-303 equipment, which has certain minimum operating requirements that prevent the delivery of DS0 loops.

Q. What requirements are there if multiple loops on a GR-303 system are to be provided to other carriers through a DS1 interface?

A. As I mentioned earlier, IDLC equipment comes in systems containing 96 POTS channels. Without GR-303, these 96 lines would require 4 DS1 carriers. However, the GR-303 protocol allows the switching interface to communicate with the remote terminal and concentrate these 96 lines on fewer than 4 DS1s. The degree of concentration is at the discretion of the carrier operating the system. CBT believes that there would be numerous technical and operational issues (which are currently untested) for more than one carrier to share the same 96 line system. Separate GR-303 systems likely would have to be provisioned for each NEC requesting unbundled loops using GR-303. Each NGDLC site can be subdivided to serve up to four separate IDCUs on a GR-303 switch or up to four separate switches. Subdivision of

a FACTR system is accomplished by creating separate Remote Digital Terminals (RDT). Because CBT generally will need to connect a GR-303 site to more than one switch module in its central office, CBT will require at least two of the four possible RDTs for its switched lines. This means a maximum of two additional carriers could share the use of a GR-303 site. Furthermore, a minimum of two DS1s is required for each NEC to manage each RDT in each GR-303 system. Additionally, the site serving the unbundled loops must have NGDLC equipment installed. Also, in order for the switch serving the particular loops to test the copper loops beyond the DLC site, it is necessary to install a copper bypass pair from each switch to the NGDLC site. Presently less than one percent of the total of CBT's lines are served by GR-303 service.

Q. Please explain why a NEC must be assigned a minimum of two DS1s from a GR-303 system if a DS1 interface is provided to the NEC?

A. Each RDT within an NGDLC system must have a minimum of two DS1 lines installed to provide communication between the GR-303 interface of a digital switch and the RT. These two DS1 lines contain an Embedded Operations Channel (EOC) and a Time Slot Management Channel (TMC). The primary EOC and TMC is always located on the first DS1 of the system and the secondary EOC and TMC must be provisioned on a separate DS1. The requirement of primary and secondary EOCs and TMCs reduces the available voice channels from 24 to 22 on these two DS1s. The FLEXR System that is used to provision the FACTR System to communicate with the GR-303 switch module does not allow the primary and secondary EOC & TMC to operate on the same DS1 line. This is a protection system built into GR-303

so that if one DS1 loses its connection to the switch the other DS1 takes over. Without the EOC or TMC the NGDLC cannot communicate with the GR-303 switch unit, with the result that no calls could be made or received over that system.

Q. Please explain why there is a restriction on the number of carriers that can utilize the same NGDLC site.

A. A FACTR NGDLC site working in GR-303 is only able to have four RDTs. This means that the remote terminal can communicate with a maximum of four different switch entities. I believe that this limitation is due to the Fujitsu FACTR equipment.

Q. You indicated in cross-examination that you were not familiar with the word "multihosting." Please explain why you answered in this manner.

A. I am familiar with the concept of connecting an NGDLC site to multiple switches, as I have just explained, but I had not heard the term "multihosting" used to describe this setup. I have actually been working with switch engineers and outside plant engineers to try to develop a means of using multiple switches in one of our switching centers to serve a NGDLC site. This, however, has been determined not to be a viable option due to the setup of our OSPlant assignment system.

Q. Assuming that a "multihosting" arrangement could be established, could CBT migrate unbundled DS0 loops to NEC specific DS1s in existing GR-303 systems by using the Time Slot Assignment (TSA) capability of the Fujitsu NGDLC product?

A. There several problems that must be addressed prior to CBT being able to groom unbundled DS0s to NEC specific DS1s from an IDCU or GR-303 FACTR system. These include the following:

1) Provisioning for DS0s in FACTR is completed by the use of the FLEXR Software System only. This means that:
   a) Provisioning must be done from a laptop computer at a node on the SONET ring.
   b) Software cross-connects only reside in the software of the node.
   c) CBT is unable to remote access the node for current DS0 cross-connect information. A craft person must go to Central Office or Remote Terminal to get the cross-connect information.
   d) A new system is currently under development by Fujitsu, called NETSMART, that is intended to allow remote provisioning. This system is not expected to be available to CBT until 2nd or 3rd Quarter 2000 and is estimated to cost around $400,000. No decision has been made by CBT to purchase this system. Some aspects of NETSMART are still in development.
   e) Assignment of the cable pairs will still be done by the LAC system in OSPlant.
2) Tracking DS0 Cross-Connects
   a) CBT has no mainframe software system to track DS0 cross-connects.
   b) CBT would have to put a system in place to inventory all GR-303 systems if unbundled loops are to be digitally cross-connected on this type of system.
   c) The cost of a system to track the DS0 cross-connects on FACTR systems has been estimated at $500,000, with a 6 month development and installation period.
   d) CBT presently does not require such an inventory system because DS0s associated with DS1s are provisioned straight across. This process has

worked well at CBT and has eliminated the additional costs of an inventory system.

e) The same result (migrating individual loops to a particular NGDLC system) could be achieved by moving jumpers at the SAI to match the appropriate distribution pair to a sub-feeder pair that connected to the NGDLC system provisioned for use by the NEC. This would probably be a far lower cost than the cost of the new inventory system that otherwise would be necessary.

3) If a NEC requires an unbundled loop on an IDLC system with DS0 cross-connects, this cross-connect is only able to occur at the RT. At the Central office there will only be access to a DS1 signal.

Q. Can you comment on the cost of provisioning separate RDTs for use by NECs?

A. CBT has not studied the sharing of GR-303 NGDLC sites in detail at this time. I believe there are numerous technical difficulties that would have to be overcome in order to make such a system work. I do not believe it would be appropriate to require CBT to develop its loop costs based upon an arrangement that has never been put into practice in CBT's network and whose technical limitations are not fully understood. In addition, it seems to me that the cost of provisioning a loop in this fashion would be very dependent upon the number of loops that would be unbundled at a given DLC site. I have not been given any information from any NEC as to how many loops they would plan to use at any DLC sites.

Q. Several witnesses have mentioned that the Fujitsu FACTR system has the ability to provide ADSL. What is your understanding of the capabilities of the Fujitsu FACTR system for providing ADSL?

A. Fujitsu claims to be able to provide ADSL services from the FACTR system. However, a special "Speedport" shelf along with a splitter shelf needs to be installed in the remote terminal, which would then reduce the amount of DS0s that can be served by the system. CBT is looking at other solutions besides the Speedport shelf.

Q. Is CBT planning on using the Fujitsu FACTR system to provide ADSL?

A. No. CBT does not plan to use the FACTR system for ADSL service. Additionally, my understanding is that the type of ADSL service that the Speedport shelf supports is not compatible with CBT's ADSL service offering.

Q. Are all new digital loop carrier systems that CBT is installing the Fujitsu FACTR system?

A. Not all CBT's new systems being activated are FACTR systems. When expansion is necessary at existing sites where CBT has Lucent Series 5 equipment, this equipment is being used when possible. In general, all new sites are provisioned with Fujitsu FACTR equipment. Very few existing sites containing Lucent SLC-96 or Series 5 equipment are being removed and replaced with the FACTR product.

Q. How many of CBT's lines are served by the Fujitsu FACTR system?

A. Currently less than 1% of CBT's lines are served by a FACTR system. This number will only increase slightly on a going forward basis.

Q. Some testimony has suggested that the Fujitsu FACTR System, being a computerized system, should allow the removal of some of the manual Loop Assignment Center (LAC), duties. Do you agree?

A. Even though the FACTR system is a computerized system, it is a system to provide local loop DLC and is not an assignment system. There is no electronic interface in

the NGDLC product that can interact with any assignment system, including CBT's current assignment systems such as COSMOS and OSPlant. To my knowledge, no such interface is planned in the future. The LAC will still be necessary to locate loop facilities available to serve a particular location.

Q. Can the FACTR system's cross-connect capability be used to replace a Serving Area Interface (SAI)?

A. No. The cross-connect capability of the FACTR system resides in the Common Shelf (CMS) and not in the NBS. CBT only activates one DLC system at a time which is equivalent to one-half of a NBS shelf providing 96 derived copper pairs to the F1 side of a SAI. To use the FACTR system instead of an SAI to provide cross-connects would require that every local distribution pair be connected to a working DLC system. For example, presently a 2700 pair SAI could have 96 main F1 pairs (one system) activated. These 96 lines can be cross-connected to any of the 1800 pairs on the distribution side of the SAI by placing a jumper. This keeps capital expenditures at a minimum by only activating systems when they are required. If the FACTR system was connected directly to the distribution cable, 19 FACTR systems would have to be activated in order to be able to reach every distribution cable pair. This would dramatically increase the capital expenditures for NGDLC plug-ins. This would also reduce CBT's feeder electronics fill of 70% to a fill similar to the distribution fill of 35%.

Q. It has been suggested by Mr. Starkey that CBT's labor rate increases should not apply to the installation of Fujitsu FACTR equipment because Fujitsu provides installation labor. Is this contention true?

A. No. All Fujitsu equipment is completely installed by CBT's engineering and installation forces. This includes equipment installed at a central office, at a remote terminal site, or on a customer premise. The reference Mr. Starkey made to the Fujitsu contract concerns the availability of technical support from Fujitsu regarding installation issues, not the physical labor, which is done by CBT personnel.

Q. During your earlier cross-examination, you were asked whether you had experienced distribution cables with 100% fill. Could you explain the circumstances you were describing?

A. On rare occasions, I have seen distribution cables that had reached 100% cable fill. However, all of these cables have been in rural areas where there was limited growth and it would require a large amount of cable to be placed to provide relief. Usually these cables did require reinforcement or replacement. Distribution cables placed under CBT's current design guidelines seldom require reinforcement unless the nature of the distribution area changes from the original concept.

Q. In Mr. Starkey's testimony, he referred to your deposition testimony where you were asked: "Ultimately, of the 12 strands in a 12 – strand fiber cable, how many would you like to use?" Could you please explain what you meant by your answer?

A. I believe a clarification needs to be made because of the word "ultimately." Ultimately, in a perfect world, CBT would like to use all 12 fiber strands. However CBT does not exist in a perfect world. CBT would start by using 4 fibers and fiber usage would grow as additional optical systems are needed. But, as usage may increase on this 12 fiber cable, newer fiber cables would likely be placed elsewhere,

reducing the overall cable fill and offsetting any gain on this twelve fiber cable.

Q. In CBT's unbundled loop cost studies, buried copper cable is rarely used for loop feeder. Can you explain why this is so?

A. CBT has installed very little buried feeder cable and plans to place very little buried feeder cable in the future. CBT's feeder cable routes are designed to be reinforced. To place a buried cable with the knowledge that an additional cable will be required along the same route in the future would not be good engineering practice because of the difficulty of reinforcing buried cables. It is very expensive to excavate an area and it would be foolish to have to do it repeatedly. In addition, re-excavating in an area where existing cables have been buried creates a high risk of damage to the existing cables. Therefore, when feeder cable is placed, it generally will be placed in a conduit or on poles where easier reinforcement can take place in the future.

Q. During the hearing, your responses to certain data requests concerning future plans for ATM switches and fiber loops were presented. Could you clarify the intent of your responses?

A. Yes. I answered these questions under the assumption that they were requesting CBT's current deployment plans. CBT engineering generally looks at a three to five year period for this purpose. I did not intend to address CBT's potential long-term plans beyond that time frame.

Q. During your earlier cross-examination, you were asked questions about CBT's growth in access lines and the growth in second lines. Is there something you would like to clarify about your answers?

A. Yes. My direct testimony indicated that CBT's overall number of access lines grew

from 820,518 to 1,004,829 and that the percentage of residence second access lines increased from 4.9% to 10.1%. The questioner then combined these two facts and came to the conclusion that this meant there were approximately 59,000 new second lines, which I accepted at the time. However, I have come to realize that the number of access lines includes all CBT customers. Therefore, the percentage of second line growth should only be applied to CBT's residential customer base, which would result in a smaller number.

CONCLUSION

Q. Would you please summarize your testimony?

A. Yes. I have reviewed various issues related to the use of integrated digital loop carrier equipment in CBT's unbundled loop cost studies. I have shown that the simplest and most economical means to provide DS0 unbundled loops is the universal digital loop carrier system that CBT used in its loop cost studies. Provisioning unbundled loops over integrated digital loop carrier systems is technically complex and would require that special systems be installed which CBT does not need currently for its own purposes and would cost more than UDLC. I have also provided clarification of several issues that came up during the hearing with respect to how CBT provisions its network.

Q. Does that conclude your testimony?

A. Yes, it does.