Direct Testimony of Joseph Craig

BEFORE THE
SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

IN THE MATTER OF DETERMINING PRICES FOR UNBUNDLED NETWORK ELEMENTS (UNEs) IN QWEST CORPORATION'S STATEMENT OF GENERALLY AVAILABLE TERMS (SGAT)	)))))	TC01-098

DIRECT TESTIMONY

OF

JOSEPH CRAIG

QWEST CORPORATION

OCTOBER 15, 2002

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I. IDENTIFICATION OF WITNESS

Q. PLEASE STATE YOUR NAME, EMPLOYER AND BUSINESS ADDRESS.

A. My name is Joseph Craig. I am employed by Qwest Corporation ("Qwest") as a Director, Technical Regulatory in the Local Network Organization. My business address is 700 W. Mineral, Littleton, Colorado, 80120.

Q. PLEASE REVIEW YOUR WORK EXPERIENCE AND PRESENT RESPONSIBILITIES.

A. I have been in the telephone business since 1974. I began as a directory assistance operator for Mountain Bell. After about 2½ years in that position, I transferred into Network Operations and since that time have had network-related responsibilities. My introduction to network responsibilities began in the late 1970s when I had responsibility for installing and repairing telephone service. I had responsibility for installations and repairs until 1980 when I became a Central Office Technician assigned to the Denver South Switching and Control Center in Denver, Colorado.

As a Central Office Technician, I was responsible for switch alarm surveillance, switch maintenance and repair, trunk installation, line and routing translations, switch equipment installation and software upgrades. My

responsibilities as a Central Office Technician provided me with detailed knowledge of engineering issues relating to trunking, routing and alarm surveillance in the switching network. I also worked closely with vendor equipment installers and acquired substantial knowledge about switching equipment, switch translations and the overall operation of the switching network.

In 1987, I accepted a three-year rotational assignment to Bellcore's training facility in Chicago, Illinois where I was a Switch Lab Manager. In that position, I was responsible for servicing switching equipment and modifying the equipment to update it with the latest features. My experience at the Bellcore training facility gave me the opportunity to work with switching experts from around the country and to learn about new switching technology and advanced switching repair techniques. I developed expertise in switch repair and recovery techniques, and the operations and functions of Signaling System 7 ("SS7"). While at Bellcore, I was selected for an award for exceptional performance called the Esteemed Member of Bellcore Staff.

In 1990, I returned to U S WEST working in Network Administration where I acquired additional experience in switching capacity and service measurements. After three years, I assumed responsibility for the Switching Control Center, where I managed the technicians who were responsible for

monitoring the switching network for all of Colorado. In 1994, I was assigned to the SS7 Control Center, where I had responsibility for provisioning and maintaining the SS7 signaling network for the U S WEST 14-state region.

In 1997, I accepted a position in Network Planning, and became responsible for writing network plans for new switch services in the SS7 network. I also was responsible for monitoring these plans through the implementation phase. In 1998, I was honored as a recipient of Presidents Club for successfully implementing SS7 into the 911 network in Minnesota.

In June 1999, I accepted a promotion to my current position in Technical Regulatory, Interconnection Planning. In my current position, I provide litigation support before federal and state commissions on issues relating to switching, SS7, trunking, and routing. As of June 30, 2000, I assumed the same job responsibilities for Qwest. In addition, I am the Qwest representative to the Network Reliability and Interoperability Council ("NRIC"), Focus Group 2, chartered by the FCC.

II. PURPOSE

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to describe Qwest's product offerings for Unbundled Dedicated Interoffice Transport ("UDIT") and Extended Unbundled Dedicated Interoffice Transport ("E-UDIT"). I also describe Qwest's product offering for Unbundled Packet Switching ("UPS") and identify the network components and rate elements that go into this product. I describe these products from a technical, engineering perspective. My purpose is to assist the Commission and the parties in understanding these products and the nature of the elements that go into them.

III. UDIT AND E-UDIT

Q. WHAT IS UNBUNDLED DEDICATED INTEROFFICE TRANSPORT?

A. UDIT is a UNE that provides a transport facility for a single competitive local exchange carrier ("CLEC") between two Qwest wire centers in the same LATA. UDIT may also be used to provide a facility path between a CLEC in one Qwest wire center and a different CLEC in another Qwest wire center within the same LATA. The transport facility used with UDIT is unchannelized, meaning just the facility between two Qwest wire centers and

does not include any electronics on either end of the facility for channelization.

Q. WHAT IS CHANNELIZATION?

A. Channelization is the process of dividing the bandwidth of a facility into smaller increments called channels. For example, a single DS1 facility is just four wires capable of providing a maximum of 1.544 Mbps. Adding electronics, such as a D4 channel bank, on both ends of the 4-wire DS1 facility, would divide the DS1 into twenty-four channels called DS0s, to accomplish the channelization process. In this case, after the channelization of a single DS1 into twenty-four DS0s, each DS0 is capable of providing 56 or 64 Kbps maximum bandwidth. Channelization is a UDIT option available to CLECs.

Q. WHAT IS THE CHANNELIZATION OPTION?

A. The channelization option of UDIT provides the CLEC with the option of specifying the electronics needed to give them assignable channels that allow for the transport of voice and/or data on the UDIT facility. Using the DS1 example in my previous answer, the UDIT facility is the DS1 and the assignable channels are the DS0s.

Q. WHAT KIND OF FACILITIES ARE AVAILABLE WITH UDIT?

A. UDIT facilities are available at Optical Carrier ("OC"), DS3, and DS1 levels. OC includes high capacity bandwidth at different levels, including OC-3 through OC-192. These high capacity bandwidth facilities are used to transmit large amounts of data at a high rate of speed. Qwest provides OC interoffice transport levels where the facilities are available to accommodate those levels.

Qwest offers UDIT in bandwidths of up to OC-48 as part of its standard offerings, and CLECs can request higher bandwidths through the special request process. The specifications, interfaces and parameters for Qwest's UDIT products are described in Qwest Technical Publication 77389.

Q. WHAT IS EXTENDED UNBUNDLED DEDICATED INTROFFICE?

A. E-UDIT provides a transmission path at varying bandwidths between a Qwest serving wire center and a CLEC's wire center or an Inter Exchange Carrier's ("IXC") point of presence ("POP") located within the same Qwest serving wire center area. The bandwidths for E-UDIT currently range from DS1 through OC-192. Like UDIT, E-UDIT is available in bandwidths of up to OC-48 as a defined product, while higher bandwidths may be available through the use of the special request process.

Q. WHAT IS THE DIFFERENCE BETWEEN UDIT AND E-UDIT?

A. UDIT provides a transport facility between two Qwest wire centers in the same LATA, utilizing what is commonly known as inter-office facilities. E-UDIT is a transport facility that extends from a Qwest wire center to a CLEC wire center or IXC POP within the same Qwest serving wire center area, utilizing what is commonly known as a loop facility. There are also significant differences in the way UDIT is provisioned versus the provisioning of E-UDIT.

Q. PLEASE ELABORATE ON THE DIFFERENCES IN PROVISIONING UDIT VERSUS E-UDIT.

A. UDIT, as previously stated, is a transport facility between two Qwest wire centers within a LATA. However, it involves more than simply going straight from Point A to Point B. In the more typical case, UDIT goes from Point A to Point Z through multiple points.

As Qwest's inter-office network has evolved over time, it consists of long transport lengths between wire centers with high bandwidth capacities capable of handling the volumes of traffic between wire centers. In an effort to fully utilize these long, large transport facilities, the concept of alternate routes has developed between Qwest wire centers. It is possible to efficiently and economically transport traffic from one Qwest wire center to another Qwest

wire center by going through multiple wire centers across the LATA utilizing the existing high bandwidth inter-office facilities rather than using a direct point to point route. For reasons of efficiency, UDIT often is provisioned using this alternate route concept.

Exhibit JC-1, Figure A, is a graphic representation of how a UDIT is provisioned in this manner.

In contrast, E-UDIT is a transport facility that extends from a Qwest wire center to a CLEC wire center or IXC POP within the Qwest serving wire center to which it is connecting. In provisioning E-UDIT, Qwest utilizes a wire center's existing loop facilities. The existing feeder and distribution loop network is migrated into service as temporary inter-office facilities. In contrast to true inter-office facilities, such as those between Qwest wire centers, these temporary inter-office facilities, as they apply to E-UDIT, are of substantially shorter length and can be provisioned as Point A to Point B with specific distances and bandwidth characteristics. Therefore, if or when E-UDIT is no longer required, Qwest will migrate the facility back to use as loop facilities. In general, one path will exist, and alternate routes are the exception rather than the rule.

Exhibit JC-1, Figure B, is a graphic representation of how an E-UDIT is provisioned in this manner.

IV. ENHANCED EXTENDED LOOP

Q. PLEASE DESCRIBE QWEST'S ENHANCED EXTENDED LOOP PRODUCT OFFERING.

A. Enhanced Extended Loop ("EEL") is a combination of loop and dedicated office transport and may also include multiplexing or concentration capabilities. EEL enables CLECs to access unbundled loops for end users without being required to collocate in the central office in which those loops terminate.

There are two options under the EEL Product:

- Point to Point EEL consists of loops and interoffice transport of the same bandwidth extending from the CLEC collocation or premises to the end user being served out of a different wire center.
- Multiplexed EEL allows the CLEC to have EEL combinations of different bandwidths.

Both EEL options are available at DS0, DS1, and DS3 levels ordered via an LSR or at OCn levels requested via the Special Request Process.

Q. WHAT NETWORK COMPONENTS MAKE UP AN EEL COMBINATION?

A. A Point to Point EEL combination is comprised of loop(s), and Unbundled Dedicated Interoffice Transport (UDIT). A Multiplexed EEL is a combination of loop(s), UDIT and multiplexing. Exhibit JC-2 illustrates the two EEL combinations and their respective network components.

Q. UNDER WHAT CONDITIONS MAY CLECS ORDER EEL?

A. Qwest provisions EEL to CLECs when they self-certify to Qwest that the EEL will be used to provide a significant amount of local exchange traffic to a particular end user per the FCC Supplemental Order on Clarification (FCC 00-183) and applies to both new EELs and Conversions. CLECs have three options by which to self-certify their local use.

Option 1: The CLEC must be the exclusive provider of local service to the end user. One end of the EEL must terminate in the CLEC's collocation and there is no minimum local use requirement by circuit. In addition, no restrictions will apply as to how any particular circuit is being used.

Option 2: The CLEC must handle 33% of the end user's local traffic and the EEL circuits must carry a minimum

percentage of local traffic. One end of the EEL must terminate in the CLEC's collocation.

Option 3: The CLEC must provide a minimum percentage of local service across their EEL circuits. One end of the EEL must terminate at the CLEC's premises.

V. UNBUNDLED PACKET SWITCH

Q. WHAT IS A PACKET?

A. As defined by Newtons' Telecom Dictionary, a packet is the "Generic term for a bundle of data, usually in binary form, organized in a specific way for transmission. . . . A packet consists of the data to be transmitted and certain control information. The three principal elements of a packet include: 1. Header – control information such as synchronizing bits, address of the destination or target device, address of originating devices, length of packet, etc. 2. Text or payload – the data to be transmitted. The payload may be fixed in length . . . or variable in length . . . 3. Trailer – end of packet, and error detection and correction bits." Newton's Telecom Dictionary, 17th Edition at page 509 (2001).

Q. WHAT IS PACKET SWITCHING?

A. Packet switching is the technology of sending data in packet form through a network to some remote location. Each data packet has a unique identification and carries its own destination address. Each packet is, therefore, independent of other packets. With packet switching, multiple packets traverse the network in a stream of packets that flows from the originating packet switch to the packet switch or node that is the destination. These packets sometimes travel by different routes, therefore making packet switching more efficient than circuit switching.

Q. WHAT IS UNBUNDLED PACKET SWITCHING?

A. Unbundled Packet Switching ("UPS") is UNE offered in compliance with the FCC's UNE Remand Order to provide access to the Qwest packet switched network. The Qwest packet switched network is based on Asynchronous Transfer Mode ("ATM"), or a packet like switch, that is used to provide DSL Service offerings.

Q. WHAT ARE DSL SERVICE OFFERINGS?

A. Digital Subscriber Line ("DSL") Service offerings involve the use of the frequencies of the copper wires other than the frequencies used for analog voice. This access to the frequencies other than voice, for example, Asymmetric Digital Subscriber Line ("ADSL") allows the customer to use

their phone for voice conversation at the same time they are using their computer for various different purposes, including Internet access.

DSL technology has many different versions. Other versions of DSL include VDSL, HDSL, RADSL, IDSL and SDSL to name a few. Each version of DSL has unique characteristics, such as frequency, bit rate or speed, and require different modem equipment both at the user's location and the remote device or node to which the user is connecting. ADSL service is the most common type, and it can be provisioned over a customers existing copper line, or twisted pair loop. ADSL, although originally developed by Telcordia, is now standardized by the American National Standards Institute ("ANSI") as T1.413.

Q. WHAT IS A PACKET SWITCHING NETWORK?

A. Packet switched networks are shared networks that deliver traffic in bursts called packets. As stated in Newton's Telecom Dictionary, "packet switched networks are shared networks, based on the assumption of varying levels of latency and, thereby, yielding a high level of efficiency for digital data networking." Newton's Telecom Dictionary, 17th Edition, at page 510 (2001).

Q. PLEASE CONTRAST HOW PACKET SWITCH NETWORKS AND CIRCUIT SWITCH NETWORKS ROUTE CALLS.

A. In a packet switched network, data is divided into individual packets, and each packet is assigned the address of the recipient of the call, much like a letter that one drops into a mailbox. Each packet is sent over the network to the recipient of the call, and the packets that comprise one call can take different routes to the recipient. The individual packets arrive at the destination address and are delivered in the proper sequence to the recipient. Significantly, the packet switched network over which these packets travel is a shared network, meaning that multiple calls traverse the network simultaneously.

In contrast, voice calls are carried over a circuit switched network. This network creates private paths for each call that are dedicated to the user for the entire length of the call. Once a connection is established, the path is used for one purpose and by a single user for the entire length of the call. No other user can use this dedicated path until the user vacates or disconnects the use of the dedicated path. In other words, unlike the routes in a packet switched network, the routes created in a circuit switched network are dedicated to a user for the length of a call and are not shared. In addition, the circuit switch network creates direct routes that a call must follow, while the packets in a packet switched network can follow multiple routes.

Q. WHAT NETWORK COMPONENTS MAKE UP THE RATE ELEMENT FOR QWEST'S UNBUNDLED PACKET SWITCHING?

A. The network components that go into the rate elements are identified in Exhibit JC-3, which depicts the network configuration for Qwest's UPS service. Specifically, the rate elements are the loop, the line splitter, the DSLAM, the DSLAM trunk port, and the ATM trunk port.

VI. CONCLUSION

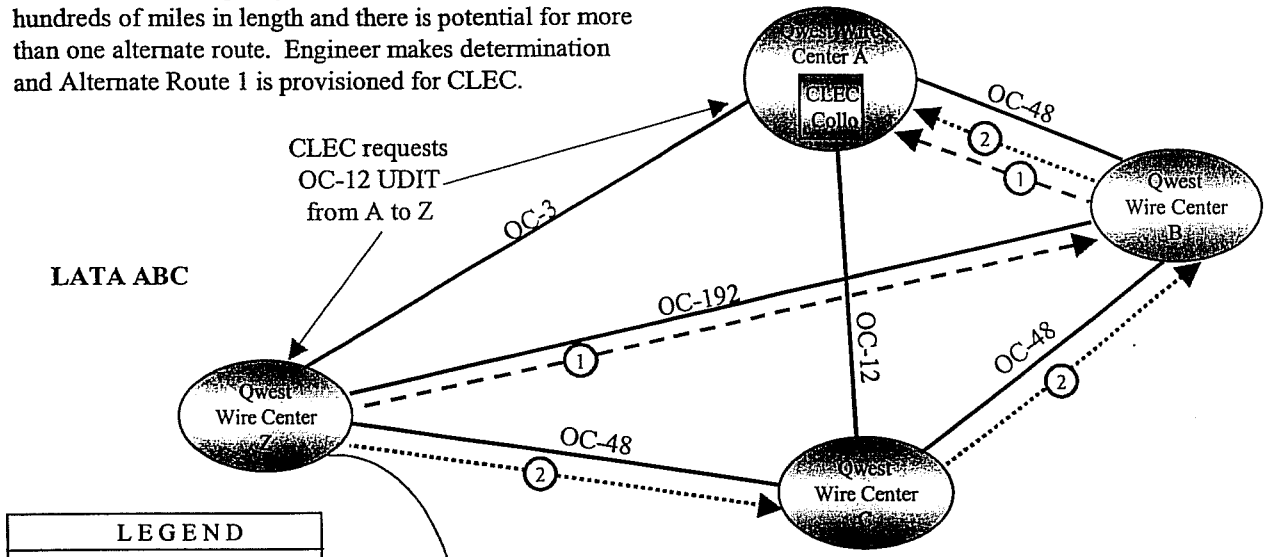
Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.

UDIT PROVISIONING EXAMPLE:

Figure A

A CLEC has ordered an OC-12 UDIT from Qwest wire center A to Qwest wire center Z. Existing IOF facilities from A to Z are OC-3capable only. Possible alternate routes are evaluated for capacity. Note, routes between wire centers can measure hundreds of miles in length and there is potential for more than one alternate route. Engineer makes determination and Alternate Route 1 is provisioned for CLEC.



LEGEND

- Existing IOF
- Possible UDIT Route 1
- Possible UDIT Route 2

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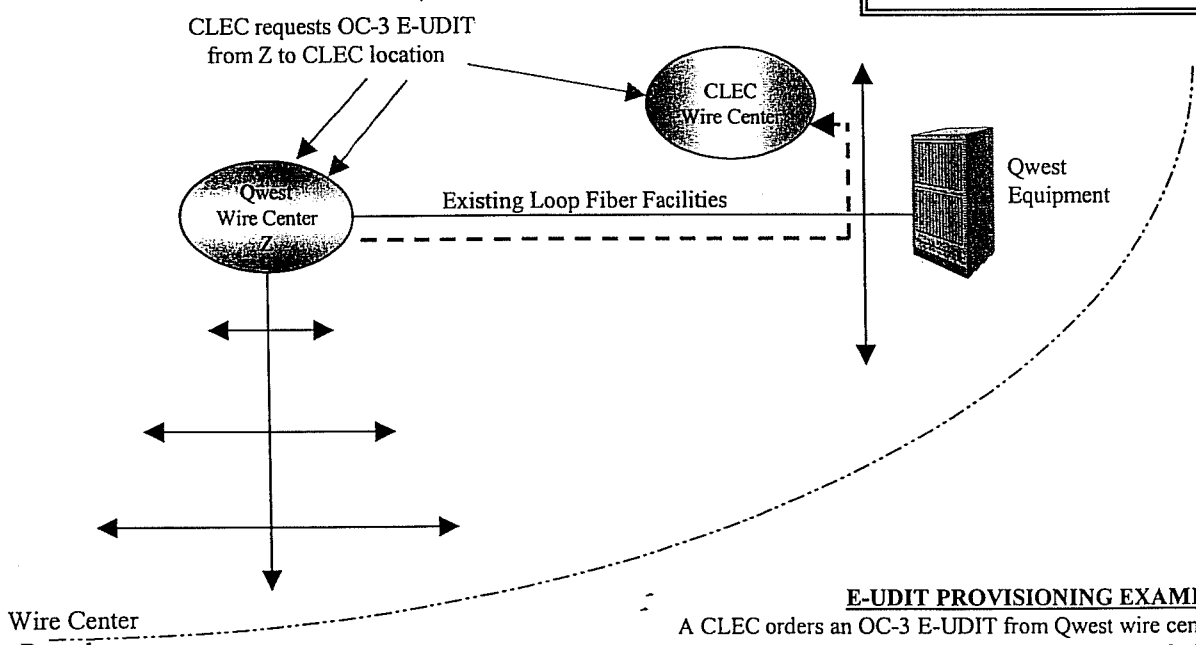


E-UDIT PROVISIONING EXAMPLE:

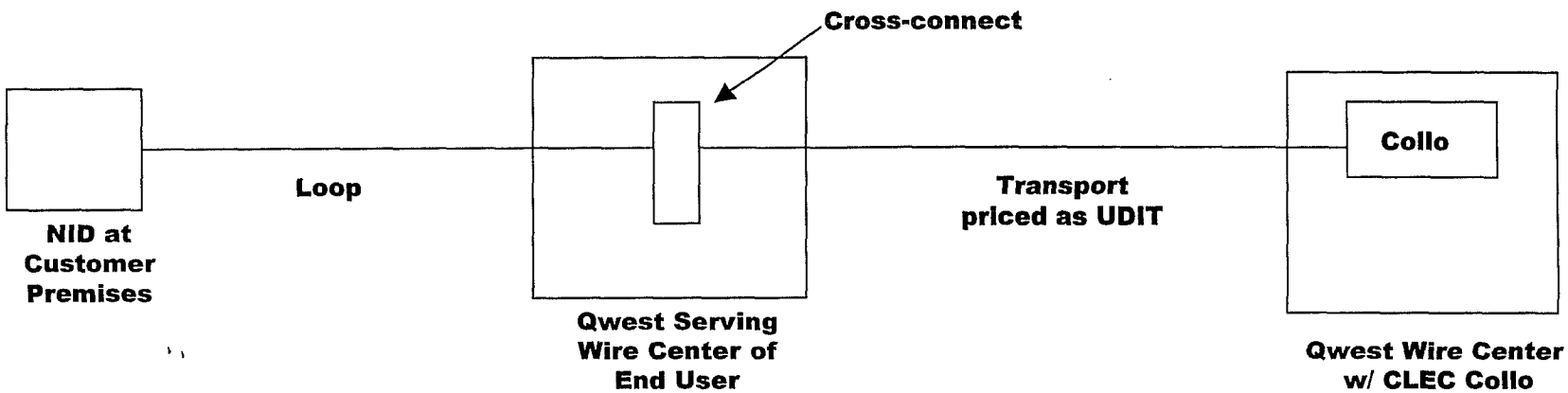
A CLEC orders an OC-3 E-UDIT from Qwest wire center Z to its location within the wire center boundary. Where spare loop facilities are available, Qwest will provision the E-UDIT to the customer location.

LEGEND

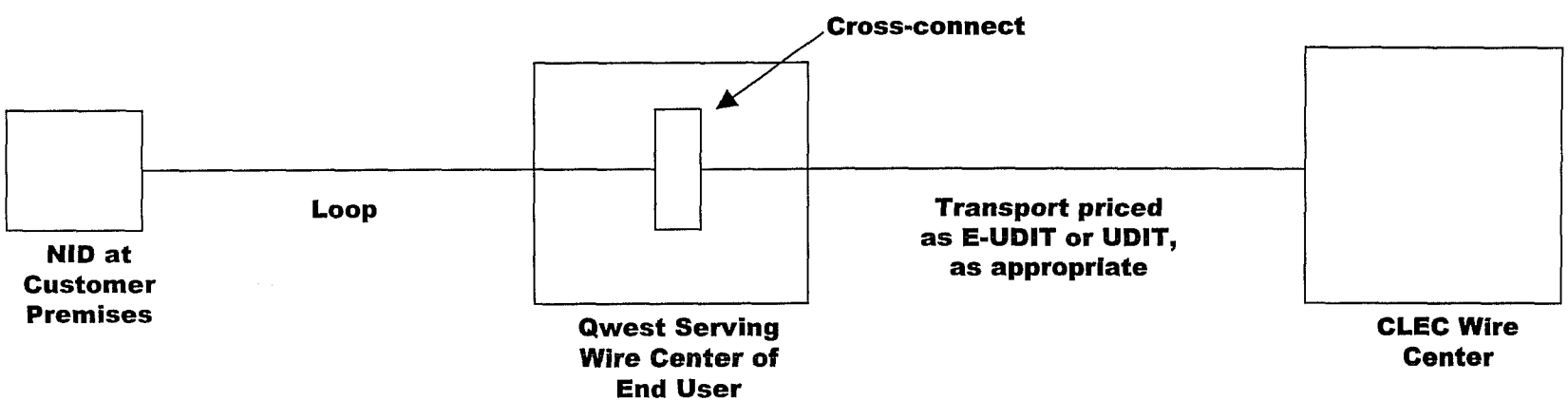
- Existing Local Loop Facilities
- E-UDIT Route

Figure B

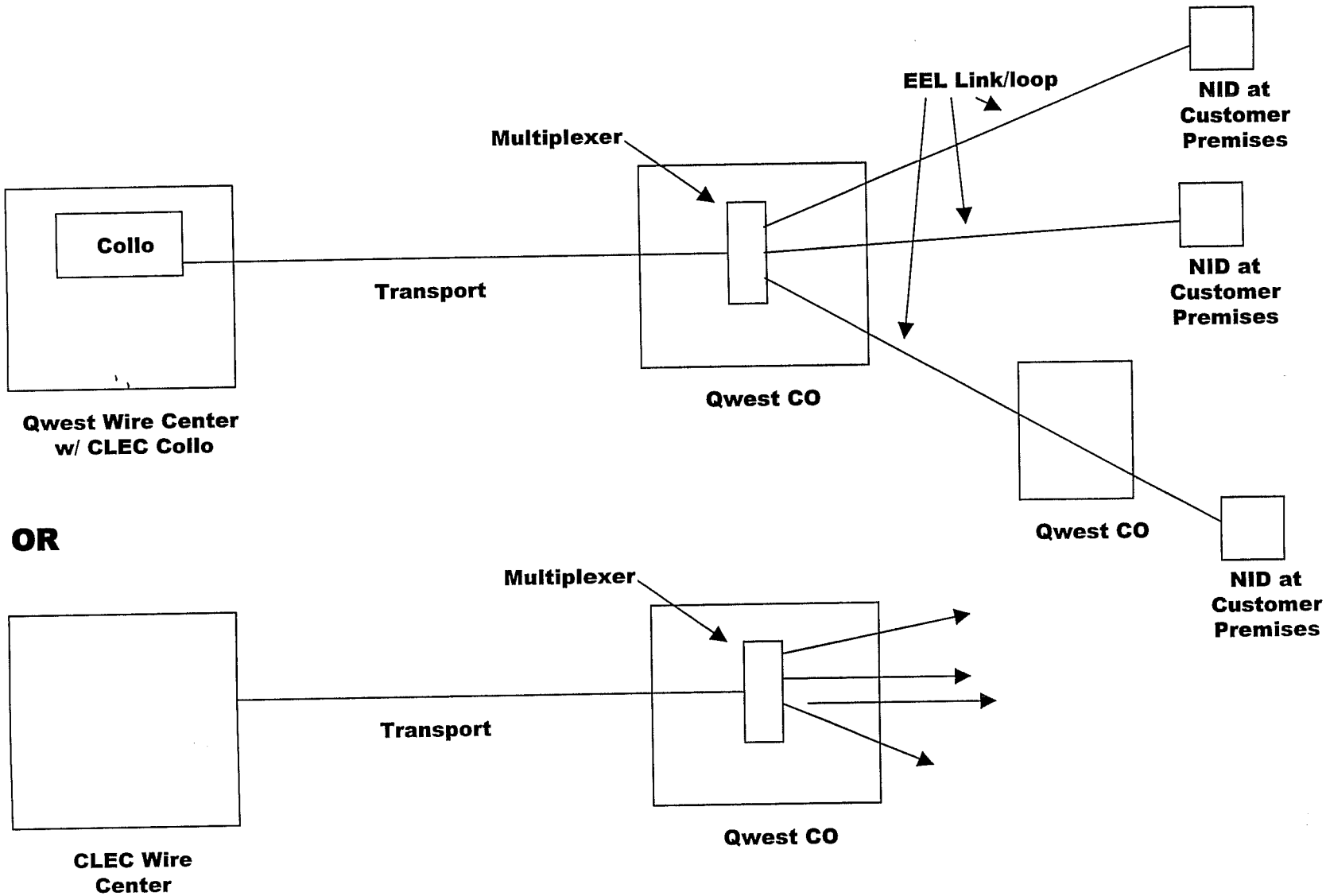
Point-to-Point EEL



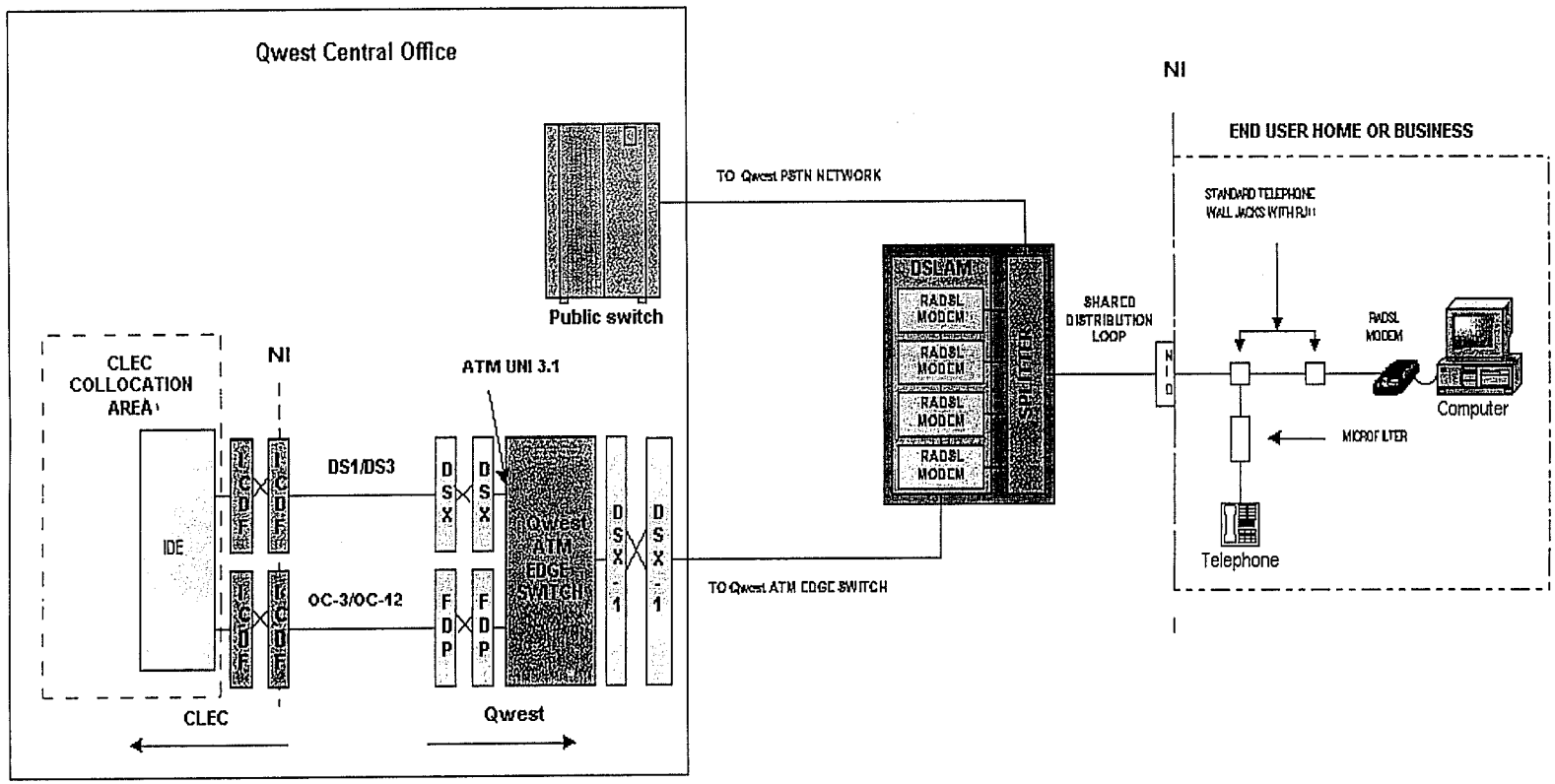
OR



Multiplexed EEL



UPS CUSTOMER CHANNEL WITH SHARED DISTRIBUTION LOOP



NI - Network Interface
CLEC - Certified Local Exchange Carrier
ICDF - InterConnection Distriburtion Frame
IDE - Interconnector Designated Equipment

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CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 14th day of October, 2002, the foregoing **Direct Testimony of Joe Craig and three exhibits** was filed and served upon the following parties as follows:

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