Ameritech 00-0393
Rehearing 10.0
12/4/01

* * * PUBLIC VERSION * *

DIRECT TESTIMONY ON REHEARING OF JAMES E. KEOWN
ON BEHALF OF AMERITECH ILLINOIS
DOCKET NO. 00-0393

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is James E. Keown. My address business is 1010 N. St. Mary's, San Antonio, Texas 78215.

Q. BY WHOM ARE YOU EMPLOYED AND WHAT IS YOUR POSITION?

A. I am employed by SBC Management Services, Inc., a subsidiary of SBC Communications Inc. ("SBC"). My position is Regional Manager - Project Management - Broadband.

Q. WHAT ARE YOUR RESPONSIBILITIES?

A. My current responsibilities include coordinating with SBC's Central Office engineering organization on issues related to Project Pronto, providing representation on technical issues related to Project Pronto and supporting other Pronto team members. I am also responsible for managing the Project Pronto-related Operations Support System (OSS) budgets.

Q. WHAT IS YOUR EDUCATIONAL BACKGROUND?

A. I have a Bachelor of Science - Electrical Engineering degree from the University of Arkansas in Fayetteville, Arkansas. I have completed company training and

external training related to switch operations, switch engineering and digital transmission, and telecommunications policy. In addition, I am a Registered Professional Engineer in the State of Arkansas.

Q. PLEASE DESCRIBE YOUR WORK EXPERIENCE.

A. I have twenty-four years of service in SBC's affiliated companies. From 1977 through 1997, I held numerous positions with Southwestern Bell Telephone Company ("SWBT"). My responsibilities included Transmission Engineering, Special Service Design Engineering, Transmission Equipment Engineering, Transmission Facility Design, Plug In Coordinator, Network Operations Center Manager and Director of Customer Interface Centers. In 1997, I moved to Operations Staff where I was responsible for SWBT Network Reliability issues and Policies, New Product Introduction, and Outside Plant Staff Support. I assumed my present duties on the Project Pronto Staff in August 1999.

II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The basic purpose of my testimony is to address the Project Pronto issues subject to rehearing in this proceeding, from an engineering perspective.

Q. WHAT ISSUES WILL YOU ADDRESS?

A. My testimony will be centered around the technical issues associated with the Commission's requirement that Ameritech Illinois "unbundle" parts of the Project Pronto DSL network equipment that Ameritech Illinois had planned to deploy and

to allow CLECs to "collocate" their own line cards in the Next Generation Digital Loop Carrier ("NGDLC") equipment that would have been deployed as part of Project Pronto. I will focus on technical problems raised by these requirements, the adverse impact of the requirements on the efficiency of the planned Pronto network, and some of the additional, unanticipated costs that these requirements would impose on Ameritech Illinois. In particular, I discuss the adverse impact on NGDLC capacity and all carriers' ability to serve the mass market that would arise from the Order's "unbundling" and line card "collocation" requirements. I also address questions 3(A)(ii)(a), 9(B), 10, and 11 from the list created by Commissioner Squires.

III. DESCRIPTION OF PROJECT PRONTO

Q. WHAT IS PROJECT PRONTO?

A. Project Pronto is SBC's planned deployment of an overlay, broadband-capable architecture in its 13-state ILEC territory. The term "broadband" or "advanced services" generally refers to high-speed data services, such as high-speed Internet access. The equipment deployed as part of Project Pronto would make such broadband service available to customers in the mass market (i.e., residential and small business customers) by allowing those customers to obtain Digital Subscriber Line ("DSL") service sold to CLECs at wholesale and carried over the Pronto facilities. This new network architecture would have enabled CLECs to offer DSL services to significantly more customers than can be reached today over full copper loops.

SBC launched Project Pronto as a means to extend broadband capabilities to the mass market, a segment of the public historically unable to obtain broadband services. Today, this mass market generally wants broadband capabilities for high-speed Internet access and they want it provisioned without long delays. In addition, these end users often do not want separate lines into their premises for Internet access. As Mr. Ireland discusses in his testimony, broadband service can be provided using various technologies, including cable modem, DSL, wireless, and satellite. Project Pronto would provide DSL service, specifically Asymmetric DSL, or ADSL. ADSL provides large bandwidth downstream toward the end user and smaller bandwidth upstream toward the Internet, which generally fits the desires and needs of mass market customers.

Q. WHAT DO YOU MEAN WHEN YOU SAY PROJECT PRONTO IS AN "OVERLAY" NETWORK?

A. I mean that the Project Pronto facilities would be new and would not replace the existing network equipment that is currently used by and available to Ameritech Illinois and CLECs. The new Pronto DSL facilities would simply provide an alternative capability to what already exists today.

Q. WHAT WERE THE PLANS FOR PRONTO DSL DEPLOYMENT IN ILLINOIS?

A. In Illinois, Project Pronto would have covered 101 wire centers. Each wire center/central office would have been equipped with a new Optical Concentration Device ("OCD") (discussed below). Approximately 2,100 Next Generation Digital Loop Carrier systems ("NGDLCs"), or about 21 per wire center, would

have been deployed in either newly constructed or upgraded Remote Terminal ("RT") sites. One ultimate goal of Project Pronto is to shorten the length of the copper portion of customer's loops, as DSL service performance is generally best on shorter copper loops. Deployment of Pronto DSL equipment in Illinois would mean that more than one million customer locations would have access to DSL service that did not have such access before.

The average cost to deploy an NGDLC is approximately [redacted]. The associated central office work is approximately [redacted]. Based on the planned deployment in Illinois, the capital investment in Illinois as a result of Pronto would have been approximately $519 million.

Q. PLEASE SUMMARIZE AND GIVE AN OVERALL VIEW OF THE PLANNED PRONTO ARCHITECTURE.

A. Attachment JEK-3 shows an overall layout of the Project Pronto DSL architecture. It helps to visualize the path of a call, starting at the customer's premise (the right side of JEK-3). From the customer's premise, a call would travel to a Serving Area Interface ("SAI"). At the SAI the subloops are connected to a copper feeder facility, and the call would then travel on copper pairs hardwired to the "backplane" of the NGDLC in the Remote Terminal. A backplane is similar to a printed circuit board with electrical connectors towards the line card side to mate with the line card connectors. The backplane has connectors for mating with the splices of the copper cables to the SAIs.

From the backplane of the NGDLC, the call travels to a port on a line card, which is installed in a slot in a Channel Bank Assembly ("CBA"). (There are typically nine Channel Banks in an NGDLC, three of which can be used to provide DSL service. A Channel Bank is a chassis with 56 slots, each of which can hold one line card. Attachment JEK-2 is a picture of a cabinet equipped with Channel Banks.) The line card, in conjunction with other software and hardware in the NGDLC, then splits voice and data traffic coming in on the same line. The voice traffic then travels over an OC3 fiber facility to the Central Office, where it goes to a Central Office Terminal ("COT") and then is connected to the equipment of the voice service provider. The data traffic from that same customer, by contrast, travels from the RT to the Central Office over a separate OC3c fiber facility and terminates on the OCD in the Central Office. The OCD is an Asynchronous Transfer Mode (ATM) packet switch that then sends the data packets to the data equipment of the customer's data service provider. CLECs would lease outbound ports on the OCD (either DS3 or OC3 rates) to their collocation space.

Q. WHAT VENDOR HAD AMERITECH ILLINOIS INTENDED TO USE FOR NGDLCs IF IT DEPLOYED PROJECT PRONTO DSL FACILITIES?

A. Primarily Alcatel and the Alcatel Litespan system. Alcatel makes two versions of the Litespan system, the Litespan 2000 and the Litespan 2012. At present, these systems support line cards that are capable of providing ADSL service only.

Q. PLEASE DESCRIBE THE FUNCTION OF THE ADLU LINE CARD IN MORE DETAIL.

A. The ADSL Digital Line Unit (ADLU) line card used in Project Pronto NGDLCs has no functionality of its own; it has functionality only when interacting with the other software and hardware in the NGDLC. When it does so, the line card is able to split the voice and data signals on a copper loop and generate the data signal. The software and other common hardware in the NGDLC then packetizes the data signal for transport to the OCD and then to the CLEC's packet-switched network. The line card sends the voice signal via the backplane to common equipment for transport to the central office over the OC3 fiber facility.

As noted above, each Channel Bank has 56 slots for line cards. Each port on a line card can be used to provide voice and data service to end users. Line cards supporting 4 ports will soon be available, meaning each Channel Bank could support 224 customers (56 x 4). A typical NGDLC thus would have total capacity to provide DSL service to 672 customers (224 x 3 DSL-capable Channel Banks).

Q. PLEASE DESCRIBE AN OC3c IN MORE DETAIL, INCLUDING PERMANENT VIRTUAL PATHS AND PERMANENT VIRTUAL CIRCUITS.

A. An OC3c is a physical fiber facility that transports all of the data traffic from the NGDLC RT to the central office. One OC3c can serve an entire NGDLC RT.

Within the OC3c, data packets (which have been packetized by the NGDLC) are assigned to travel over Permanent Virtual Paths (PVP).

A Permanent Virtual Circuit (PVC), a software-defined logical connection, is assigned to a PVP. The PVC transports the packet of data over the packetized network to the OCD in the central office.

A. WHAT IS THE RELATIONSHIP BETWEEN PVPs, PVCs, AND THE NGDLC?

A. Attachment JEK-1 depicts the relationship between an OC3c, a PVP, and a PVC. Each of the three Channel Banks in an NGDLC that can provide DSL service is assigned to a single PVP. Thus, the PVP that an end-user's data traffic will travel over is determined by which Channel Bank has the line card used for that customer's service. Within the PVP, an end user's data traffic which is assigned to a PVC will have access to the bandwidth of the entire PVP so long as all the PVCs provide the Unspecified Bit Rate (UBR) quality of service. A useful visualization is to think of a PVP as a highway, say I-94 between Chicago and Milwaukee. The route is fixed. PVCs are like the lanes in the highway; you can use any open lane, but they are all part of the same road. The major difference is that unlike lanes on the highway, a PVC can grow or shrink depending on the "width" of the traffic it needs to carry.

Q. PLEASE DESCRIBE UNSPECIFIED BIT RATE AND THE OTHER ATM QUALITY OF SERVICES (QoS).

A. The most common ATM QoSs are Constant Bit Rate (CBR), Variable Bit Rate, both real time and near real time (VBR-rt, VBR-nrt), and Unspecified Bit Rate (UBR). UBR is a best-effort allocation of bandwidth. All customers have an equal chance at the resources in the NGDLC with UBR QoS. UBR also provides the most efficient use of the shared bandwidth of the NGDLC RT. In addition, since Pronto was designed for the mass market and targeted towards high-speed Internet access, UBR is ideally suited for that type of application. CBR and VBR QoS provide a guaranteed service access (*i.e.*, bandwidth). That is, with bandwidth allocation in the ATM network, CBR and VBR services are allocated specific levels of bandwidth at the expense of UBR customers.

Q. HOW ARE THE ATM QUALITY OF SERVICES RELATED TO THE PVP AND PVC ISSUES IN THIS REHEARING?

A. Each PVP or PVC is assigned one of the quality of services (QoS). Therefore, if a customer's PVC is assigned a CBR QoS, its data traffic would always have priority over those customers with UBR QoS. This means the UBR customer, as stated above, would be subjected to a degraded level of service as opposed to a CBR or VBR customer. This also means the bandwidth resource cannot be shared as efficiently as with UBR service. With CBR and VBR, the fiber bandwidth is consumed faster and will result in premature exhaust of the fiber facility. For high-speed Internet access, which is the intended market for Pronto,

UBR is the preferred QoS to meet the service needs of the mass market customer. Also, as I stated above, UBR offers the most efficient use of the bandwidth in the NGDLC.

Q. PLEASE DESCRIBE THE FUNCTION OF THE OCD IN MORE DETAIL.

A. The OCD is a packet switch that essentially serves as a router and aggregator for data signals. The line-side ports on the OCD receive the OC3c optical data signals from all of the Project Pronto RT sites served out of that central office. All of these OC3c optical signals contain the data signals from numerous end users, each of which is served by the CLEC of their choice. The OCD routes each end user's data signal to the appropriate outbound port on the OCD for delivery to that end user's chosen CLEC. All such data signals bound for a particular CLEC are aggregated to the OCD's outbound port specific to that CLEC.[1]

IV. ADVERSE IMPACT OF THE ORDER ON NGDLC CAPACITY AND AVAILABILITY OF DSL SERVICE

Q. CAN YOU DESCRIBE THE NEW "UNEs" REQUIRED BY THE COMMISSION'S ORDER?

A. Yes. The "UNEs" ordered in this docket are:

a. Lit Fiber Subloops between the RT and the OCD in the CO consisting of one or more PVPs ("permanent virtual paths") and/or one or more PVCs ("permanent virtual circuits") at the option of the CLEC;
b. Copper subloops consisting of the following segments:

[1] In this context, the terms "inbound" and "outbound" reflect the perspective of upstream DSL traffic from the end user. In reality, DSL is a bi-directional service. Therefore, the ports connected to both the CLECs and the RTs are actually both inbound and outbound.

i. The copper subloop from the RT to the NID at the customer premises;
ii. The copper subloop from the RT to the SAI ("serving area interface");
iii. The copper subloop from the SAI to the NID at the customer premises.

c. ADLU line cards owned by the CLEC and collocated in Ameritech Illinois' NGDLC equipment at the RT;
d. ADLU line cards owned by the ILEC in the NGDLC equipment in the RT;
e. A port on the OCD in the CO; and
f. Any combination thereof.[2]

Q. WOULD PROVIDING THESE "UNEs" HAVE AN ADVERSE IMPACT ON THE PRONTO DEPLOYMENT?

A. Yes. Many of the "UNEs" in the Order are not technically feasible or would have negative impact on the capacity and utilization of the NGDLCs that were planned for Project Pronto in Illinois. The negative impacts would also add significant capital cost to Project Pronto and could adversely affect the widespread availability of DSL service that is the goal of Project Pronto. Mr. Boyer describes which UNEs are technically infeasible or impractical in his testimony.

Q. WHICH OF THE NEW "UNEs" WOULD HAVE AN ADVERSE IMPACT ON THE CAPACITY AND UTILIZATION OF THE PRONTO NGDLCS?

A. The following "UNEs" would have a significant negative impact on the capacity and utilization of Project Pronto NGDLCs and would add significant capital costs to deployment of Pronto DSL equipment:

i. The lit fiber consisting of PVCs and PVPs.
ii. The ADLU line cards owned by the CLEC and "collocated" in Ameritech Illinois' NGDLC equipment at the RT;
iii. Combinations of the above.

Q. WHAT CAPACITY ISSUES AND CONCERNS DOES AMERITECH HAVE WITH A REQUIREMENT TO PROVIDE PVPs AND PVCs AS "UNEs"?

A. As I explained previously, the preponderance of the Pronto NGDLC deployment planned in Ameritech Illinois would have been the Alcatel Litespan 2000. The typical NGDLC configuration would encompass nine Channel Banks. Only three of those Channel Banks would be capable of delivering DSL service. Also, as I explained previously, each of these Channel Banks would have a single, dedicated PVP. This means there are only three PVPs per NGDLC. Consequently, allowing a CLEC to lease an entire PVP would immediately reduce the DSL capacity in a given Remote Terminal by one-third. Said differently, 56 of the 168 slots in the NGDLC would not be available for assignment or sharing by any other CLEC. If the CLEC leasing the PVP had one or only a few customers, this arrangement would result in a gross underutilization of the NGDLC. And, of course, nothing would stop one CLEC from leasing all three PVPs in a given RT and thus controlling all of the DSL capability of the Pronto NGDLC in that RT.

Q. WOULD THIS UNDERUTILIZATION BE THE SAME IF THE CLEC USED THE PVP TO SERVE HIGH BANDWIDTH CUSTOMERS?

A. Yes. The NGDLCs were designed to serve a specific number of living units with DSL service. If a large part of the bandwidth is dedicated to fewer customers, then a situation will arise where not enough bandwidth will be available to serve

[2] Order in Docket 00-0393 at 25.

the area intended to be served by the NGDLC. Mr. Boyer provides an example of how this underutilization might occur.

Q. WOULD ALLOWING CLECS TO LEASE PVPs AS "UNEs" FORCE AMERITECH ILLINOIS TO INCUR UNNECESSARY AND UNANTICIPATED COSTS?

A. Yes.

Q. PLEASE EXPLAIN.

A. I will give a high level view of the drivers for the added cost that Ameritech Illinois would incur from the stranding of capacity that would result if the PVP has to be provided as a "UNE." Dr. Aron provides greater detail on these costs in her testimony.

Leasing PVPs as UNEs would force Ameritech Illinois to incur extra capital costs to make up for the premature exhaust of DSL capacity in an NGDLC. As Ameritech Illinois monitors the capacity of its NGDLCs, engineering jobs would be triggered at points that indicate capacity exhaust. A one-third drop in capacity, such as that caused when a single CLEC leased an entire PVP, would be noted and cause outside plant engineering to plan a capacity relief job. With a three Channel Bank, cabinetized arrangement, the only available option for the engineer would be to place a new NGDLC. (As I explained previously, the typical Alcatel Litespan deployment that was planned for Illinois would have been a 9 channel bank configuration. This is the maximum number of channels a Litespan system

can have. Therefore to add DSL capacity would require the placement of a new NGDLC system.) In order to install a new NGDLC, right-of-way would have to be secured, site work completed, and equipment housing (e.g., a new cabinet) ordered along with the new NGDLC equipment itself. In addition, port(s) would have to be added to the OCD in the serving central office to terminate the additional OC3c signal(s) coming from the new NGDLC. On average, the capital cost for a new NGDLC at an RT site with the associated copper work to the SAI is [redacted].

Q. WOULD REPLACING THE STRANDED CAPACITY IN THE NGDLC ALSO INCREASE CAPITAL COSTS IN THE SERVING CENTRAL OFFICE?

A. Yes. Equipment would have to be added in the central office, such as a new central office terminal (COT), switch port terminations to terminate the voice side of the NGDLC, power and fiber frame termination. The average capital cost for this kind of central office work to accommodate new NGDLCs is approximately [redacted].

Q. WOULD CLEC "COLLOCATION" OF LINE CARDS ALSO HAVE AN IMPACT ON THE NGDLC CAPACITY? IF SO, CAN YOU EXPLAIN THOSE IMPACTS?

A. Yes. Allowing CLECs to "collocate" line cards in Ameritech Illinois' Project Pronto NGDLCs would cause significant, and potentially insurmountable, technical and operational problems. One of the most serious problems caused by a

CLEC owning or designating the ADLU card is the premature exhaust of the port and slot capacity of the NGDLC.

Q. PLEASE EXPLAIN THE PREMATURE EXHAUST PROBLEM.

A. Each NGDLC has at most three DSL-capable Channel Banks and thus a limited number of physical slots for ADLU line cards. Based on these limitations, each NGDLC is engineered with enough slot capacity to serve anticipated customer demand in a specific geographic area. As I explained above, each DSL-capable channel bank has 56 physical slots. Each slot has cable pairs hardwired to it, with the capacity to serve the maximum number of ports the ADLU card can or will ultimately support.[5] If carriers other than Ameritech Illinois were to own or designate a line card for a particular slot, **all** the ports and associated cable pairs hardwired to that slot would become unavailable for use by any other CLEC. For example, if a CLEC were allowed to "collocate" a line card and used that card to serve 1 customer, the other 3 ports and associated copper cable pairs hardwired to the slot would become unavailable to other carriers to serve other DSL customers. As a result, if multiple CLECs were allowed to own and place their line cards in a Project Pronto NGDLC, the NGDLC equipment would exhaust much sooner than originally engineered for. It also would exhaust much sooner than if ports were individually assigned to CLECs, as would occur with Ameritech Illinois' wholesale Broadband Service.

[5] The maximum number for the Litespan equipment is 4 pairs.

Q. WOULD THESE PROBLEMS EXIST IF AMERITECH ILLINOIS OWNED THE LINE CARDS?

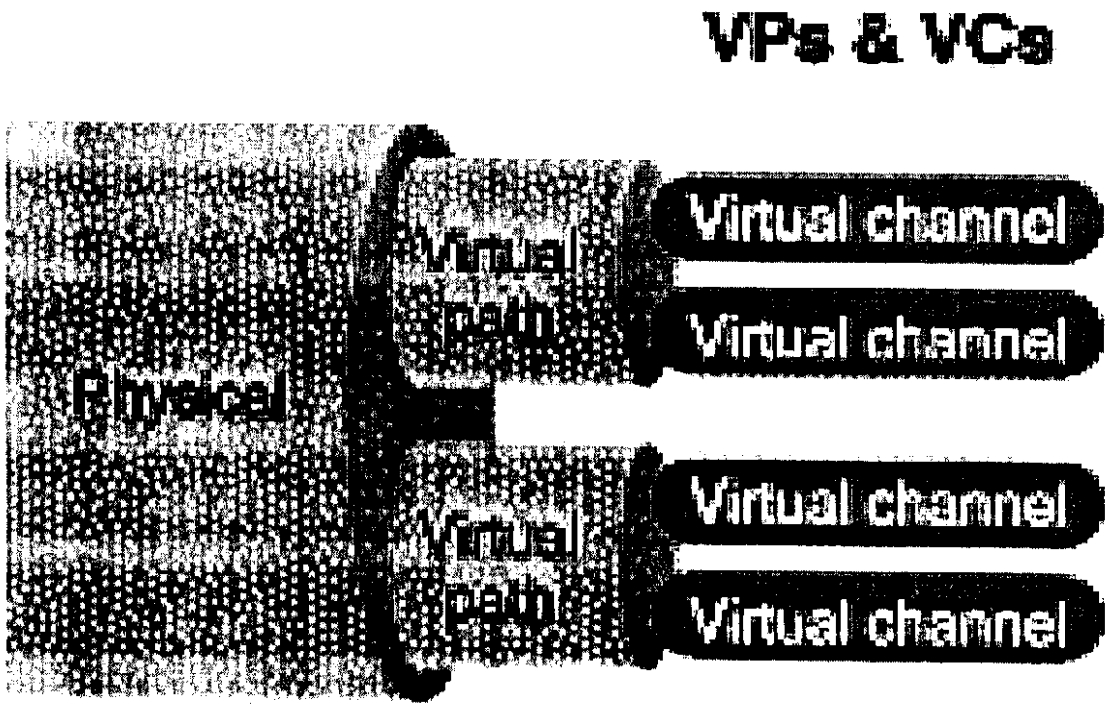
A. No. If CLECs were allowed to "collocate" line cards and two CLECs each served one customer each in the same SAI, two slots would be used (one slot per CLEC) in the NGDLC. Although only two ports would be in use (one on each card), all eight ports or cable pairs capable of being served by those two slots would be unavailable for use or assignment to other carriers. Under the same scenario, if Ameritech Illinois owned the cards, only one slot and two ports would be used, and the remaining two ports on the first card and all four ports on the second card would remain available for use by other CLECs. Ameritech Illinois ownership thus allows for a much more efficient use of the capacity available in the NGDLCs by allowing shared use of line cards and port-by-port provisioning.

Q. HAVE YOU DEVELOPED AN ESTIMATE OF THE ADDITIONAL COSTS AMERITECH ILLINOIS MIGHT INCUR AS A RESULT OF STRANDED CAPACITY CAUSED BY LEASING PVPs AS "UNEs" AND ALLOWING LINE CARD "COLLOCATION"?

A. Yes. These costs were explained in my affidavit submitted with Ameritech Illinois' application for rehearing, and the confidential cost analysis I used is attached to this testimony as Attachment JEK-4. As noted above, Dr. Aron also discusses these costs.

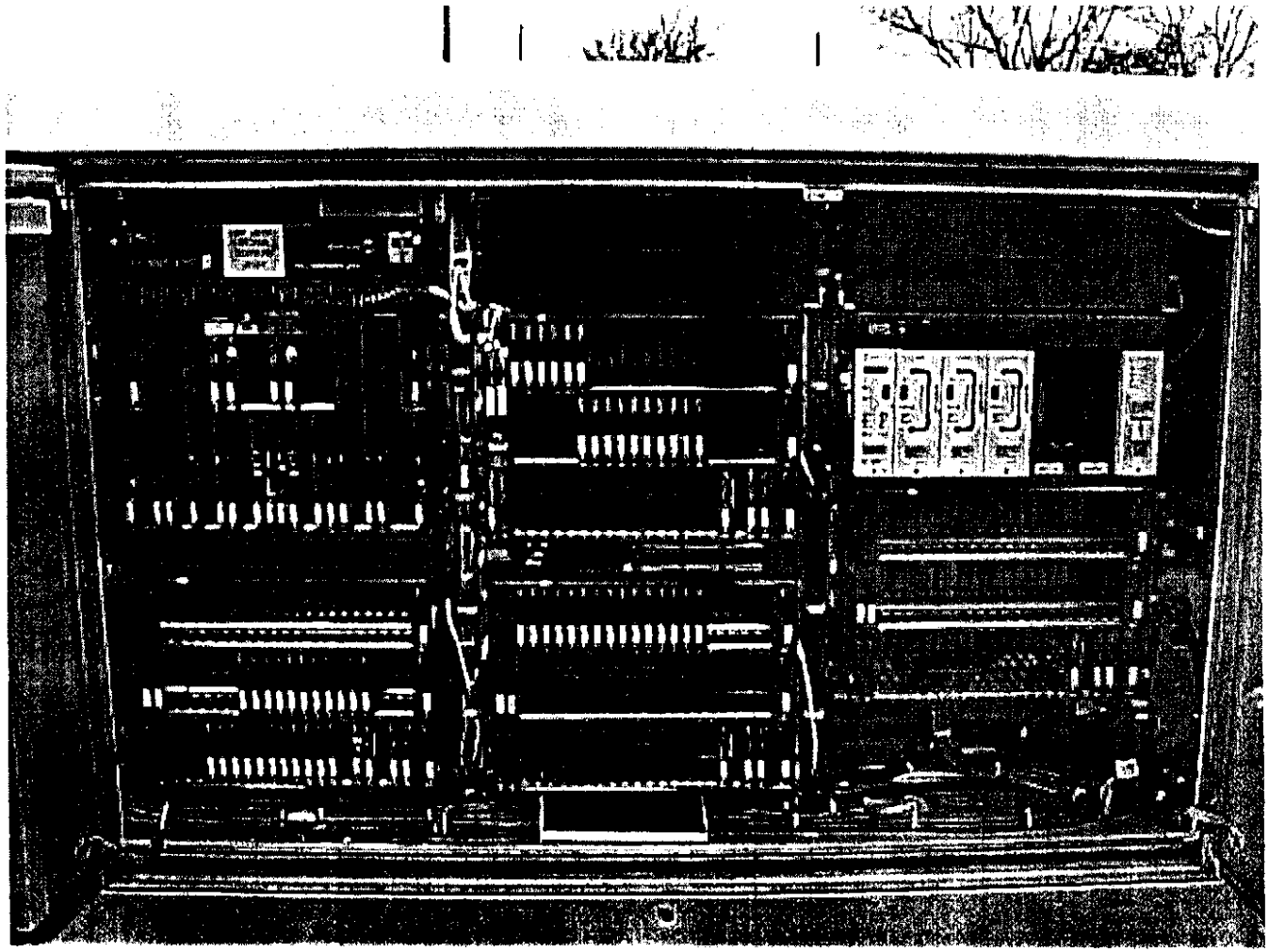
Attachment JEK1

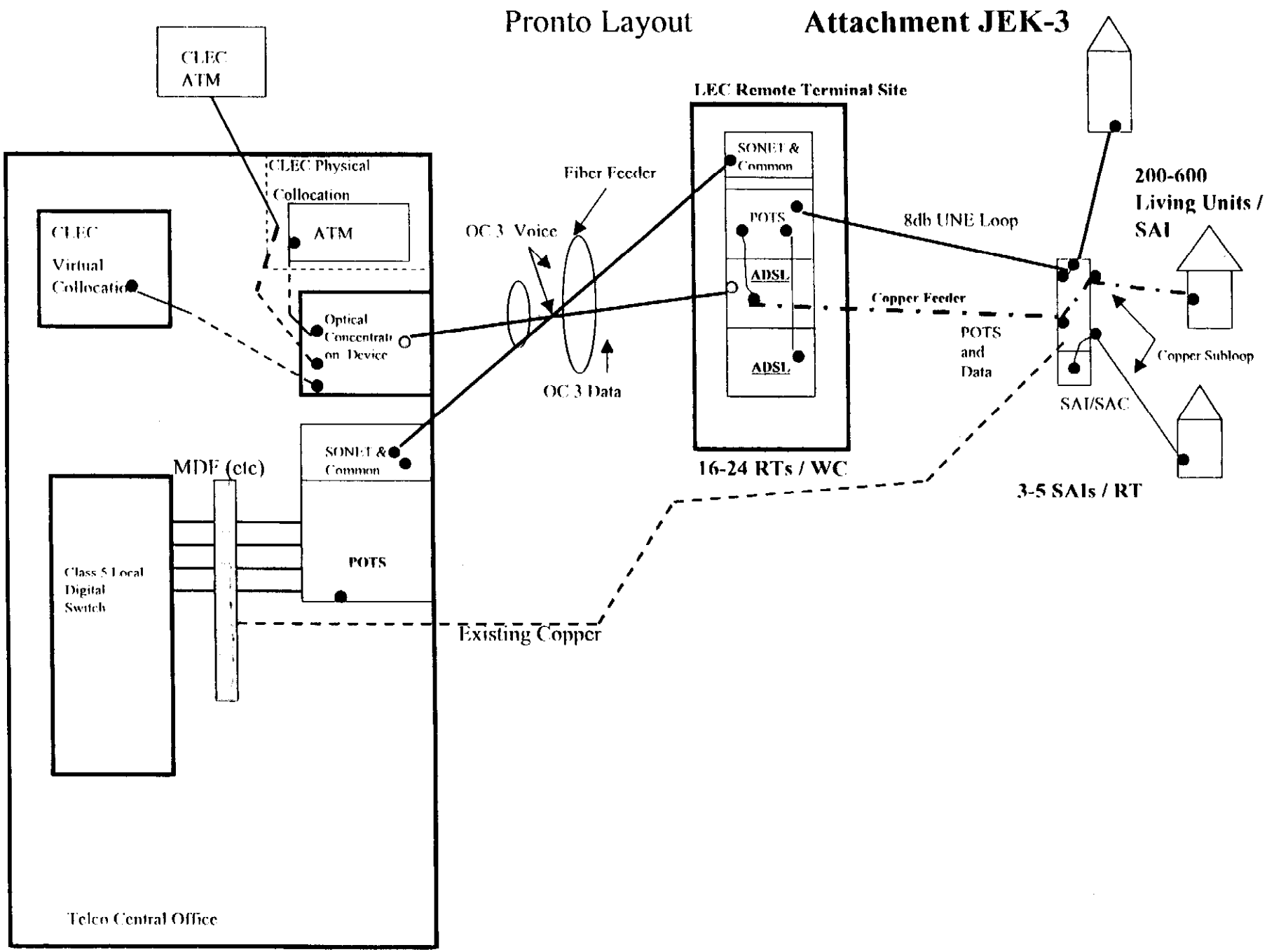
PICTORIAL REPRESENTATION OF VIRTUAL CIRCUITS



Attachment JEK-2

2016 Cabinet Front View




Pronto Layout
Attachment JEK-3
CLEC
ATM
CLEC Physical
Collocation
ATM
CLEC
Virtual
Collocation
Optical
Concentrat
on Device
SONET &
Common
MDF (etc)
Class 5 Local
Digital
Switch
POTS
Telco Central Office
Fiber Feeder
OC 3 Voice
OC 3 Data
LEC Remote Terminal Site
SONET &
Common
POTS
ADSL
ADSL
16-24 RTs / WC
8db UNE Loop
Copper Feeder
POTS
and
Data
200-600
Living Units /
SAI
Copper Subloop
SAI/SAC
3-5 SAIs / RT
Existing Copper