Qwest Communications International Inc.
Technical Publication

Unbundled Packet Switching

NOTICE

This publication describes Unbundled Packet Switching (UPS). A Certified Local Exchange Carrier may order UPS to deliver high-speed data services to their customers. This publication includes service features, technical specifications and technical information about UPS as well as the Network Channel (NC) and Network Channel Interface (NCI) codes used to order UPS.

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1.   Introduction

1.1   General

This publication describes Unbundled Packet Switching (UPS). A Certified Local Exchange Carrier (CLEC) may order UPS to deliver high-speed data services to their customers. This publication includes service features, technical specifications and technical information about UPS as well as the Network Channel (NC) and Network Channel Interface (NCI) codes used to order UPS.

1.2   Reason for Reissue

Technical Publication 77408 is being reissued to revise Chapters 2 and 3 to include the 622.080 Mbit/s and 155.520 Mbit/s UPS ATM Switch Interface Port and the associated references in
Chapter 6.

1.3   Related Publications

This document contains references to other Qwest Corporation Technical Publications. These documents may be obtained from sources listed in Chapter 6.

1.4   Scope of Document

The purpose of this document is to provide CLECs with a description of Qwest's Unbundled Packet Switching, its features, technical specifications, operational characteristics, and interfaces. It is Qwest's responsibility to provide the Unbundled Network Elements as described in this and other reference publications. It is the CLEC's responsibility to correctly design the total end-to-end service. The CLEC may request Qwest to concatenate individual unbundled elements. However, Qwest can not assure that the combination of elements will work in the manner the CLEC desires.

1.5   Document Organization

This document is organized as follows:

Chapter	Contents
1.	Introduction – General Information about the document
2.	Service Description of Unbundled Packet Switching
3.	Network Channel and Network Channel Interface Codes, Descriptions of Interfaces
4.	Responsibilities, Qwest and Customer
5.	Acronyms and Glossary
6.	Reference Section

1.6   Terminology

Customers who purchase various unbundled elements from Qwest are described by several similar terms including Co-Carrier, Co-Provider, and Certified Local Exchange Carriers (CLEC). This publication uses the latter term.

1.7   Tariffs, Catalogs and Contracts

Further information about Unbundled Packet Switching may be found in tariffs, catalogs, contracts or regulatory orders. Such jurisdiction or customer specific descriptions supersede the information in this publication.

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2.   Service Description

Unbundled Packet Switching provides CLECs with the capability to provide high-speed data services to their customers in combination with other Unbundled Network Elements (UNE). This service enables CLECs to offer Digital Subscriber Line (DSL) services using Rate Adaptive Digital Subscriber Line (RADSL) with a Discrete Multi-tone (DMT) interface.

2.1   Unbundled Packet Switching Overview

Unbundled Packet Switching utilizes Asynchronous Transfer Mode (ATM) technology to provide the functionality of delivering packet data units via a virtual channel between a CLEC demarcation point and the Remote Digital Subscriber Line Access Multiplexer (DSLAM). Unbundled Packet Switching includes use of transport facilities, DSLAM functionality and ATM electronics necessary to generate a virtual channel. It may also include use of the Shared, Line Split (not available at this time), Unbundled or CLEC provided Distribution Loop.

Unbundled Packet Switching consists of the UPS ATM Switch Interface Port and the UPS Customer Channel that can be ordered in combination with several other UNE distribution loops such as Shared, Line Split, or Unbundled. The CLEC also has the option of providing their own distribution loop.

 Qwest will provide the CLEC with virtual channels at a physical network demarcation point. The demarcation point is the access point where the CLEC interconnects with Qwest. For UPS, the demarcation point is at the InterConnection Distribution Frame (ICDF) in the central office housing the Qwest ATM switch where UPS is available. Figure 2-1 illustrates one example of this service configuration.
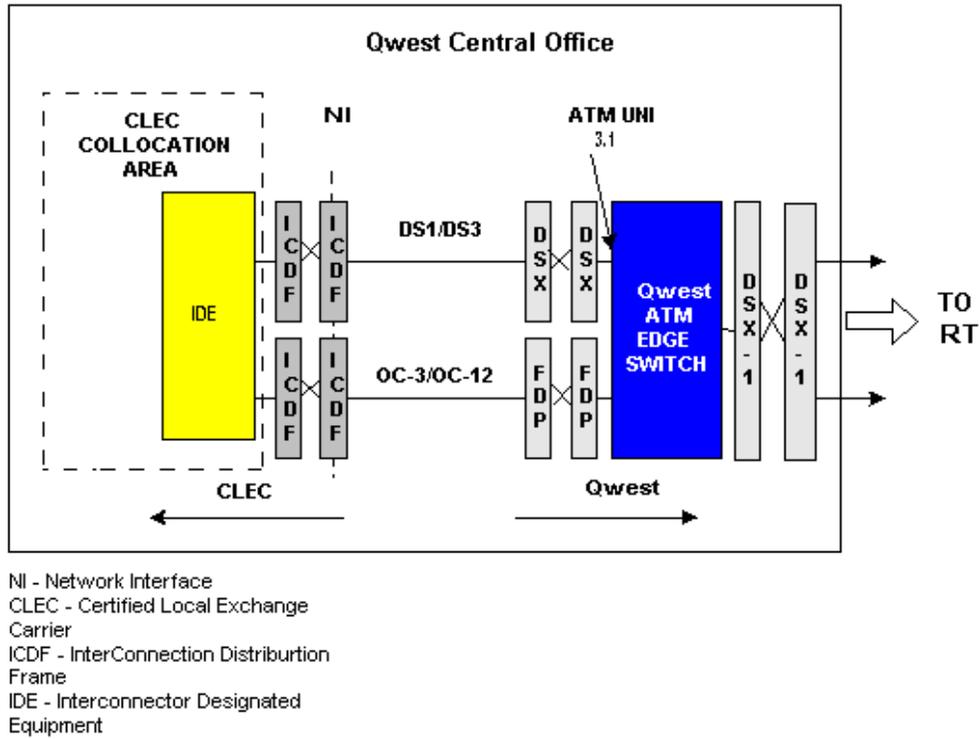
Figure 2-1 UPS ATM Switch Interface Port Configuration

Collocation is required for UPS but does not limit a CLEC to the central office of the ATM switch where UPS is disclosed. If a CLEC chooses collocation in any other office, they must order additional UNE services to connect to the central office where UPS is disclosed. An example of this option is depicted Figure 2-2.

Figure 2-2 UPS ATM Interface Port with UDIT EICT

2.2   Unbundled Packet ATM Switch Interface Port

The Unbundled Packet ATM Switch Interface Port is the physical entry point into the Qwest ATM Cell Relay Service Network. It is the originating and terminating point for Virtual Path Connections and Virtual Channel Connections. Ports include the electronic equipment used in connecting these service elements to the ATM Cell Relay Service Network. It allows a CLEC to aggregate Virtual channel connections (VCCs) from multiple customer channels onto a single high-speed DS1, DS3, OC-3c, or OC-12cATM Switch Interface Port.

A CLEC can choose from the following speeds to aggregate their UPS Customer Channel VCCs:

- ATM DS1 (1.544 Mbit/s) Interface

- ATM DS3 (44.736 Mbit/s) Interface

- ATM OC-3 (155.520 Mbit/s) Interface

- ATM OC-12 (622.080 Mbit/s) Interface

The 622.080 Mbit/s UPS ATM Switch Interface Port is offered as an unprotected circuit. It delivers a 2-fiber optical interface to the CLEC.

The 155.520 Mbit/s UPS ATM Switch Interface Port is offered as an unprotected circuit or as a protected circuit. It delivers a 2-fiber optical interface to the CLEC for unprotected service and a 4-fiber optical interface for protected service.

If the ATM 44.736 Interface is chosen, the CLEC must specify either Physical Layer Convergence Protocol (PLCP) cell mapping or Direct Mapped ATM cells across the ATM 44.736 Interface.

For additional information about the ATM Switch Interface Port, refer to PUB 77378, *Qwest Corporation ATM Service.*

UPS ATM Switch Interface Port will only be available in ATM switches where UPS is available.

Due to regulatory restrictions on the transport of data between Local Access and Transport Areas (LATAs), the UPS ATM Interface must be in the same LATA as the UPS Customer Subscriber Channels.

2.2.1   Standards and Specifications

The UPS ATM Switch Interface Port is essentially the same interface port as those offered in the ATM Service and is therefore based upon the same standards. Refer to ATM Standards and Specification in PUB 77378, *Qwest Corporation ATM Service* for additional information.

The UPS ATM Switch Interface Port is based on the following documents:

- TA-TSV-001408, Generic Requirements for PVC Cell Relay Service Telcordia, Technical Advisory.

- SR-3330, Cell Relay Service Core Features, Telcordia Special Report

- SR-3445, Requirements for PVC Cell Relay Service, Telcordia Special Report

- ATM Forum ATM User Network Interface Specification, Version 3.1, Prentice Hall 1994

- ATM Forum, Traffic Management Specification, Version 4.0, The ATM Forum 1996.

- ATM Forum, DS1 Physical Layer Specification, The ATM Forum 1994

- ATM Forum DS3 Physical Layer Interface Specification, The ATM Forum 1994

- ANSI T1.511. B-ISDN ATM Layer Cell Transfer – Performance Parameters.

- GR-1113-CORE. Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols, Telcordia.

- GR-1248-CORE, Generic Requirements for Operations of ATM Network Elements, Telcordia.

- GR-1117-CORE, Generic Requirements for Exchange PVC CRS Service, Telcordia.

- TR-NWT-001112, Broadband ISDN User to Network Interface and Network Node Interface Physical Layer Generic Criteria, Telcordia.

2.2.2   Class of Service

The ATM class of service for all PVCs provisioned on the UPS ATM Interface will be Unspecified Bit Rate (UBR). UBR is a best effort service designed to support connections carrying information flowing at uneven rates. It is intended for non-real-time applications that are very tolerant to delay, delay variation and cell loss.

UBR does not specify traffic related service guarantees. Specifically, UBR does not include the notion of a per-connection negotiated bandwidth. No numerical commitments are made by Qwest with respect to the cell loss ratio experienced by a UBR Connection, or to the cell transfer delay experienced by cells on the connection. Additional information about UBR can be found in PUB 77378, *Qwest Corporation ATM Service.*

2.2.3   Service Class Traffic Parameters

Since the UPS ATM Switch Interface Port will be utilizing the UBR class of service, the traffic parameters will be Peak Cell Rate (PCR). The PCR traffic parameter specifies an upper bound on the cell rate that can be submitted across a connection. The PCR for a UBR connection is the associated bandwidth that is requested when the service is provisioned.

2.2.4   Service Parameters

The following parameters are specific to the UPS ATM Interface Port.

- UPS Customer Channel VCCs will be delivered to the UPS ATM Interface Port using the Dedicated PVC Method at the Data Link Layer. Additional information about the Dedicated PVC Method can be found in PUB 77392, *Qwest DSL Services.*

- In the case of Dedicated PVC Method of delivery of subscriber data to the UPS ATM Interface Port, there will be one VCC provisioned on the interface for each UPS Customer Channel.

- The maximum number of VCCs on the UPS 1.544 Mbps ATM Interface Port is 60 VCCs.

- The maximum number of VCCs on the UPS 44.7636 Mbps ATM Interface Port is 2000 VCCs.

- The maximum number of VCCs on the UPS 155.520 Mbps ATM Interface Port is 3000 VCCs.

- The maximum number of VCCs on the UPS 622.080 Mbps ATM Interface Port is 4000 VCCs.

- The maximum throughput per VCC will be determined by the data rate of the UPS Customer Channel.

- The logically significant VCC address for each UPS Customer Channel will be provided to the CLEC at the time the UPS Customer Channel is provisioned in the Qwest Corporation Network.

- UPS ATM Interface Ports are available at DS1 (1.544 Mbit/s), DS3 (45Mbit/s), OC-3 (155.520 Mbit/s), and OC-12 (622.080 Mbit/s) Interfaces.

- The nominal peak bandwidth on the 45 Mbit/s interface will be 45 Mbit/s. Peak bandwidth will not be provisioned in increments.

- PVC Management Procedures can be found in PUB 77378.

2.2.5 Network Traffic Control and Congestion Management Responsibilities and Procedures

Detailed information about Network Traffic Control and Congestion Management Responsibilities and Procedures can be found in Pub 77378. It is the CLEC's responsibility to perform traffic shaping with their CPE in order to conform to the traffic parameters agreed upon in the service contract. For UBR connections, it is the CLEC's responsibility to not exceed the agreed upon PCR.

2.3 Unbundled Packet Switch Customer Channel

The UPS Customer Channel consists of DSLAM functionality and a virtual channel that serves as the originating and terminating point for Virtual Path Connections (VPC) and Virtual Channel Connections (VCC). Each UPS Customer Channel must correspond to an ATM Switch Interface Port. Multiple UPS Customer Channels can be routed to one UPS ATM Switch Interface Port, similar to a hub and spoke configuration.

Permanent Virtual Connections (PVCs) are the Qwest predefined path between the remote DSLAM and the ATM switch that facilitate the VPCs and VCCs requested by a CLEC.

- The VCC is a point-to-point logical connection between two locations that is identified in the cell header with a virtual channel identifier (VCI).

- The VPC is a collection of VCCs routed together between two locations. It is identified in the cell header with a virtual path identifier (VPI).

2.3.1 Available Data Rates for the UPS Customer Channel

The UPS Customer Channel is available in the following data rates:

- Data rate at 256 Kbit/s up to 640 Kbit/s downstream and 256 Kbit/s upstream

- Data rate at up to 640 Kbit/s downstream and 256 Kbit/s upstream

- Nominal peak data rate of 640Kbit/s bi-directional

- Data rate at 1.024 Mbit/s downstream and 864 Kbit/s up to 1 Mbit/s upstream

- Data rate at 4 Mbit/s downstream and 864 Kbit/s up to 1 Mbit/s upstream (This data rate is unavailable at this time.)

- Data rate at 7 Mbit/s downstream and 864 Kbit/s up to 1 Mbit/s upstream (This data rate is unavailable at this time.)

2.3.2   UPS Customer Channel in Combination with Distribution Loop UNEs

A CLEC can order the UPS Customer Channel in combination with several other UNE distribution loops such as Shared, Line Split, Unbundled, or provide their own distribution loop. When the CLEC orders these UNE loops, in combination with UPS, the following conditions shall exist:

- Loops will be connected to a Qwest DSLAM, not a CLEC provided DSLAM.

- Qwest will provide POTS splitter functionality in the DSLAM. CLECs may not install a splitter.

- Qwest will provide the wiring of the DLSAM port and card to the Loop. CLECs will not have access to the Remote DSLAM or FDI with UPS service.

- Neither a CLEC nor Qwest may utilize the High Frequency Spectrum on a given copper loop if another telecommunications carrier is already using the high frequency spectrum to provide data services, unless the end user of that loop or Qwest or the CLEC with Proof of Authorization from the end user, disconnects the original telecommunications carrier's high-frequency service.

- All distribution loop types may not be available with UPS in every location; CLECs should contact their service representative to confirm the availability of their desired distribution loop.

By combining the UPS Customer channel with a loop, a CLEC can provide high-speed data to their customers using XDSL technology on a single pair of copper wires. If the loop is Shared, Line Split, or Unbundled, the Network Interface will be at the End User location. If the CLEC provides the loop, the Network Interface will be at the Field Connection Point. In either case, the interface provided to the customer is Discrete Multi-tone (DMT) per ANSI T1.413 Issue 2, *Network and Customer Installation Interfaces - Asymmetric Digital Subscriber Line (ADSL) Metallic Interface.* For additional information about DSL, refer to PUB 77392, *Qwest Corporation DSL Services.* The RADSL interface connects to a RADSL modem at the End User's customer premise. It is the CLEC's responsibility to provide CPE equipment to their customers compatible with Qwest's Remote DSLAM and to determine if the loop they are ordering or providing can support the desired data rate. Refer to Section 2.4.1 for modem requirements.

2.3.3   UPS Customer Channel with Shared Distribution Loop

- Shared Distribution Loop provides CLECs with the opportunity to offer advanced data services simultaneously with an existing end user's analog voice-grade (POTS) service provided by Qwest on a single copper loop referred to as the "Shared Loop" or "Line Sharing", by using the frequency range above the voice band on the copper loop. The frequency range above the voice band portion of the copper loop is referred to as the High Frequency Spectrum Network Element ("HUNE"). A POTS splitter separates the voice and data traffic and allows the copper loop to be used for simultaneous data transmission and POTS service. The POTS service must be provided to the end user by Qwest. The Shared Distribution loop will terminate on Qwest's splitter. Refer to PUB 77406 for information about the Shared Distribution Loop. Figure 2-3 depicts an example of this service configuration. Shared Distribution loop may not be available with UPS in every location; CLECs should contact their service representative to confirm availability.

2.3.4   UPS Customer Channel with Line Split Distribution Loop

Line Splitting provides the CLEC with the opportunity to offer advanced data service simultaneously with an existing CLECs UNE-P POTS service by using the frequency range above the voice band on the copper loop. The advanced data service may be provided by the CLEC or another data service provider chosen by the CLEC. A POTS splitter must be inserted into the UNE-P to accommodate establishment of the advanced data service. The POTS splitter separates the voice and data traffic and allows the copper loop to be used for simultaneous DLEC data transmission and CLEC provided voice service to the end user. The Line Split Distribution Loop will terminate on Qwest's splitter. Refer to PUB 77406 for information about the Line Split Distribution Loop. Figure 2-4 depicts an example of this service configuration. When Offered, Line Split Distribution Loop may not be available with UPS in every location; CLECs should contact their service representative to confirm availability.

2.3.5   UPS Customer Channel with Unbundled Distribution Loop

The UPS Customer Channel with the Unbundled Distribution Loop provides the CLEC with the opportunity to offer advanced data services using the frequency range above the voice band on a copper loop provided by Qwest. The UPS Customer Channel with the Unbundled Distribution Loop is the only option when requesting UPS in a BNU. It will terminate on the Qwest DSLAM. Refer to PUB 77401 for information about Unbundled Distribution Loop. Figure 2-5 illustrates an example of this service configuration.

2.3.6   UPS Customer Channel with CLEC Provided Loop

When a CLEC provides their own distribution loop, it will terminate at the FCP, which will be jumpered to the FDI/Qwest splitter. This option allows the CLEC to offer advanced data services over their own copper loop to the end user by using the frequency range above the voice band on the copper loop. Refer to Section 2.4.2 for the loop requirements. Figure 2-6 illustrates an example of this service configuration. CLEC Provided loop may not be available with UPS in every location; CLECs should contact their service representative to confirm availability.
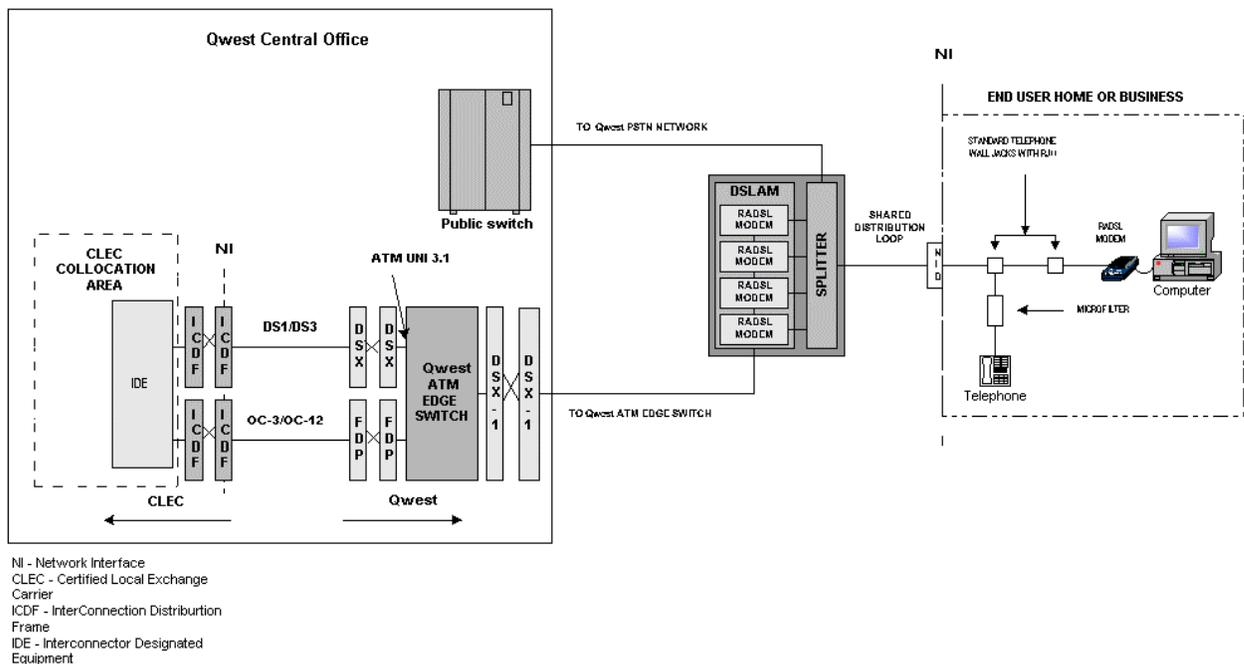
Figure 2-3 UPS Customer Channel with Shared Distribution Loop
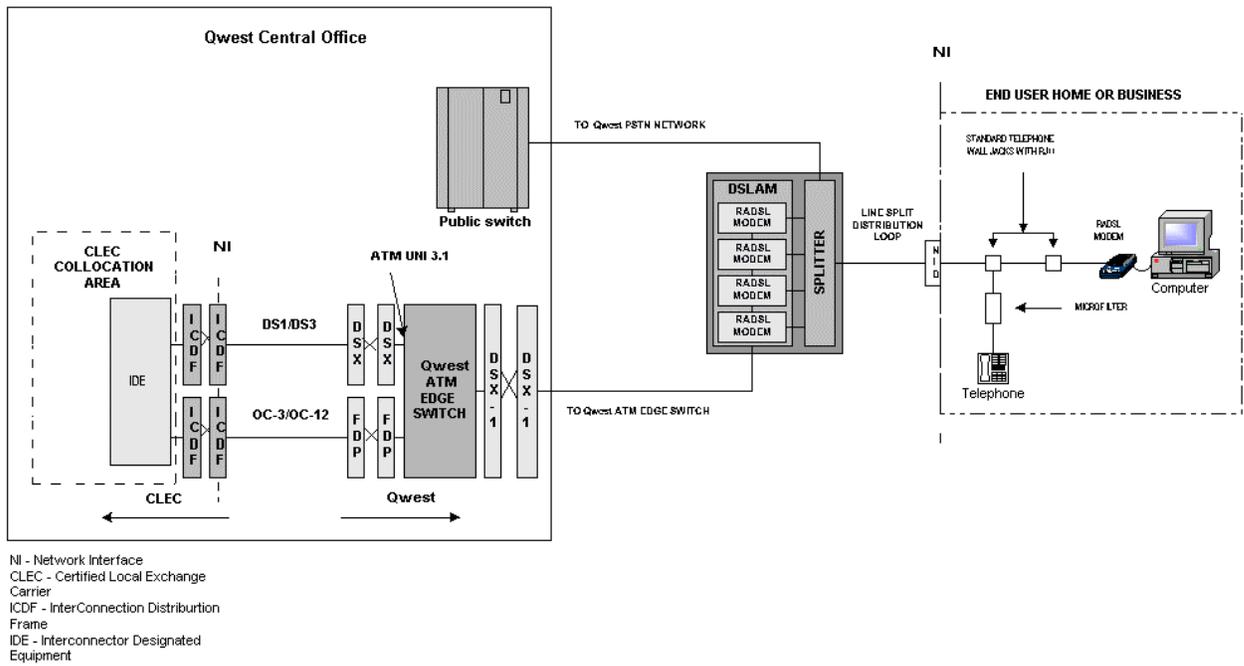
Figure 2-4 UPS Customer Channel with Line Split Distribution Loop
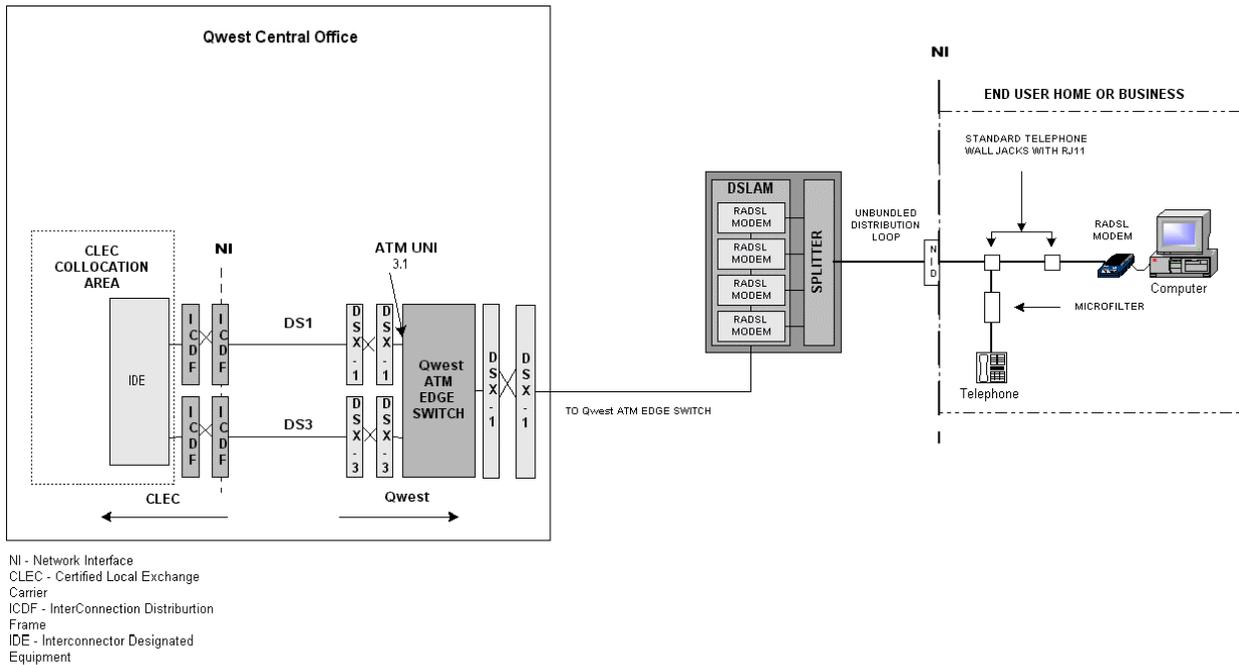
Figure 2-5 UPS Customer Channel with Unbundled Distribution Loop
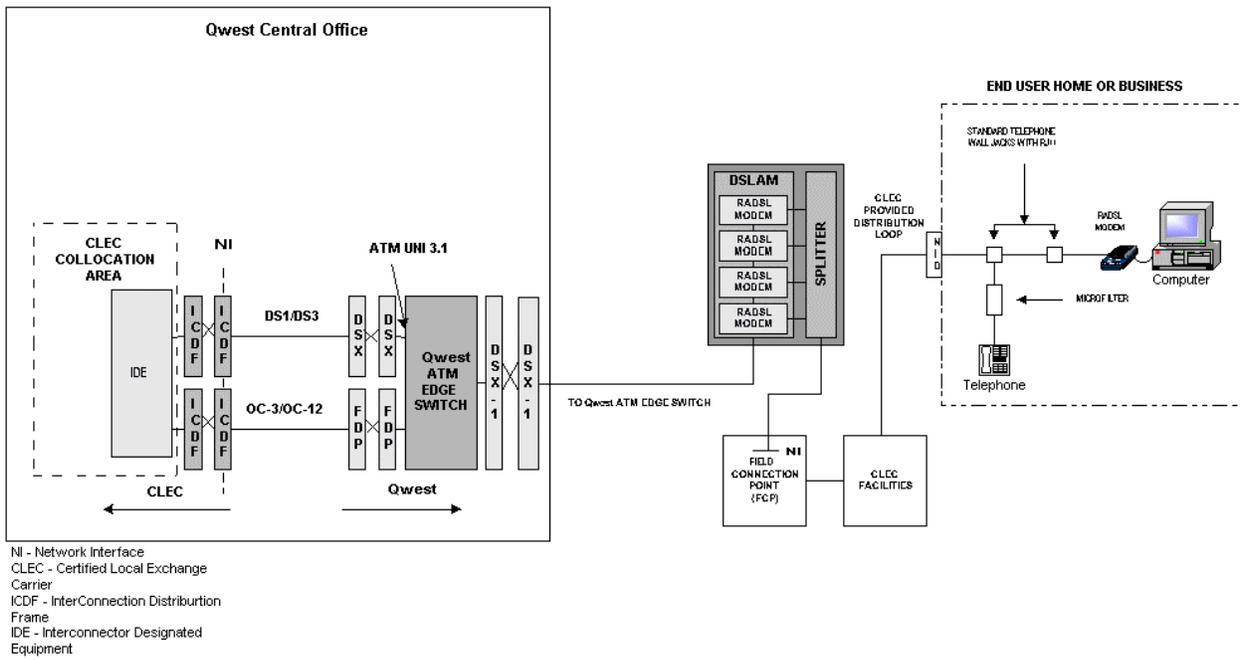
Figure 2-6 UPS Customer Channel with CLEC Provided Distribution Loop

2.4   DSL Information

2.4.1   Modem Requirements

It is the CLEC's responsibility to provide RADSL modems to their end users. The RADSL modems must be compliant with ANSI T1.413 Issue 2 *Network and Customer Installation Interfaces - Asymmetric Digital Subscriber Line (ADSL) Metallic Interface.*

2.4.2   Loop Requirements

Qwest RADSL modems are designed to operate on loops that meet certain criteria. The following criteria are listed below:

- A loop no longer than 15,000 feet of 26-gauge copper or 18,000 feet of 24-gauge copper.

- The customer must be fed by Digital Loop Carrier.

- The loop must not have any load coils on it.

- All bridge taps must be included in the total loop length.

- The sum of all bridge taps must not exceed 2,500 feet.

2.4.3   Service Speeds

Qwest will set a maximum downstream and upstream data rate based on the service selected by the CLEC. The data rates mention in Section 2.3.1 are service designations and represent nominal data rates that the customer can connect. The actual payload supported in either the downstream or upstream will be different than these service speeds.

It is the CLEC's responsibility to determine the service speeds their loop can support. The selected service speeds will be used to software provision the RADSL modems in the Remote DSLAM. The software settings will determine how the two modems train or synchronize.

2.4.4   Data Link Layer

Qwest DSLAMs support the transport of ATM cells at the data link layer. The method used to transport the VCC for UPS is the Dedicated PVC Method. Additional information about the Dedicated PVC Method and ATM Address Assignments can be found in PUB 77392, *Qwest C DSL Services.*

2.4.5   Microfilter Specifications

CLECs are also responsible for providing their End Users with Microfilters as necessary according to the Cisco Systems document, 78-6089-01, *EZ-DSL Microfilter Specification*, January 29, 1999.

End Users do not need to place microfilters in series with their telephone set. However, it is recommended that the microfilter be placed in series with all telephones to prevent the interference of ringing transients on the RADSL signal. Ringing transients may cause sufficient noise in the RADSL signal to cause the modems to retrain. If the customer is in the middle of a data session, that data session will be interrupted and may resume once the modem retrains.

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3.   Network Channel/Network Channel Interface Codes

3.1   Unbundled Packet Switching Network Interfaces

3.1.1   UPS ATM Interface Port Network Interface

The UPS ATM Interface Port is provided to collocated CLECs. The Network
Interface is at the cross-connect frame in the central office housing the Qwest ATM
Switch where UPS is available. The cross-connect frame could be an ICDF, FDP, or
DSX depending on the level of the channel (DS1, DS3, OC-3, OC-12) and the
interconnection agreement. The signal characteristics and/or optical characteristics
for the physical interface of the UPS ATM Interface Port can be found in Technical
Publication 77346, *Synchronous Service Transport* for OC-3 and OC-12; Technical
Publication 77324, *Qwest DS3 Service* for DS3; Technical Publication 77375, *1.544
Mbit/s Channel Interfaces* for DS1; and Technical Publication 77386, *Interconnection
and Collocation for Transport and Switched Unbundled Network Elements and Finished
Services* for Interconnection.

3.1.2   UPS Customer Channel Network Interface

The UPS Customer Channel in combination with a Qwest provided loop (Shared,
Line-Split, or Unbundled Distribution Loop) is provided to the End User. If it is a
Shared Distribution Loop, there will be an existing POTS line at the End User
Premise. If the loop is Line Split, then Qwest will provide the POTS channel to the
CLEC and the HUNE channel can be provided to the CLEC or another DLEC at the
request of the CLEC. If it is an Unbundled Distribution Loop, only the HUNE will
be provided to the End User. In each of the above cases, the signal characteristics at
the NI of the EU are described in ANSI T1.413 Issue 2 *Network and Customer
Installation Interfaces - Asymmetric Digital Subscriber Line (ADSL) Metallic Interface.*
The Physical Network Interface is at the NID.

The UPS Customer Channel in combination with a CLEC provided loop is provided
to the CLEC at the Field Connection Point (FCP). The signal characteristic at the
Network Interface is described ANSI T1.413 Issue 2 *Network and Customer
Installation Interfaces - Asymmetric Digital Subscriber Line (ADSL) Metallic Interface.*

3.2   Network Interface Power Levels

Information about the Network Interface Power levels for the UPS ATM Interface
Port can be found in Technical Publication 77378, *Qwest ATM Service.*

3.3   Network Channel (NC) Codes

3.3.1   General

Network Channel (NC) codes are a part of the Bellcore COMMON LANGUAGE®
code set. The NC code is used to identify a channel used with the service. This
section identifies the available channels and their NC codes.

3.3.2   Format

An NC code is a four-character code with two data elements:

> Channel Code
> Optional Feature Code

The format is illustrated in Figure 3-1.

Network Channel Code			
Data Element	Channel Code		Optional Feature Code	
Character Position	1	2	3	4
Character Key	X	X	X or -	X or -
X = Alphanumeric - = Hyphen				

Figure 3-1 Format Structure for NC Codes

The **Channel Code** (character positions 1 and 2) is a two-character alpha or
alphanumeric code that describes the channel service in an abbreviated form. The
channel code will frequently, but not always, be specified as the service code of the
special service circuits or the transmission grade of the message trunk circuit. The
NC channel code field is always filled.

The **Optional Feature Code** (character positions 3 and 4) is a two-character alpha or
alphanumeric or hyphen code that represents the option codes available for each
channel code. Varying combinations of this code will allow the customer to
enhance the technical performance of the requested channel, or to further identify
the type of service. It is also used to specify options such as conditioning, effective
4-wire, multiplexing, etc. The NC optional code field is always filled.

Further information about NC Codes may be found in ANSI T1.223-1997,
*Information Interchange — Structure and Representation of Network Channel (NC) and
Network Channel Interface (NCI) Codes for the North American Telecommunications
System.*

3.3.3   Network Channel Codes for the UPS ATM Switch Interface Port

For the UPS ATM Switch Interface Port, the first two characters indicate the requested family of services. The third and fourth characters provide additional features as needed.

Table 3-1 lists the available NC codes for the UPS ATM Interface Port associated with the Qwest Corporation Unbundled Packet Switching Service.

Table 3-1 Available NC Codes —UPS ATM Switch Interface Port

Network Channel Code	D e s c r i p t i o n
	OC-12 (622.080 Mbit/s)
OD-P	OC-12 SONET, None/ Point to Point, Optical termination on a switch (e.g. ATM)
ODAP	OC-12 SONET, Loop Timing / Point to Point, Optical termination on a switch (e.g. ATM)
ODBP	OC-12 SONET, External Timing / Point to Point, Optical termination on a switch (e.g. ATM)
	OC-3 (155.520 Mbit/s)
OB-P	OC-3 SONET, None/ Point to Point, Optical termination on a switch (e.g. ATM)
OBAP	OC-3 SONET, Loop Timing / Point to Point, Optical termination on a switch (e.g. ATM)
OBBP	OC-3 SONET, External Timing / Point to Point, Optical termination on a switch (e.g. ATM)
	DS3 (44.736 Mbit/s)
HFCA	High Capacity Channel Service HC3, C-Bit Parity M Framed, PLCP Mapped ATM Cells
HFCB	High Capacity channel Service HC3, C Bit Parity M Framed, Direct Mapped ATM
	DS1 (1.544 Mbit/s)
HCEJ	ANSI ESF and B8ZS, ATM Termination

3.3.4   Available NC Codes for the UPS Customer Channel

For the UPS Customer Channel, the first two Characters are AC indicating ADSL. The third character indicates DMT and the fourth character provides the upstream and downstream speeds.

Table 3-2 lists the available NC codes for the DMT RADSL Interface for the UPS Customer Channel with Shared, Unbundled Line Split, and CLEC provided Distribution loop.

Table 3-2 Available NC Codes – UPS Customer Channel

Network Channel Code	D e s c r i p t i o n
AC-H	ADSL Discrete Multi-tone (DMT) per ANSI T1.413 1998, Provisioned speed of 256 Kbps downstream and upstream
AC-I	ADSL Discrete Multi-tone (DMT) per ANSI T1.413 1998, Provisioned speed of 640 Kbps downstream and 256kbps upstream
AC-C	ADSL Discrete Multi-tone (DMT) per ANSI T1.413 1998, Provisioned speed up to 640kps downstream and 640kps upstream
AC-J	ADSL Discrete Multi-tone (DMT) per ANSI T1.413 1998 up to 1.024 Mbps of data downstream and 1 Mbps upstream.
AC-K	ADSL Discrete Multi-tone (DMT) per ANSI T1.413 1998 up to 4 Mbps of data downstream and 1 Mbps upstream. (This speed not available at this time).
AC-L	ADSL Discrete Multi-tone (DMT) per ANSI T1.413 1998 up to 7 Mbps of data downstream and 1 Mbps upstream (This speed not available at this time).

3.4   Network Channel Interface (NCI) Codes

3.4.1   General

Network Channel Interface (NCI) codes are a part of the COMMON LANGUAGE® code set. The NCI code is used to identify a network interface of a service in our mechanized systems.

3.4.2   Format

An NCI code is a maximum twelve-character code that consists of five (5) data elements:

Total Conductors
Protocol
Impedance
Protocol Options
Transmission Level Point(s) (TLP)

The first three fields are required. The last two are optional. The format is illustrated in Figure 3-2.

Network Channel Interface Code											
Total Conductors		Protocol		I	D	Protocol Options			D	TLP Level	
				Impedance	Delimeter				Delimiter	Transmit	Receive
1	2	3	4	5	6	7	8	9	10	11	12
N	N	A	A	X	•	X	X	X	•	X or -	X or -
A = Alpha N = Numeric X = Alphanumeric • = Delimiter (normally a period) - = Hyphen											

Figure 3-2 Format Structure for NCI Codes

Total Conductors (character positions 1 and 2) is a two-character numeric code that represents the total number of physical conductors (e.g., wires or fibers) required at the interface.

Protocol (character position 3 and 4) is a two-character alpha code that defines requirements for the interface regarding signaling/transmission.

Impedance (character position 5) is a one-character alpha or numeric code representing the nominal reference impedance that will terminate the channel for the purpose of evaluating transmission performance. Values are listed in Table 3-3

Table 3-3 NCI Impedance Values

Impedance in Ohms (Character Position 5)			
Data Value	Code	Data Value	Code
110	0	124	7
150	1	Variable	8
600	2	100	9
900	3 *	Fiber	F
1200	4	Radio	Z
135	5	50 Coaxial	C
75	6		
* Except for interface code 04DD3, the impedance character 3, when used with a 4-wire voice-frequency path at the POT, denotes a historical customer (IC) provided transmission termination rather than a 900 ohm impedance. Such terminations were provided by customers in accordance with FCC Docket No. 20099 settlement Agreement and by Automatic Transmission Test and Control Circuit used in the previous provisioning process.			

Protocol Options (character positions 7, 8, and 9) is a one to three-character alpha, numeric, or alphanumeric code that describes additional features (e.g., bit rate or bandwidth) on the Protocol to be used. It is an optional field that is always left justified.

Transmission Level Point(s) (character positions 8 through 12) is assigned one or two-character alpha code corresponding to a value for Transmission Level Point(s) (TLPs) from either the Exchange Carrier/service provider or customer end. The convention for TLP Levels is as follows:

- Transmitting TLP Level signifies the TLP transmit signal level at the U S WEST interface when transmitting to the customer.

- Receiving TLP Level signifies the TLP transmit signal level at the U S WEST interface when receiving from the customer.

Further information about NCI Codes may be found in ANSI T1.223-1997.

3.4.3   Available Network Channel Interface Codes for UPS 622.080 Mbit/s ATM Switch Interface Port

Table 3-4 lists the NCI codes valid for UPS 622.080 Mbit/s ATM Switch Interface Port.

Table 3-4 NCI Codes for UPS 622.080 Mbit/s ATM Switch Interface Port

Network Channel Interface Codes	Description
FDP Interface	
02SOF.D	IR1-SLM (Intermediate Reach Single – Longitudinal Mode)
02SOF.B	LR1-SLM (Long Reach – Single Longitudinal Mode)
ICDF Interface	
02QBF.LL	Central Office Manual Cross-Connect Termination with No Subrating Capability, Fiber Cross-Connect or Fiber Distribution Bay

3.4.4   Available Network Channel Interface Codes for UPS 155.520 Mbit/s ATM Switch Interface Port

Table 3-5 lists the NCI codes valid for UPS 155.520 Mbit/s ATM Switch Interface Port.

Table 3-5 NCI Codes for UPS 155.520 Mbit/s ATM Switch Interface Port

Network Channel Interface Codes	Description
FDP Interface	
02SOF.D	IR1-SLM (Intermediate Reach Single – Longitudinal Mode)
02SOF.B	LR1-SLM (Long Reach – Single Longitudinal Mode)
04SOF.D	IR1-SLM (Intermediate Reach Single – Longitudinal Mode)
04SOF.B	LR1-SLM (Long Reach – Single Longitudinal Mode)
ICDF Interface	
02QBF.LL	Central Office Manual Cross-Connect Termination with No Subrating Capability, Fiber Cross-Connect or Fiber Distribution Bay
04QBF.LL	Central Office Manual Cross-Connect Termination with No Subrating Capability, Fiber Cross-Connect or Fiber Distribution Bay

3.4.5 Available Network Channel Interface Codes for UPS 44.736 Mbit/s ATM Switch Interface Port

Table 3-6 lists the NCI codes valid for UPS 44.736 Mbit/s ATM Switch Interface Port.

Table 3-6 NCI Codes for UPS 44.736 Mbit/s ATM Switch Interface Port

Network Channel Interface Codes	Description
DSX Interface	
04DS6.44A	44.736 Mbit/s (DS3) Unchannelized Application and C-Bit Parity
ICDF Interface	
04QB6.33	44.736 Mbit/s Payload, Central Office Manual Cross-Connect Termination with No Subrating capability

3.4.6 Available Network Channel Interface Codes for UPS 1.544 Mbit/s ATM Interface Port

Table 3-7 lists the NCI codes valid for UPS 1.544 Mbit/s ATM Interface Port.

Table 3-7 NCI Codes for UPS 1.544 Mbit/s ATM Interface Port

Network Channel Interface Codes	Description
DSX Interface	
04DS9.1S	1.544 Mbit/s (DS1) ANSI ESF and B8ZS Clear Channel Capability per GR-342-Core
ICDF Interface	
04QB9.11	DS1 to DS1 Central Office Manual Cross-Connect Termination with No Subrating Capability, may or may not meet DS1 signal levels as specified in GR-342-Core

3.4.7 Available Network Channel Interface Codes for UPS Customer Channel with Shared Distribution Loop

Table 3-8 lists the NCI codes valid for the UPS Customer Channel with Shared Distribution Loop.

Table 3-8 NCI Codes for UPS Customer Channel with Shared Distribution Loop

Network Channel Interface Codes	Description
02DU9.01A	One POTS Channel ADSL per T1.413

3.4.8 Available Network Channel Interface Codes for UPS Customer Channel with Line Split Distribution Loop

Table 3-9 lists the NCI codes valid for the UPS Customer Channel with Line Split Distribution Loop (The Line Split Distribution Loop is not available at this time).

Table 3-9 NCI Codes for UPS Customer Channel with Line Split Distribution Loop

Network Channel Interface Codes	Description
02DU9.01A	One POTS Channel ADSL per T1.413

3.4.9 Available Network Channel Interface Codes for UPS Customer Channel with Unbundled Distribution Loop

Table 3-10 lists the NCI codes valid for the UPS Customer Channel with Unbundled Distribution Loop.

Table 3-10 NCI Codes for UPS Customer Channel with Unbundled Distribution Loop

Network Channel Interface Codes	Description
02DU9.00A	ADSL Using DMT Format

3.4.10 Available Network Channel Interface Codes for UPS Customer Channel with CLEC provided Distribution Loop

Table 3-11 lists the NCI codes valid for the UPS Customer Channel with CLEC provided Distribution Loop.

Table 3-11 NCI Codes for UPS Customer Channel with CLEC Provided Loop

Network Channel Interface Codes	Description
02QE9.005	Field Location Manual Cross-Connect Termination with No Sub-rate Capability (Outside Plant Cross-Connect Location) with Spectrum Management Class 5

3.5   Valid Network Channel/Network Channel Interface Combinations

This section describes valid combinations of NC and NCI codes. The term "Digital" is used in the tables to represent a DS1 or higher-level digital interface. Representative NCI codes include 04DS9.15, 04DJ9.1S, 04DU9.BN, 04SOF.D and 04DS6.44, etc.

3.5.1   UPS ATM Switch Interface Port

Table 3-12 shows the currently available NC/NCI Code Combinations used to order a UPS ATM Switch Interface Port.

Table 3-12 UPS ATM Switch Interface Port

NC Codes	Description	NCI Codes		
OD-P	OC-12 SONET, None/ Point to Point, Optical termination on a switch (e.g. ATM)	02SOF.D	02SOF.B	02QBF.LL
ODAP	OC-12 SONET, Loop Timing / Point to Point, Optical termination on a switch (e.g. ATM)	02SOF.D	02SOF.B	02QBF.LL
ODBP	OC-12 SONET, External Timing / Point to Point, Optical termination on a switch (e.g. ATM)	02SOF.D	02SOF.B	02QBF.LL
OB-P	OC-3 SONET, None/ Point to Point, Optical termination on a switch (e.g. ATM)	02SOF.D 04SOF.D	02SOF.B 04SOF.B	02QBF.LL 04QBF.LL
OBAP	OC-3 SONET, Loop Timing / Point to Point, Optical termination on a switch (e.g. ATM)	02SOF.D 04SOF.D	02SOF.B 04SOF.B	02QBF.LL 04QBF.LL
OBBP	OC-3 SONET, External Timing / Point to Point, Optical termination on a switch (e.g. ATM)	02SOF.D 04SOF.D	02SOF.B 04SOF.B	02QBF.LL 04QBF.LL
HFCA	High Capacity Channel Service HC3, Unchannelized C-Bit Parity, PLCP Mapped ATM Cells	04QB6.33 04DS6.44A		
HFCB	High Capacity Channel Service HC3, Unchannelized C-Bit Parity, Direct Mapped ATM Cells	04QB6.33 04DS6.44A		
HECJ	1.544 Mbps ANSI ESF & B8ZS Clear Channel Capability ATM Termination per ANSI T1.403 1989 and GR-342-CORE	04QB9.11 04DS9.1S		

3.5.2 UPS Customer Channel with Shared Distribution Loop

Table 3-13 shows the currently available NC/NCI Code Combinations used to order a UPS Customer Channel with a Shared Distribution Loop.

Table 3-13 UPS Customer Channel with Shared Distribution Loop

NC CODE	NCI CODE	DESCRIPTION
AC-H	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 256 Kbps of data downstream and up to 256 Kbps upstream
AC-I	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 640 Kbps of data downstream and up to 256 Kbps upstream
AC-C	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 640 Kbps of data downstream and upstream.
AC-J	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 1.024 Mbps of data downstream and 1 Mbps upstream.
AC-K	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 4 Mbps of data downstream and 1 Mbps upstream (This speed is not available at this time). .
AC-L	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 7 Mbps of data downstream and 1 Mbps upstream (This speed is not available at this time).

3.5.3   UPS Customer Channel with Line Split Distribution Loop

Table 3-14 shows the currently available NC/NCI Code Combinations used to
order a UPS Customer Channel with a Line Split Distribution Loop.

Table 3-14 UPS Customer Channel with Line Split Distribution Loop

NC CODE	NCI CODE	DESCRIPTION
AC-H	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 256 Kbps of data downstream and up to 256 Kbps upstream
AC-I	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 640 Kbps of data downstream and up to 256 Kbps upstream
AC-C	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 640 Kbps of data downstream and upstream.
AC-J	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 1.024 Mbps of data downstream and 1 Mbps upstream.
AC-K	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 4 Mbps of data downstream and 1 Mbps upstream (This speed is unavailable at this time).
AC-L	02DU9.01A	DMT RADSL line with one POTS Channel and with up to 7 Mbps of data downstream and 1 Mbps upstream (This speed is unavailable at this time).

3.5.4   UPS Customer Channel with Unbundled Distribution Loop

Table 3-15 shows the currently available NC/NCI Code Combinations used to
order a UPS Customer Channel with an Unbundled Distribution Loop.

Table 3-15 UPS Customer Channel with Unbundled Distribution Loop

NC CODE	NCI CODE	DESCRIPTION
AC-H	02DU9.00A	DMT RADSL line with up to 256 Kbps of data downstream and up to 256 Kbps upstream
AC-I	02DU9.00A	DMT RADSL line with up to 640 Kbps of data downstream and up to 256 Kbps upstream
AC-C	02DU9.00A	DMT RADSL line with up to 640 Kbps of data downstream and upstream.
AC-J	02DU9.00A	DMT RADSL line with up to 1.024 Mbps of data downstream and 1 Mbps upstream.
AC-K	02DU9.00A	DMT RADSL line with up to 4 Mbps of data downstream and 1 Mbps upstream (This speed is not available at this time).
AC-L	02DU9.00A	DMT RADSL line with up to 7 Mbps of data downstream and 1 Mbps upstream (This speed is not available at this time).

3.5.5 UPS Customer Channel with a CLEC Provided Distribution Loop

Table 3-16 shows the currently available NC/NCI Code Combinations used to order a UPS Customer Channel with a CLEC Provided Distribution Loop.

Table 3-16 UPS Customer Channel with CLEC Provided Distribution Loop

NC CODE	NCI CODE	DESCRIPTION
AC-H	02QE9.005	Field Location Manual Cross-Connect Termination with No Sub-rate Capability (Outside Plant Cross-Connect Location) with Spectrum Management Class 5, DMT RADSL line with up to 256 Kbps of data downstream and up to 256 Kbps upstream
AC-I	02QE9.005	Field Location Manual Cross-Connect Termination with No Sub-rate Capability (Outside Plant Cross-Connect Location) with Spectrum Management Class 5, DMT RADSL line with up to 640 Kbps of data downstream and up to 256 Kbps upstream
AC-C	02QE9.005	Field Location Manual Cross-Connect Termination with No Sub-rate Capability (Outside Plant Cross-Connect Location) with Spectrum Management Class 5, DMT RADSL line with up to 640 Kbps of data downstream and upstream.
AC-J	02QE9.005	Field Location Manual Cross-Connect Termination with No Sub-rate Capability (Outside Plant Cross-Connect Location) with Spectrum Management Class 5, DMT RADSL line with up to 1.024 Mbps of data downstream and 1 Mbps upstream.
AC-K	02QE9.005	Field Location Manual Cross-Connect Termination with No Sub-rate Capability (Outside Plant Cross-Connect Location) with Spectrum Management Class 5, DMT RADSL line with up to 4 Mbps of data downstream and 1 Mbps upstream (This speed is not available at this time).
AC-L	02QE9.005	Field Location Manual Cross-Connect Termination with No Sub-rate Capability (Outside Plant Cross-Connect Location) with Spectrum Management Class 5, DMT RADSL line with up to 7 Mbps of data downstream and 1 Mbps upstream (This speed I snot available at this time)..

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4.   Responsibilities

4.1   Design Responsibilities

The CLEC is responsible for all equipment on the CLEC side of the ICDF. Similarly, if the CLEC has chosen to provide their own distribution loop with the UPS Customer Channel, they are also responsible for all equipment on the CLEC side of the Network Interface at the FCP.

At the End-User premise, the CLEC and End-User must decide their respective responsibilities on their side of the Network Interface.

4.1.1   Qwest Responsibilities

Qwest will provide the ADSL Loop Qualification information via the ADSL Loop Qualification Tool through IMA 4.2. The loop qualification tool works with either the End User telephone number or station address. IMA will provide the following local loop cable information:

- Total cable length in kilo feet
- Total bridged tap length in kilo feet
- The presence of Load Coils in the loop
- The presence of Digital Loop Electronics (DLC, UDS, etc)
- An insertion loss calculation based on 196 kHz with 135-Ohm termination.

For additional information regarding the ADSL Qualification Tool refer to PUB 77406

4.1.2   Customer Responsibilities

The CLEC and/or End-User are responsible for obtaining and providing CPE and Microfilters (as necessary) compatible with the Qwest DSLAM as specified in Chapter 2. It is the CLECs responsibility to ensure that the loop they order with the UPS Customer Channel can support their desired data rate.

CLECs meeting Qwest on the customer premise must make arrangements with the property owner for any required access.

4.2   Maintenance Responsibilities

Joint testing between the CLEC and Qwest will not be available.

4.2.1   Qwest Responsibilities

Qwest will provide the CLEC with a trouble report telephone number. Upon request, Qwest will initiate actions specified in the Service Interval Guide to clear the trouble.

Since CLECs will not have access to the NMS, Qwest will notify CLECs of any problems detected with the UPS ATM Switch Interface Ports.

Service restoration will be nondiscriminatory.

4.2.2   Customer Responsibilities

The CLEC or their responsible agent must sectionalize trouble conditions and verify that the trouble is not a CLEC owned equipment or cable before calling the applicable Qwest Repair Center. The CLEC must provide Qwest with this information before Qwest will dispatch to repair.

If the trouble is isolated to End-User owned equipment, the CLEC or End-User is responsible for clearing the trouble and restoring the service to normal based on their joint agreement.

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5.   Definitions

5.1   Acronyms

AAL	ATM Adaptive Layer
ADSL	Asymmetric Digital Subscriber Line
ANSI	American National Standards Institute
ATM	Asynchronous Transfer Mode
B8ZS	Bipolar with 8 Zero Substitution
bps	Bits Per Second (Now bit/s)
BW	Bandwidth
CLEC	1) Certified Local Exchange Carrier 2) Competitive Local Exchange Carrier
CO	Central Office
CPE	1) Customer Provided Equipment 2) Customer Premises Equipment
CRS	Cell Relay Service
CSU	Channel Service Unit
DLCI	Data Link Correction Identifier
DMT	Discrete Multi-tone
DS	Digital Signal
DS1	High Capacity 1.544 Mbit/s Service Digital Signal Level 1 (1.544 Mbit/s)
DS3	High Capacity 44.736 Mbit/s Service Digital Signal Level 3 (44.736 Mbit/s)
DSL	Digital Subscriber Line
DSU	1) Digital Service Unit 2) Data Service Unit
DSX	Digital Signal Cross-Connect
DSX-1	Digital Signal Level 1 Cross-Connect
DSX-3	Digital Signal Level 3 Cross-Connect
DTE	Data Terminal Equipment

ESP	Enhanced Service Provider
EU	End-User
EU-POT	End-User-Point of Termination
FCC	Federal Communications Commission
FDDI	Fiber Distributed Data Interface
FDP	Fiber Distribution Panel
ICDF	InterConnect Distribution Frame
ICL	Inserted Connection Loss
IEEE	Institute for Electrical and Electronic Engineers
IntraLATA	IntraLocal Access and Transport Area
IP	Internet Protocol
ITU	International Telecommunication Union (formerly CCITT)
kbit/s	kilobits per second (1,000 bit/s)
LAN	Local Area Network
LATA	Local Access and Transport Area
LEC	Local Exchange Carrier
M23	M23 multiplexer application
Mbit/s	Megabit per Second
MBL	Mini-Bridge Lifter
MODEM	MOdulator/DEModulator
MUX	Multiplexer
NC	Network Channel
NCI	Network Channel Interface
NCTE	Network Channel Terminating Equipment
NE	Network Element
NECA	National Exchange Carrier Association
NI	Network Interface
NM	Network Management
NMS	Network Management System

NNI	Network-to-Network Interface
PDN	Packet Data Network
POTS	Plain Old Telephone Service
PPSN	Public Packet Switched Network
PSI	Packet Switching Interface
PSN	Public Switched Network
PSTN	Public Switched Telephone Network
PVC	Permanent Virtual Connection
PVN	Private Virtual Network
QoS	Quality of Service
RADSL	Rate Adaptive Digital Subscriber Line
SECNCI	Secondary NCI
SEFS	Severely Errored Frame Seconds
SES	Severely Errored Second
TLP	Transmission Level Point
TLS	Transparent LAN Service
TMN	Telecommunications Management Network
TMNA	Telecommunications Management Network Applications
TOC	Table of Contents
UDP	User Datagram Protocol
UNI	User-Network Interface
USOC	1) Universal Service Order Code 2) Universal Service Ordering Code
VF	Voice Frequency
VPN	Virtual Private Networks
WAN	Wide Area Network

5.2   Glossary

Acceptance (Cooperative) Tests

Those tests performed by QWEST in cooperation with the customer at a pre-negotiated time to establish new or additional service.

Acceptance Limit (AL)

The maximum deviation from a design parameter that is allowed at service turnup or customer acceptance.

Acronym

A word formed from the first (or first few) letters of a series of words.

American National Standards Institute (ANSI)

An organization supported by the telecommunications industry to establish performance and interface standards.

ATM Cell

A digital information block of fixed length (53 octets) identified by a label at the ATM Layer of the B-ISDN protocol architecture.

Asynchronous Transfer Mode (ATM)

An information transfer method in which the information is organized into fixed length (53 octet) cells. It is asynchronous in the sense that the recurrence of cells containing user information is not necessarily periodic.

Asynchronous Transmission

Not synchronous: Data transmission in which the time of occurrence of specified significant instant of a data bit (usually the leading edge) is arbitrary, and occurs without necessarily having a fixed time relationship to preceding comparable instants.

Availability

The relative amount of time that a service is "usable" by a customer, represented as a percentage over a consecutive 12 month period.

Avoidance

Bypassing a customer specified geographical area and/or wire center.

Bandwidth

The range of frequencies that contain most of the energy or power of a signal; also, the range of frequencies over which a circuit of system is designed to operate.

BAUD

A unit of signaling speed. It is the reciprocal of the time duration in seconds of the shortest signal element (binary 1 or 0) within a code signal. The rates specified are the number of signal elements per second.

Binary *n*- Zero Substitution (B*n*ZS)

Binary *n*- Zero Substitution is an application of BPRZ, and is an exception to the Alternate Mark Inversion (AMI) line-code rule. It is one method for providing bit independence for digital transmission, by providing a minimum 1s density of 1 in *n*-bits. For DS3, *n*=3; for DS1, *n*=8; for 56 kbit/s service, *n*=7, and for subrates, *n*=6. The rule of B*n*ZS is:

- Successive binary 1s (Marks) will be of opposite polarity (AMI) unless they are separated by *n* consecutive binary zeros, in which case the *n* 0s will be replaced by an *n*-bit byte containing 1s, having or causing, an intentional bipolar violation (bpv).

- For example in B6ZS, if the preceding binary 1 was +, then binary 100000011 is transmitted as signal voltage values: -000+0+-+ (the B6ZS byte is underlined). Assume the leftmost bit is transmitted first.

- In the decoding process, the B*n*ZS signature is recognized and replaced by an all zero *n*-bit byte.

Bipolar With 8 Zero Substitution (B8ZS)

Bipolar 8 Zero Substitution is an application of BPRZ and is an exception to the Alternate Mark Inversion (AMI) line-code rule. It is one method of providing bit independence for digital transmission by providing a minimum 1s density of 1 in 8 bits.

Bit (Binary Digit)

A binary unit of information. It is represented by one of two possible conditions, such as the value 0 or 1, on or off, high potential or low potential, conducting or not conducting, magnetized or demagnetized. A Bit is the smallest unit of information, by definition.

Bits/second (bit/s)

Bits per second, e.g., 1200 bit/s. In data transmission, it is the number of binary zero and one bits transmitted in 1 second. Modern terminology uses "bit/s" e.g., 1200 bit/s.

Bit Error Rate (BER)

The ratio of the number of bit errors to the total number of bits transmitted in a given time interval.

Broadband Inter-Carrier Interface (B-ICI)

An ATM-based, multi-service capable interface between two carriers that provide public ATM network service.

Broadband Inter-Switching System Interface (B-ISSI)

An ATM-based interface between two BSSs within a single LEC network capable of transporting SMDS, FRS, and other ATM-based services. The B-ISSI may be operated in a single service mode, or may carry multiple services depending on the application. In special circumstances, a BISSI may be used to interconnect two LEC networks in a single LATA.

Byte

A consecutive number of bits usually constituting a complete character or symbol. If the length of the byte is not specified, it is conventionally assumed to have a length of 8-bits. In the Digital Data System, a byte refers to an arbitrary group of 8 consecutive bits; it does not correspond to a byte of customer data.

C-Bit Parity

An M-framed application in which the C bits are used for network management and maintenance functions instead of denoting the presence or absence of stuff bits.

Call

The sequence of events begun when an End-User makes a request for service and provides an address code, and concluded when communication between the End-Users has terminated.

Carrier

An organization whose function is to provide telecommunications services. Examples are: Local Exchange Carriers, Interexchange Carriers, Cellular Carriers, etc.

Central Office (CO)

A local switching system (or a portion thereof) and its associated equipment located at a wire center.

Certified Local Exchange Carrier (CLEC)

A Local Exchange Carrier certified to do business in a state as a Local Exchange Carrier.

Channel

An electrical or photonic (in the case of fiber optic based transmission systems) communications path between two or more points of termination.

Channel Service Unit (CSU)

This unit provides regeneration of the signal received from the network, controls the pulse shape and amplitude for transmission of the signal into the network, and possibly provides loop-back. the CSU function is frequently found within a Data Service Unit (DSU).

Channelize

The process of multiplexing-demultiplexing channels using analog or digital techniques.

Character

Letter, numeral, punctuation, control figure or any other symbol contained in a message.

Clear Channel Capability (CCC)

A characteristic of a transmission path in which the bit positions allocated for customer data may represent any combination of zeroes and ones.

Customer Installation (CI)

Equipment and wiring at the customer's location on the customer side of the Network Interface.

Customer Interface

The interface with a customer at a Point of Termination.

Customer Premises

Denotes a building or portion(s) of a building occupied by a single customer or
End-User as either a place of business or residence. Adjacent buildings and the
buildings on the same continuous property occupied by the customer and not
separated by a public thoroughfare, are also considered the same customer's premises.

Customer Premises Equipment (CPE)

All telecommunication equipment located at a customer's location.

Customer Premises Equipment (CPE)

Customer telecommunications equipment, such as telephone sets, PBXs, modems and
answering machines. The FCC regulations about CPE do not cover inside wire,
coin-operated pay phones, some multiplexers, or voltage protection equipment.

Customer Provided Equipment (CPE)

Equipment owned and maintained by the customer and located on their side of the
End-User Point of Termination (EU-POT) network interface.

Customers

Denotes any individual, partnership or corporation who subscribes to the services
provided by QWEST. Customers are divided into two distinct and separate categories:
(1) carriers, who provide services for hire for others, and (2) End-Users, who request
services only for their own use.

Cyclic Redundancy Check (CRC)

A method of checking the integrity of received data, where the check uses a
polynomial algorithm based on the content of the data.

Data Communications Equipment (DCE)

The equipment that provides the functions required to establish, maintain and
terminate data transmission connections; e.g., a modem, as well as the signal
conversion and coding required for communications between data terminal
equipment and data circuit.

Data Link

The Data Link provides the electrical connection between a customer's terminal
equipment, from the Network Interface and the fiber transmission facilities to a
QWEST Serving Wire Center.

Data Link (DL) - ESF

The over head portion of a DS1 Clear Channel that may be used for carrying performance and control information across the network. This portion requires 4 kbit. In addition, framing requires 2 kbit, and Cyclic Redundancy Check requires 2 kbit.

Data Link Connection Identifier (DLCI)

The Data Link Connection Identifier is located within the address field of a frame relay packet, and is used to identify each PVC.

Data Service Unit (DSU)

Digital, customer premises equipment used to recover timing from a baseband BPRZ signal, and which converts from BPRZ line signals to a business machine interface signal such as V.35. At 64 kbit/s and below, DSU and Channel Service Unit (CSU) functions are, in modern equipment, combined in a single unit sometimes called a General Service Unit (GSU), Basic Service Unit (BSU) or Data Service Unit-A (DSU-A) so that it is part of the Data Communications Equipment (DCE). Above 64 kbit/s, DSU functions are frequently contained in the Data Terminal Equipment (DTE). the DSU usually contains circuitry to recognize, and respond to, loop-back commands from the serving test center.

Data Set Ready (DSR)

An EIA or ITU defined interface control signal that indicated to the Data Terminal Equipment (DTE) whether the Data Communications Equipment (DCE) is ready to transmit or receive data.

Data Terminal Equipment (DTE)

A generic term for customer terminal equipment that connects to the network through a modem or through digital Network Channel Terminating Equipment (NCTE), e.g., a computer or a PBX.

Data Terminal Ready (DTR)

An EIA or ITU defined control signal that indicates to the Data Terminal Equipment (DTE) that the Data Communications Equipment (DCE) is ready to transmit or receive data.

Access Line: Denotes the communications path between component stations of the

dBm

A decibel in which the reference power is one milliwatt. Decibel reference to one milliwatt.

DC Channel

A direct Current (DC) Channel is an unconditioned 2-Wire channel with DC continuity capable of transmitting low speed varying signals at rates up to 30 baud. It is also capable of providing a two-point circuit for control of a transfer arrangement, control of a relay, or similar contact closure.

Decibel (dB)

A unit measurement of transmission loss, gain, or relative level. It is the logarithmic unit of signal power ratio most commonly used in telephony. It is used to express the relationship between two signal powers, usually between two acoustical, electrical, or optical signals; it is equal to ten times the common logarithm of the ratio of the two signal powers.

Dedicated InterConnect Distribution Frame (DICDF)

An InterConnect Distribution Frame (ICDF) dedicated for the sole use of one Certified Local Exchange Carrier or Co-Provider.

Demarcation Point

See Network Interface

Demultiplexing

The opposite of multiplexing. That is, the multiplexer combines signals and the demultiplexer takes them apart again. Also see Multiplexing.

Destination Address

An 8-octet field contained within the Level 3 Protocol Data Unit which identifies a specific end point of the destination SNI.

Digital Connectivity

Denotes central offices or customer premises that are connected with digital transport facilities.

Digital Hierarchy Level

The level in the digital hierarchy. The levels and the respective bit rates are:

Level	Bit Rate	Level	Bit Rate
DS0	64.0 kbit/s	DS3	44.736 Mbit/s
DS1	1.544 Mbit/s	DS4NA	139.264 Mbit/s
DS1C	3.152 Mbit/s	DS4	274.176 Mbit/s
DS2	6.312 Mbit/s		

Digital Loop Carrier (DLC)

A digital transport facility used to carry circuits or channels on part of all of the loop between the serving wire center and the customer's location. Copper or fiber is normally used as the transport medium.

Digital Test Access Unit+ (DTAU+)

Equipment interposed in the DS1 bit stream providing access to the DS0 and DS1 bit stream for testing and performance monitoring capabilities.

Digital Transmission Facilities

May include both loop and interoffice facilities which perform multiplexing, demultiplexing, and transport of digital signals between the SS Exchange Termination and the Subscriber Access Termination.

DS1 Clear Channel

Denotes that 1.536 Mbit/s of a 1.544 Mbit/s DS1 facility are available for customer information. The remaining 8 kilobits, or overhead, are for error correction, framing, and network performance/status/information.

DTAU+ (Digital Test Access Unit)

Equipment interposed in the DS1 bit stream providing access to the DS0 and DS1 bit stream for testing and performance monitoring capabilities.

E & M Signaling Arrangements

Denotes a method of transmitting supervisory information between a switching machine or an End-User and signaling system.

Echo Control

The control of reflected signals in a telephone channel.

Echo Path Loss (EPL)

The echo path loss, in decibels, is the difference between the incident and reflected signal powers.

Echo Return Loss (ERL)

The weighted average of the return losses of all frequencies between 560 and 1965 Hz.

End Office

A designation of a QWEST switching system that occupies the lowest level of the public switched network hierarchy. It is the designation of a switching system that connects lines to lines, and lines to trunks (a local switching system).

End-User (EU)

The term "End-User" denotes any customer of telecommunications service that is not a carrier, except that a carrier shall be deemed to be an "End-User" to the extent that such carrier uses a telecommunications service for administrative purposes without making such service available to others, directly or indirectly. The term is frequently used to denote the difference between a Carrier interface and an interface subject to unique regulatory requirements at non-Carrier customer premises (FCC Part 68, etc.)

End-User POT (EU-POT)

The Network Interface at the End-User's premises at which QWEST Communication, Inc.'s responsibility for the provision of service ends.

Errored Second (ES)

A one second interval with one or more bit errors.

Note - A period of no signal shall be considered a period of errored bits.

Exchange

A unit established by QWEST for the administration of communications service in a specified geographic area that usually embraces a city, town, or village and its environs.

Expanded Interconnection Channel Termination (EICT)

A QWEST-provided Channel Termination for the communications path or channel between Interconnector-Designated Equipment (through an interconnection arrangement) and a QWEST private line, switched access or other service or Unbundled Network Element.

Extended Superframe (ESF) Format

An Extended Superframe consists of twenty-four consecutive DS1 frames. Bit one of each frame (the F-bit) is time shared during the 24 frames to describe a 6 bit frame pattern, a 6 bit Cyclic Redundancy Check (CRC) remainder, and a 12 bit data link. The transfer rate of each is 2 kbit/s, 2 kbit/s, and 4 kbit/s respectively.

Facility Termination Point

Generic term for the point of termination, in the Wire Center, for a cable pair, optic fiber, microwave signal, etc.

Facilities

Facilities are the transmission paths between the demarcation points serving customer locations, a demarcation point serving a customer location and a QWEST Central Office, or two QWEST offices.

Interconnector

Any customer who subscribes to Expanded Interconnection-Collocation (EIC) Service and who provides fiber optic or (where permitted) metallic facilities to QWEST-designated locations for connection to EIC Service.

InterConnect Distribution Frame (ICDF)

The generic name for a cross-connect frame(s) designated as the Network Interface between QWEST and a collocated Certified Local Exchange Carrier or Co-Provider. ICDFs are generally level-specific (e.g., DS0/voice, DS1, DS3 or optical). These frames typically serve other purposes and normally will have a more specific name depending on usage in a specific wire center.

Interconnector-Designated Equipment (IDE)

Equipment under control of an Interconnector, whether owned by the Interconnector in physical space, or leased to QWEST for Virtual Collocation.

Interconnector's Facilities

The fiber optic or (where permitted) metallic cable owned by the Interconnector for the sole use of the Interconnector in conjunction with Expanded Interconnection-Collocation Service.

Interexchange Carrier (IC)/(IEC) or Interexchange Common Carrier

Any individual, partnership, association, joint-stock company, trust, governmental entity or corporation engaged for hire in interexchange, interstate or foreign communication by wire or radio.

Interface Code

See Network Channel Interface

Layer 1

Physical Layer. Provides the transparent transmission of bit streams between systems including relaying through different media.

Layer 2

Data Link Layer. Provides the transfer of software between directly connected systems and detects any errors in the transfer. Establishes, maintains and releases software data links; handles error and flow control.

Layer 3

Network Layer. Provides routing and relaying through intermediate systems. Also handles segmenting, blocking, error recovery, and flow control.

Layer 4

Transport Layer. Provides the transparent transfer of software between end systems. Handles end-to-end control, multiplexing, and mapping.

Layer 5

Session Layer. Provides administration and control sessions between application processes and manages their data.

Layer 6

Presentation Layer. Provides representation, interpretation, format and code transformation of information communicated between or referred to by application processes. MEDIACC uses standard ASN.1 representations for all messages and data communicated remotely. It uses standard presentation encoding, decoding, and transfer syntax's.

Layer 7

Application Layer. Provides a window between application processes in order to exchange meaningful information. Performs management functions.

Line

The transport facility (cable pair or carrier channel) between the Central Office and Network Channel Interface.

Loaded Cable

Inductance, in the form of "Load Coils", is placed on longer metallic cables to improve the cable's voice transmission performance.

Local Access and Transport Area (LATA)

A geographic area for the provision and administration of communications service. It encompasses designated exchanges that are grouped to serve common social, economic and other purposes.

Local Area Network (LAN)

Network permitting the interconnection and intercommunication of a group of computers, primarily for the sharing or resources such as data storage devices and printers.

Local Exchange Carrier (LEC)

Any company or corporation engaged for hire in providing Access and intraLATA communications services.

Loop

The facility which connects the Local Wire Center to the customer's location.

Loopback

An out-of-service test procedure applied to a full duplex channel that causes a received signal to be returned to the source.

Megabit per Second (Mbit/s)

One million (1,000,000) bits per second

Metallic Facilities

A facility that consists of continuous metallic conductors, i.e., devoid of electronic enhancements that would corrupt Direct Current continuity.

Modulator/DEModulator (Modem)

A contraction formed from the words modulator and demodulator to describe electronic equipment having both of these capabilities. A modem is a Data Communications Equipment (DCE) device to convert business machine interface, e.g. RS232, to voiceband signals suitable for transmission over a telecommunications channel.

Multiplex

See multiplexer

Multiplexer (Mux)

Equipment used to multiplex, or do multiplexing: Multiplexing is a technique of modulating (analog) or interleaving (digital) multiple, relatively narrow bandwidth channels into a single channel having a wider bandwidth (analog) or higher bit-rate (digital). The term Multiplexer implies the demultiplexing function is present to reverse the process so it is not usually stated.

Network

The interconnected telecommunications equipment and facilities.

Network Channel (NC) Code

The Network Channel (NC) code is an encoded representation used to identify both switched and non-switched channel services. Included in this code set are customer options associated with individual channel services, or feature groups and other switched services.

Network Channel Interface (NCI) Code

The Network Channel Interface (NCI) code is an encoded representation used to identify five (5) interface elements located at a Point of Termination (POT) at a central office or at the Network Interface at a customer location. The Interface code elements are: Total Conductors, Protocol, Impedances, Protocol Options, and Transmission Level Points (TLP). (At a digital interface, the TLP element of the NCI code is not used.)

Network Interface (NI)

The point of demarcation on the customer's premises at which QWEST's responsibility for the provision of service ends.

Octet

An eight (8) bit byte

Open Systems Interconnection (OSI)

A seven-layer network architecture being used for the definition of network protocol standards to enable any OSI-compliant computer or device to communicate with any other OSI-compliant computer or device for a meaningful exchange of information.

Packet

A unit of data, consisting of binary digits including data and call-control signals, that is switched and transmitted as a composite whole.

Packet Switched Network

A switched network which provides connection for forwarding standard data packets between user parties.

Permanent Virtual Connection (PVC)

An ATM connection that is established during provisioning of the circuit and torn when the customer disconnects their ATM service.

Physical Layer

Layer one of the OSI model which allows the protocol to provide the transmission of information on the transmission facility. It is concerned with the physical and electrical characteristics of the interface.

Physical Layer Convergence Protocol

Physical Layer Convergence Protocol: the IEEE 802.6 defines The PLCP. It is used for DS3 transmission of ATM. ATM cells are encapsulated in a 125 microsecond frame defined by the PLCP which is defined inside the DS3 M-frame.

Physical Signaling

That portion of the physical layer, contained within the Data Terminal Equipment (DTE) that provides the logical and functional coupling between Medium Attachment Unit (MAU) and Data Link Layers. Shown in IEEE Std. 802.3-1985 Figure 8-1.

Point of Presence (POP)

A physical location within a LATA at which an Interexchange Carrier (IC) establishes itself for the purpose of obtaining LATA access and to which QWEST provides access service.

Point of Termination (POT)

The physical telecommunications interface that establishes the technical interface, the test point(s), and the point(s) of operational responsibility. (See Network Interface).

Point-To-Point

A circuit connecting two (and only two) points.

Port

A place at which energy or signals enter or leave a device, circuit, etc.

Premises

Denotes a building or portion(s) of a building occupied by a single customer or End-User either as a place of business or residence.

Protocol

The rules for communication system operation which must be followed if communication is to be effected; the complete interaction of all possible series of messages across an interface. Protocols may govern portions of a network, types of service, or administrative procedures.

Protocol Code

The Protocol (character positions 3 and 4 or the Network Channel Interface [NCI] Code) is a two-character alpha code that defines requirements for the interface regarding signaling and transmission.

Service Acceptance Limit (SAL)

The maximum deviation from a design parameter that is allowed at service turnup or customer acceptance.

Service Code (A COMMON LANGUAGE® code set)

A coded designation by which a particular Special Service Circuit may be identified. This designation must be unique, in a form that is readable and understandable, and be acceptable for both manual and mechanized procedures. [Special Service, as used by COMMON LANGUAGE®, may be called "Private Line", "Private Line Transport", "Switched Specials", "Dedicated Access", "Special Access", etc. in various tariffs and technical publications. Special Service is actually: COMMON LANGUAGE® Circuit Identification - Special Service, (abbreviated CLCI™ - S/S).]

Serving Area

Geographic area which is normally provided telecommunications services via one Wire Center.

Serving Wire Center

The term "Serving Wire Center" denotes a QWEST Central Office from which dial tone for the local Exchange Service would normally be provided to the demarcation point on the property at which the customer is served.

Signaling

The transmission of information to establish, monitor, or release connections and/or provide Network Control.

SONET

Synchronous Optical Network (SONET): A standard providing electrical and optical specifications for the physical and higher layers, the first stage of which is at 51.84 Mbit/s, the Optical Channel 1 (OC1) level. Other rates, defined as OCn where n=3 through a number not yet firm, are possible.

Superframe Format (SF)

A superframe consists of 12 consecutive DS1 frames. Bit one of each frame (the F-bit) is used to describe a 12-bit framing pattern during the 12 frames.

Switch Port

A point of access to a switching system (or portion thereof) and its associated equipment.

Throughput *

The total capability of equipment to process or transmit data during a specified time period.

Transmission Control Protocol/Internet Protocol (TCP/IP)

Internetworking software suite originated on the Department of Defense's Arpanet network. IP corresponds to Open Systems Interconnection (OSI) network Level 3, TCP to OSI Layer 4 and 5.

Transmission Level Point (TLP)

A point in a transmission system at which the ratio, usually expressed in decibels, of the power of a test signal at that point to the power of the test signal at a reference point, is specified. For example, a zero transmission level point (0 TLP) is an arbitrarily established point in a communication circuit to which all relative levels at other points in the circuit are referred.

Unbundled Network Element

Portions of QWEST's network that have been unbundled or segmented for sale to Certified Local Exchange Carriers (CLECs). These elements are described in QWEST Technical Publications, tariffs, contracts or other documents. The CLEC may combine the Unbundled Network Element with their equipment and/or other QWEST services or Unbundled Network Elements to provide CLEC-designed services for their customers. The combination of these elements and services may or may not be the same as similar QWEST-designed services. Typical examples include Unbundled Loops and Unbundled Switch Ports.

Uniform Service Order Code (USOC)

The term "Uniform Service Order Code" denotes a three or five character alphabetic, numeric, or an alphanumeric code that identifies a specific item of service or equipment. Uniform Service Order Codes are used in QWEST billing system to generate recurring rates and non recurring charges.

Virtual Expanded Interconnection-Collocation (VEIC)

An arrangement whereby an Interconnector's fiber optic or (where permitted) metallic facilities are connected at a point of interconnection designated by QWEST outside of a QWEST wire center to QWEST-owned fiber optic or (where permitted) metallic entrance facilities and Interconnector-owned basic transmission terminating equipment installed and maintained by QWEST or its representative.

Virtual Channel (VC)

A logical association between the end points of a link (e.g., an ISSI transmission path) that enables unidirectional transfer of ATM cells over that link.

Virtual Channel Connection (VCC)

A concatenation of virtual channel links that extends between the points where the ATM service users access the ATM layer.

Virtual Channel Link (VCL)

A means of unidirectional transport of ATM cells between a point where a virtual channel identifier (VCI) value is assigned and the point where that value is translated or removed.

Virtual Path (VP)

A concept used to describe unidirectional transport of ATM cells belonging to virtual channels that are associated by a common identifier value.

Virtual Path Connection (VPC)

A concatenation of virtual path links that extends between the point where the values are assigned and the point where those virtual channel identifier values are translated or removed.

Virtual Path Link (VPL)

A means of unidirectional transport of ATM cells between the point where a VPI value is assigned and the point where that value is translated or removed. **Voice Grade (VG)**

A term used to describe a channel, circuit, facility or service that is suitable for the transmission of speech, digital or analog data or facsimile, generally with a frequency range of about 300 to 3000 Hz.

Voiceband

Relating to the frequency spectrum from 300 to 3000 Hz.

Wire Center

A building in which one or more central offices, used for the provision of local exchange services, are located.

xDSL

Term used to generically denote the family of digital subscriber line (DSL) technologies.

CONTENTS

6.   References

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ANSI T1.223-1997   *Information Interchange — Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for the North American Telecommunications System.*

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ANSI T1.511-1994   B-ISDN ATM Layer Cell Transfer - Performance Parameters.

ANSI T1.646-1995   Broadband ISDN - Physical Layer Specification for User-Network Interfaces Including DS1/ATM

6.2   Telcordia Documents

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GR-499-CORE   *Transport Systems Generic Requirements (TSGR): Common Requirements.* Issue 1, December 1995.

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TR-NWT-001112   *Broadband ISDN User to Network Interface and Network Node
                       Interface Physical Layer Generic Criteria* , Issue 1, June 1993.

6.3   Qwest Corporation Technical Publications

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PUB 77346   *Synchronous Service Transport. Issue G*, January 2001

PUB 77375   Qwest Corporation *1.544 Mbit/s Channel Interfaces.* Issue D,
                       October 1995.

PUB 77378   Qwest Corporation *ATM Cell Relay Service.* Issue E, October 2001.

PUB 77386   Qwest Corporation *Interconnection and Collocation for Transport and
                       Switched Unbundled Network Elements and Finished Services.* Issue G,
                       November 2001

PUB 77392   *Qwest DSL Services.* Issue I, September 2001.

PUB 77405   Qwest Corporation *Interconnection – Unbundled Sub-Loops and Field
                       Interconnection.* Issue C, September 2001.

PUB 77406   Qwest Corporation *Interconnection – Shared Loop.* Issue B, June
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Service Interval   Updated twice yearly. Available through the Interconnect Center
Services Guide

6.4 ATM Forum Documents

ATM Forum   ATM User Network Interface Specification, Version 3.1, Prentice-Hall 1994.

ATM Forum   Traffic Management Specification, Version 4.0, April 1996.

ATM Forum   DS3 Physical Layer Interface Specification, March 1996.

ATM Forum   DS1 Physical Layer Specification, September 1994.

6.5 International Telecommunications Union (ITU)

ITU-T Recommendation I.610   OAM Principles of B-ISDN Access.

ITU-T Recommendation I.150   *B-ISDN Asynchronous Transfer Mode Functional Characteristics.*

ITU-T Recommendation I.361 *B-ISDN ATM Layer Specifications.*

6.6   Ordering Information

All documents are subject to change and their citation in this document reflects the most current information available at the time of printing. Readers are advised to check status and availability of all documents.

Those who are not QWEST employees may order:

American National Standards Institute (ANSI) documents from:

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> General Secretariat
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> Government Printing Office
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> Phone: 202 783-3238

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