Qwest Communications International Inc. Technical Publication

LAN Switching Service

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NOTICE

This document describes Qwest LAN Switching Service (LSS). LSS is designed to extend the reach of Ethernet (Institute of Electrical and Electronic Engineers [IEEE] Std. 802.3), Token Ring (IEEE Std. 802.5), and Fast Ethernet (IEEE Std. 802.3u) Local Area Networks (LANs) within a metropolitan area. The information provided in this document includes service features, technical specifications, and valid service interfaces.

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1. Introduction

1.1 General

This document describes QWEST LAN Switching Service (LSS). LSS is designed to extend the reach of Ethernet (Institute of Electrical and Electronic Engineers [IEEE] Std. 802.3), Token Ring (IEEE Std. 802.5), and 100BASE-TX (IEEE Std. 802.3u, referred to as Fast Ethernet in this publication) Local Area Networks (LANs) within a metropolitan area. The information provided in this document includes service features, technical specifications, and valid service interfaces.

LSS offers several types of LAN interfaces:

- 10 Mb Ethernet with 10 Mbps of total network bandwidth
- Fast Ethernet with 45 Mbps of total network bandwidth
- Fast Ethernet with 100 Mbps of total network bandwidth

1.2 Reason for Reissue

This document is being reissued to add Full Duplex transmission, the support of 802.1Q VLAN 1522 byte sized frames, increased performance shown by updated throughput charts and the removal of token ring.

1.3 Purpose

The purpose of this document is to describe QWEST LAN Switching Service. Technical information is furnished to allow an End-User (EU), to select an end-to-end communications channel service for internetworking separated LANs. It explains distinguishing service features, identifies applicable technical specifications, and defines valid service interfaces.

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2. Service Description

2.1 Applicability of Technical Specifications

The technical specifications presented in this document are applicable to QWEST Local Area Network (LAN) Switching Service (LSS) only. It does not attempt to describe the various types of transmission equipment utilized to provide the service.

2.2 Description of Service

QWEST LSS is a data transport service designed to interconnect LAN interfaces between customer designated premises within a Local Access and Transport Area (LATA). LSS provides a specific amount of bandwidth over the QWEST Network to support the inter-connectivity of either Ethernet LANs (operating at a data rate of 10 Mbps) or Fast Ethernet LANs (operating at data rate of 45 Mbps or 100 Mbps). Half duplex transmission is supported for the 10Mb Ethernet LAN and half or full duplex is supported for the 45 Mb and 100Mb Fast Ethernet connections. Transmission of 802.1Q VLAN 1522 byte frames is also supported over the QWEST LSS service offerings.

2.3 General Architecture

LSS establishes virtual connectivity between customer designated LANs within a LATA. LSS uses existing data communications technologies to interconnect LSS nodes. The LSS system consists of the following:

- Customer-selectable Network Interfaces (NI)
- LSS Service Points
- Customer-selectable Network Access Link (NAL)
- Up to a full mesh of Virtual Circuits through the QWEST Asynchronous Transfer Mode (ATM) Network

Connectivity between customer designated premises is accomplished by provisioning LSS Network Interfaces (NIs) up to a full mesh of Permanent Virtual Circuits (PVCs) through the QWEST ATM Network. The NI consists of the electrical interface to the Customer Provided Equipment (CPE). Between customer nodes, the NIs operate as transparent, learning bridges as defined in IEEE 802.1d. While the customer's NI operates at the full LAN rate, the actual throughput in the QWEST ATM network will be limited by the Network Access Link ordered by the customer. (Figure 2-1).

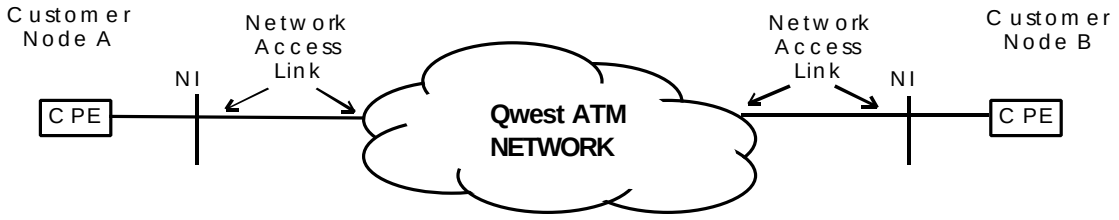

Figure 2-1: LSS and QWEST ATM Network

2.3.1 QWEST LAN Switching Service Network Interfaces (LSS NI)

The QWEST LSS NI is used to provide an electrical interface to the CPE for the service requested. The NI is the point where the CPE inter-connects with the QWEST Network. Customer data is transported over the QWEST ATM Network between customer designated LSS nodes. The associated NI at the customer location is provided and is a function of the service selection. Neither the customer's networking protocol(s) nor the data is modified by this service, which is passed transparently through the QWEST ATM Network. Security precautions are also implemented in the LSS network to ensure that traffic from different customers is not intermingled. Figure 2-2 illustrates this relationship between the LSS NI(s) and the QWEST ATM Network.

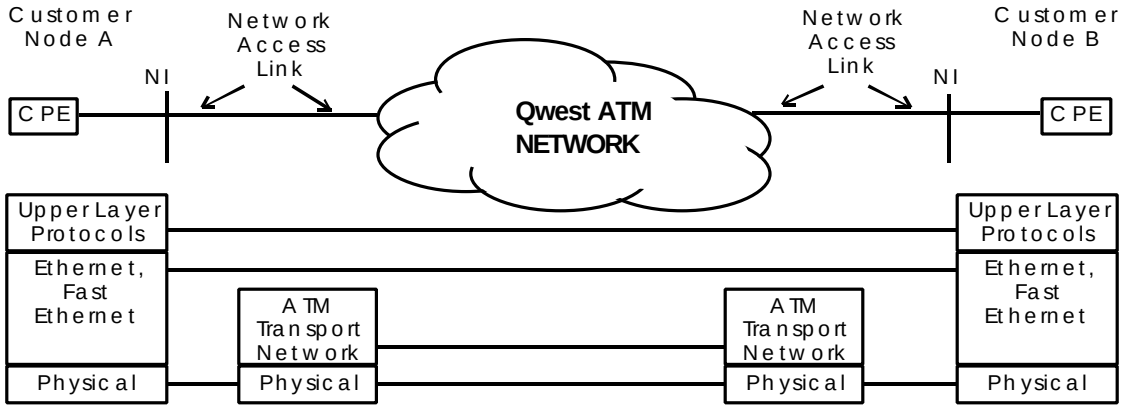

Figure 2-2: Relationship between LSS Nodes and the QWEST ATM Network

The QWEST LSS supports multiple NIs for one customer. In a typical scenario, multiple interfaces can be grouped with a discrete set of remote interfaces. For example, a customer may have five locations, each with 10 Mb Ethernet LANs. At one site ("headquarters"), this customer requires more than 10 Mbps of bandwidth. The customer could purchase multiple interfaces at headquarters, and then specify which remote sites are connected via LSS to which interface. So, two remote sites could connect to one interface at the headquarters, and the other two sites could connect to another interface at the headquarters. Because of the security precautions described above, this functions as two completely separate LSS networks. The customer would be responsible for routing between the two separate LSS networks if this functionality is required.

2.3.2 LSS Service Points

LSS Service Points are geographic locations, designated by QWEST, where the QWEST ATM Network is accessible. They are those Serving Wire Centers designated as entry points into the QWEST ATM Network. NALs are available at all LSS Service Points. Customers with a Serving Wire Center that is not designated as a LSS Service Point, will require Private Line Service or what is also known as Remote Network Access Link, to connect to the QWEST ATM Network. QWEST Technical Publications 77324 and 77346 provide more information on Private Line Service.

2.3.3 LAN Switching Service Customer-Selectable Network Access

The QWEST LSS NI connects to the QWEST ATM Network via several types of Network Access Links (NAL). The NAL are a customer-specified option. Available LSS NAL options are:

- Unprotected NAL service
- Protected NAL service
- Diverse routed option
- Private Line Service (also known as Remote NAL) as described in QWEST Technical Publications 77324, "QWEST DS3 Service", and 77346 "Synchronous Service Transport"

Unprotected NAL service provides one pair of fibers from a LSS Service Point to the NI. There is no protection or re-route capability for Unprotected NAL service.

Protected NAL service is provided over 2 pairs of fibers for a total of 4 fibers. If the "working" pair of fibers fail, the second pair or "protected" fibers are automatically activated to continue service. The standard Protected NAL DOES NOT provide a diverse route between the LSS Service Point and NI.

If the customer orders the Protected NAL service, they have the option of also requesting that the Protected NAL path be diversely routed.. The Diverse option is the same as Protected NAL, and includes the placement of the "protected" fibers over facilities separated from the working fibers by 25 feet or more. Diverse separation is from the first utility vault outside the customer's Serving Wire Center to the last utility vault or hand hole prior to the customer's

premise. The Diverse option is only available with Protected NAL. Diversity is subject to availability and special construction charges may apply. Applicable charges for the Diverse option are outlined in FCC Tariff #5, Access Service, section 11, *Special Facilities Routing of Access Services - Diversity.*

Private Line Service or a Remote Network Access Link service, provides an access link between the LSS NI and the QWEST ATM Network when the customer's Serving Wire Center is not a LSS Service Point. Private Line Service must be used for LSS access at those QWEST Serving Wire Centers not designated as LSS Service Points.

2.3.4 Connectivity Utilizing Virtual Circuits

End-to-end connectivity is accomplished by establishing virtual circuit(s) between LSS NIs within the QWEST ATM Network. The QWEST ATM Network uses a connection-oriented, cell-based switching technology. This technology provides high efficiency and flexibility because it provides "virtual circuits or logical connections" instead of a single dedicated physical channel per destination**.** Virtual circuit implementation with LSS permits a full mesh of virtual circuits to be configured between a customer's locations. Figure 2-3 illustrates the connectivity capability available with multiple virtual circuits, represented by the dashed lines. The customer at service subscription will specify the type of NI. The mesh of virtual circuits between the LSS NIs is static and is established during provisioning.

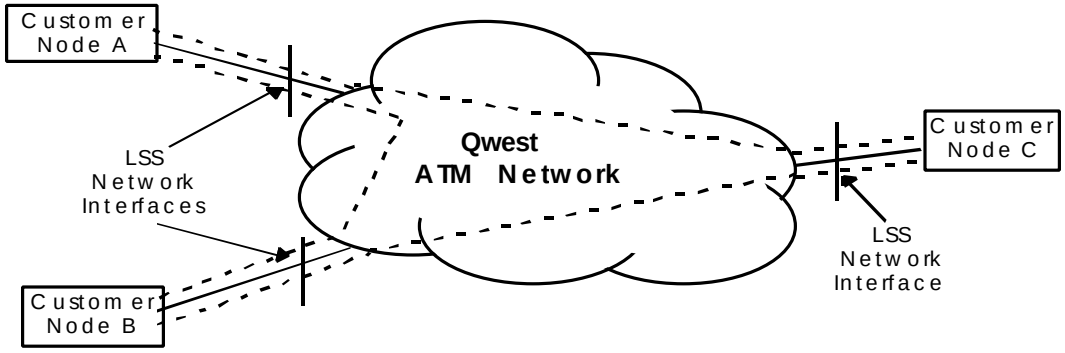

Figure 2-3: Example of LSS Node Networking Using Multiple Virtual Circuits.

2.3.5 Connectivity LSS-LSS/LSS-ATM

QWEST LSS also supports the provisioning of an ATM logical connection between two separate LSS networks and/or between LSS and ATM locations to support the inter-connectivity of LSS and ATM Network Interfaces. The logical connection between LSS-LSS or LSS-ATM locations is an ATM Permanent Virtual Circuit (PVC), which is a static connection that is established during the provisioning process. Consistent with LSS virtual connections, a Virtual Channel Connection (VCC) is implemented on an appropriate class of service (as described in the QWEST ATM Service Technical Publication 77378).

This virtual circuit will transport RFC 1483 encapsulated traffic between LSS nodes, operating as transparent learning bridges (see LSS Technical Publication, Section 2.3), and ATM locations. As a result, the ATM customer premises equipment must support RFC 1483 bridged encapsulation in order to properly identify and convert the cell payload to the appropriate LAN Ethernet frame. The traffic characteristics on the LSS links are unchanged.

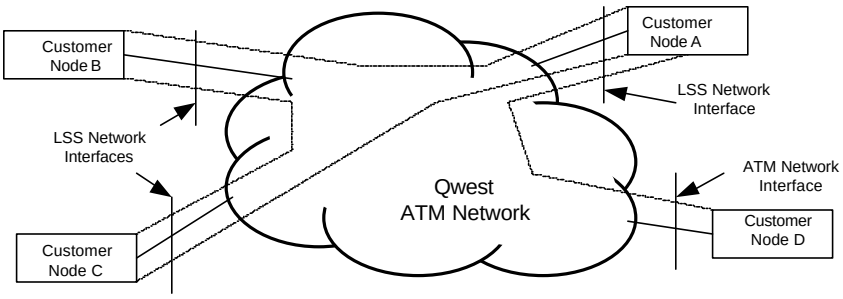

Figure 2-4: Example of LSS to ATM Networking Using a Virtual Circuit.

2.3.6 QWEST ATM Network

The QWEST LSS uses the QWEST ATM Network to transport data from one customer NI to another. The traffic parameters in the ATM Network associated with the LSS virtual circuits are based on the service rate subscribed to by the customer and the implementation the appropriate class of service. QWEST ATM Service is described in Technical Publication 77378. The publication should be consulted for a full description of this service.

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Tables

3. QWEST LAN Switching Service (LSS)

QWEST LSS provides maximum flexibility to customers by offering several Network Interface (NI) options. The LSS NI options are standard physical interfaces for the attachment of Data Terminal Equipment (DTE) to Ethernet and 100BASE-TX Ethernet (Fast Ethernet).

3.1 Description of Ethernet LAN Interface

The physical Ethernet NI shown in Table 3-1 will consist of a standard DB15 (15-pin) AUI connector, or RJ-45 (Category 5 Unshielded Twisted Pair [UTP]). A detailed description of the electrical and physical characteristics of these connectors can be obtained in IEEE Std. 802.3-1993. The NI associated with LSS for Ethernet LANs will not provide repeater functionality as described in IEEE Std. 802.3, 1993 Edition,
Section 9.

The Ethernet NI for QWEST LSS supports a nominal peak data rate of 10 Mbps and is available with two (2) different types of physical NIs described below.

Table 3-1: Ethernet Network Interface Comparisons

Network Interface	**Physical Connector**
10BASE-5, Thicknet AUI	DB15
10BASE-T, Category 5 UTP	RJ-45

The NI presented to the customer in each of the two (2) interfaces identified above is unique due to the physical and/or electrical characteristics, as well as functionality. For each type of interface, the customer can expect a signal which exhibits the characteristics of a signal which has been attenuated up to ten (10) meters of cable (i.e., the QWEST LAN Switching Service NI can utilize up to ten (10) meters of the recommended maximum cable length as referenced in IEEE Std. 802.3).

3.2 Description of 100BASE-TX Ethernet or "Fast Ethernet" LAN Interface

The Fast Ethernet LAN interface will conform to clause 25 and other applicable clauses of IEEE Std. 802.3u-1995, 100BASE-TX interface. The 100BASE-TX interface will be provided as an UTP cable by way of a RJ-45 Jack. The interface will not have the 10 Mbps and 100 Mbps auto-negotiation option enabled. Currently, the 100BASE-TX interface will support only 45 Mbps or 100 Mbps connections the LSS network.

The NI presented to the customer is unique due to the physical and/or electrical characteristics, as well as functionality. For the interface, the customer can expect a signal which exhibits the characteristics of a signal which has been attenuated up to ten (10) meters of cable (i.e., the QWEST LAN Switching Service NI can utilize up to ten (10) meters of the recommended maximum cable length as referenced in IEEE Std. 802.3u).

3.3 Network Channel (NC) Code Form

The NC code has the form HMXX, where X is a variable. There are always four (4) positions. There are neither spaces nor delimiters between the characters.

3.3.1 NC Code Components

A NC code consists of four (4) alpha/numeric characters. The first two (2) positions are the alpha Channel Codes used to define the basic channel type. The latter two (2) positions are used to identify the channel options. The option positions may take the value of a dash (-). The format is illustrated in Table 3-3. The QWEST NC codes for LSS are identified in Table 3-4.

Table 3-2: Format Structure for NC Code

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

Table 3-3: LSS NC Codes

NC Code	Option
HM - -	2-Point (Ethernet, Fast Ethernet, or Token Ring)
HMWQ	2-Point Fast Ethernet Nominal Data at 45 Mbps

3.4 Network Channel Interface (NCI) Code Form and Components

This section gives a brief description of the NCI code format. A complete description of the basic NCI (and NC) code format can be found in ANSI T1.223-1991, *Information Interchange - Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for the North American Telecommunications System.*

3.4.1 NCI Code Form

The NCI code has fields not used for digital services. Only those fields relevant to digital interfaces are discussed here. A digital NCI code has the form 15LN6.10A. The period between the 6 and 10A is a delimiter used for improved clarity. It causes the Protocol Option Code, discussed in the figure, to stand out. An NCI code has no hyphens or dashes (-).

3.4.2 NCI Code Components

A LSS NCI code has four (4) components as illustrated in Figure 3-1.

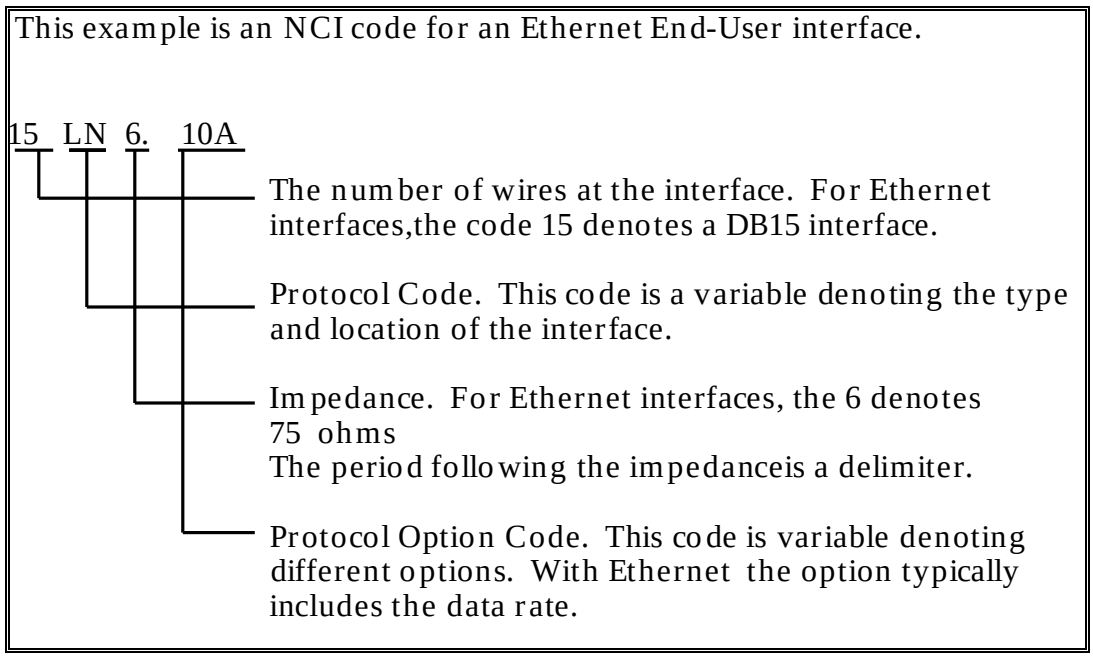

Figure 3-1: NCI Code Components

3.5 NCI Codes for Ethernet

The available NC/NCI codes for QWEST LSS, Ethernet are listed in Table 3-5. Definitions of the NCI Code Components are listed in Table 3-6. All LSS NC Codes are compatible with the Ethernet NCI codes listed.

Table 3-4: Ethernet NC/NCI Compatibility Table

NCI Code	NC Code	Physical Description
04LN9.10T	HM--	RJ-45, 10BASE-T with 10 Mbps Data Rate
15LN6.10A	HM--	DB15, 10BASE-5 with 10 Mbps Data Rate

Table 3-5: Definition of NCI Code Components (LSS Ethernet)

CODE COMPONENTS						
Character Positions						
1 2	3 4	5	6	7 8 9	10 11 12	Definition
04			d			RJ-45 Conductor
15			e			15 Pin Conductor
	LN		l			LAN Transport
		6	i			75 Ohms
		9	m			100 Ohms
			i t	10A		Ethernet NI
			e r	10T		Ethernet NI

3.6 NCI Codes for 100BASE-TX Ethernet

The available NC/NCI codes for QWEST LSS, 100BASE-TX Ethernet are listed in Table 3-7. Definitions of the NCI Code Components are listed in Table 3-8. All LSS NC Codes are compatible with the 100BASE-TX Ethernet NCI codes listed.

Table 3-6: 100BASE-TX Ethernet NC/NCI Compatibility Table

NCI Code	NC Code	Physical Description
04LN9.1CT	HMWQ	RJ-45, 100BASE-TX with 45 Mbps Data Rate
04LN9.1CT	HM--	RJ-45, 100BASE-TX with 100 Mbps Data Rate

Table 3-7: Definition of NCI Code Components (LSS Fast Ethernet)

CODE COMPONENTS						
Character Positions						
1 2	3 4	5	6	7 8 9	10 11 12	Definition
04			d e l i m e t e r			RJ-45 Conductor
	LN					LAN Transport
		9				100 Ohms
				1CT		100BASE-TX Ethernet NI

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4. Performance Parameters

This section describes the service objectives and transmission requirements for QWEST LAN Switching Service (LSS). LSS provides objectives for throughput, availability, delay, and frame delivery rate.

4.1 Ethernet Performance Parameters

LSS provides a half duplex LAN Network Interface (NI) for 10Mb Ethernet and either half or full duplex LAN Network Interface (NI) for 45Mb and 100Mb Ethernet. These connections to the customer are capable of transmitting, receiving, or both with a total throughput that is dependent on the type of NI and the NAL. These throughput parameters are specified in the following sections.

4.1.1 10 Mb Ethernet Throughput Parameters

The Ethernet throughput objective is based on congestion-free network conditions. The objective is a transmitted or received frame rate for 64 byte as 14,790 frames per second (FPS); for 1518 or 1522 byte frames the throughput objective is 810 FPS.

Utilizing an Ethernet NI, the maximum customer data throughput on a non-congested LSS Network is shown in Figures 4-1 and 4-2.

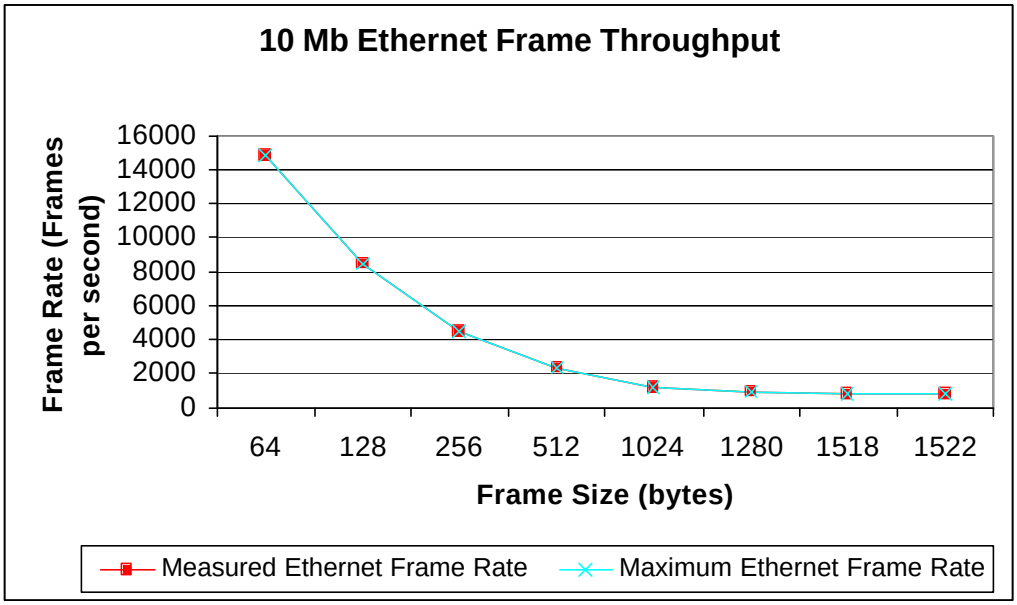

Figure 4-1: 10 Mb Ethernet Throughput in Frames per second (FPS)

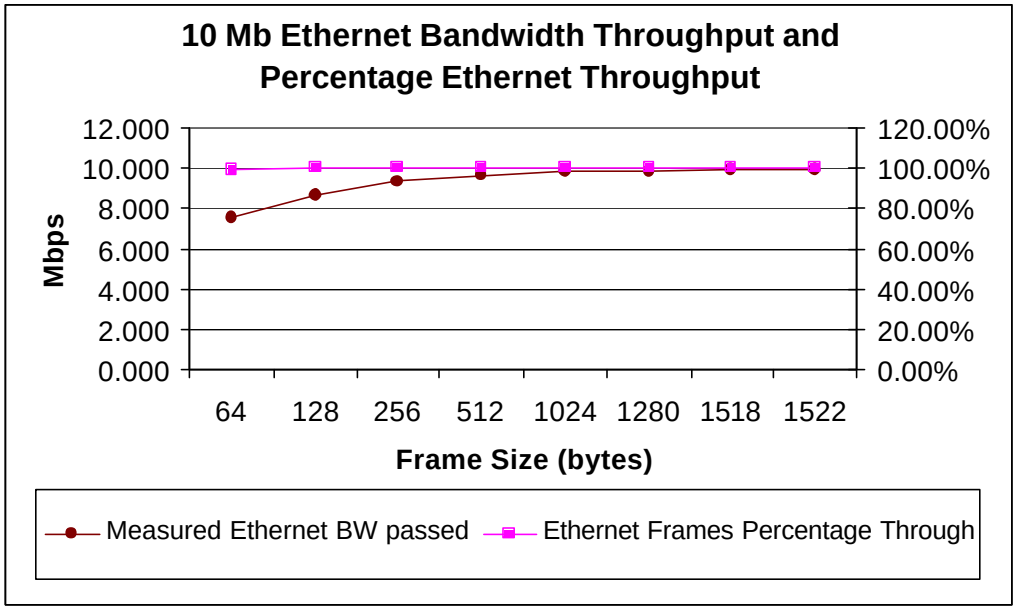

Figure 4-2: 10 Mb Ethernet Throughput in Mbps and Percentage Throughput

4.1.2 45 Mb Fast Ethernet Throughput Parameters

The 45 Mb Fast Ethernet throughput parameters are based on PLCP only in congestion-free network conditions. The half duplex connection transmitted or received frame rate throughput for 64 byte frames is 44,640 FPS and for 1518 or 1522 byte frames is 2890 FPS. Over a full duplex connection, the frame rate for 64 byte frames is 22,510 FPS, each direction, and for 1518 or 1522 byte frames is 2890 FPS each direction.

Utilizing a 45 Mb Fast Ethernet NI, the maximum customer data throughput on a non-congested LSS Network is shown in 4-3 through 4-6. On graphs 4-4 and 4-6 the percentage throughput is the actual throughput out of a 100BASE-TX Fast Ethernet port that is rate limited by a DS3 network connection.

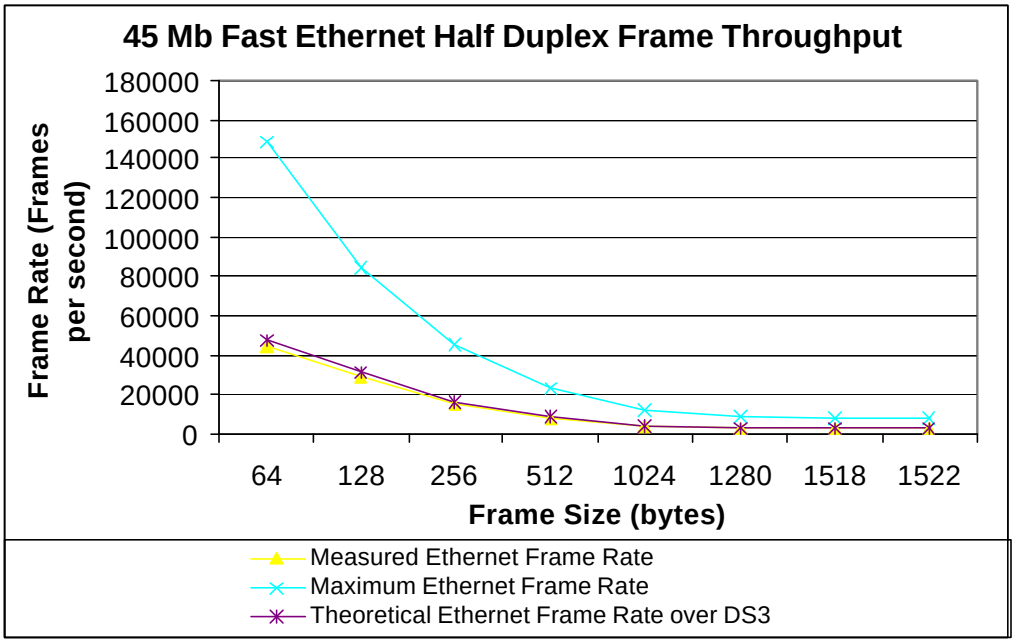

Figure 4-3: 45 Mb Fast Ethernet Half Duplex (PLCP) Throughput in FPS

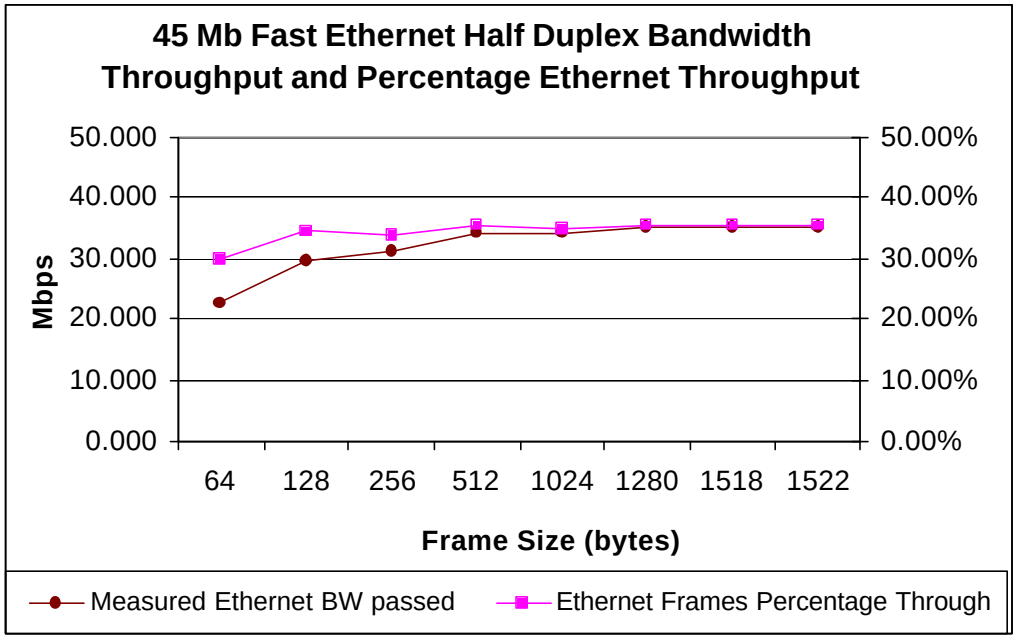

Figure 4-4: 45 Mb Fast Ethernet Half Duplex (PLCP) Throughput in Mbps and Percentage Throughput

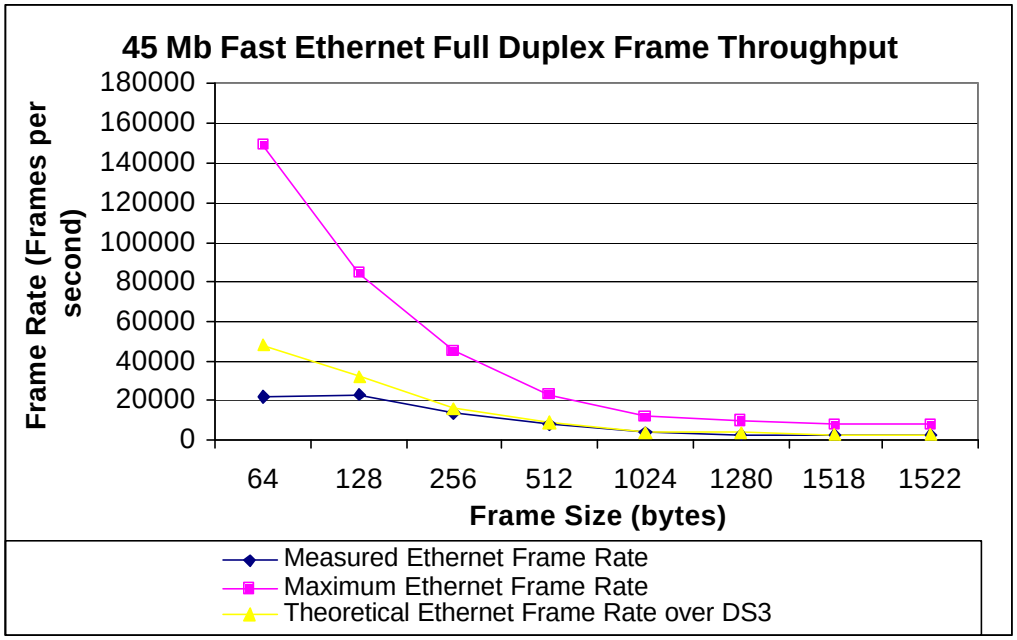

Figure 4-5: 45 Mb Fast Ethernet Full Duplex (PLCP) Throughput in FPS

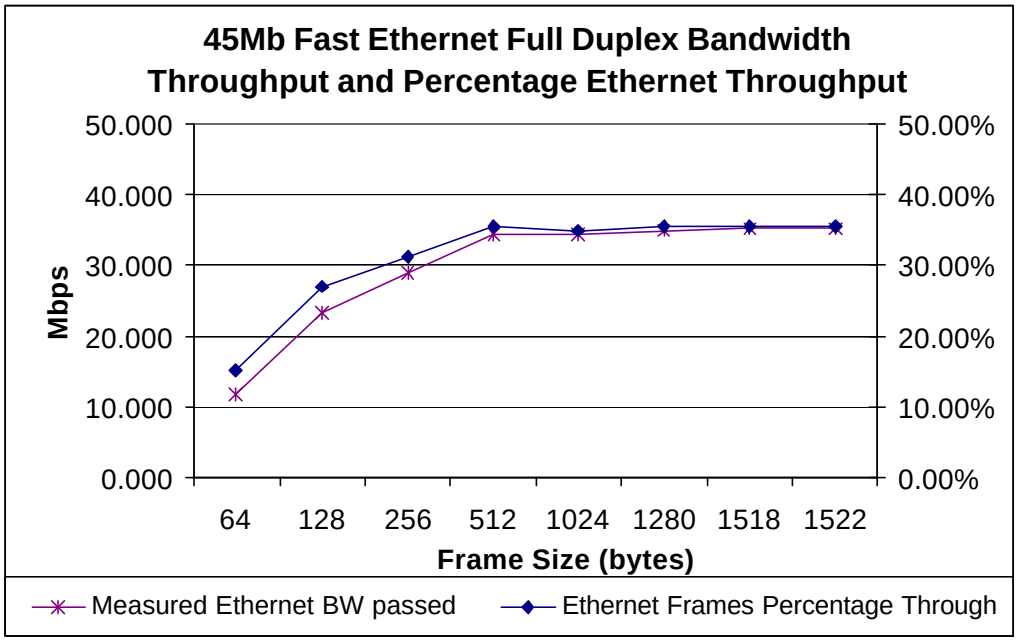

Figure 4-6: 45 Mb Fast Ethernet Full Duplex (PLCP) Throughput in Mbps and Percentage Throughput

4.1.3 100 Mb Fast Ethernet Throughput Parameters

The 100 Mb Fast Ethernet throughput parameters are based on congestion-free network conditions. The half duplex connection transmitted or received frame rate throughput for 64 byte frames is 55,000 FPS and for 1518 or 1522 byte frames is 8120 FPS. For full duplex, the transmitted or received frame rate throughput for 64 byte frames is 27,500 FPS, each direction, and for 1518 or 1522 byte frames is 8120 FPS, each direction.

Utilizing a 100 Mb Fast Ethernet NI, the maximum customer data throughput on a non-congested LSS Network is shown in Figures 4-7 and 4-10. On graphs 4-8 and 4-10 the percentage throughput is the percentage of the customer's original 100BASE-TX Fast Ethernet LAN bandwidth that is transmitted through a OC3 LSS connection.

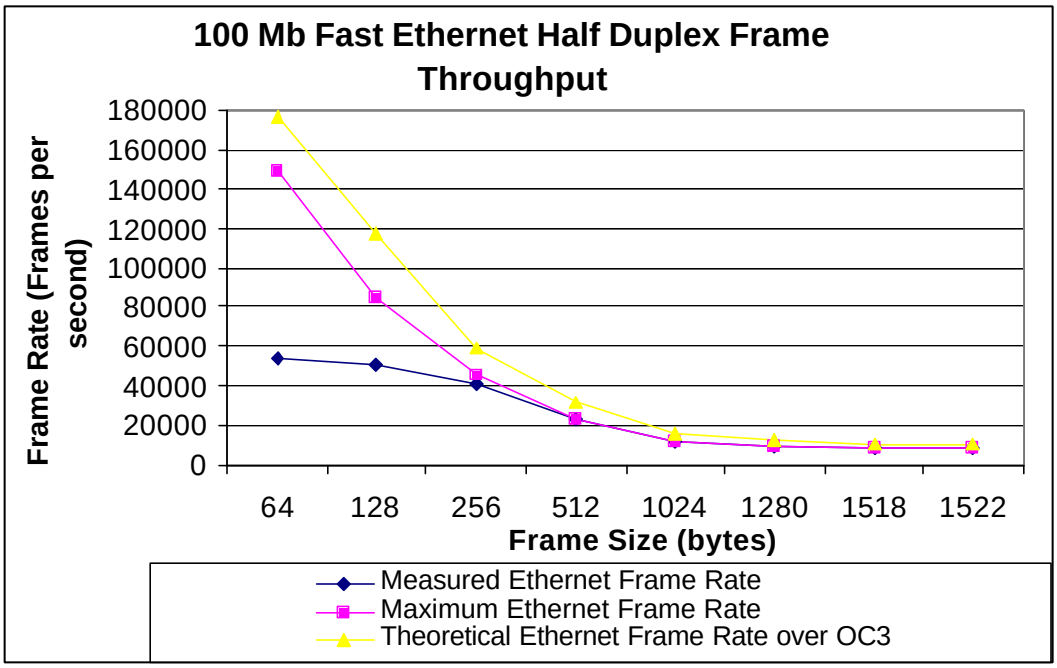

Figure 4-7: 100 Mb Fast Ethernet Half Duplex Throughput in FPS

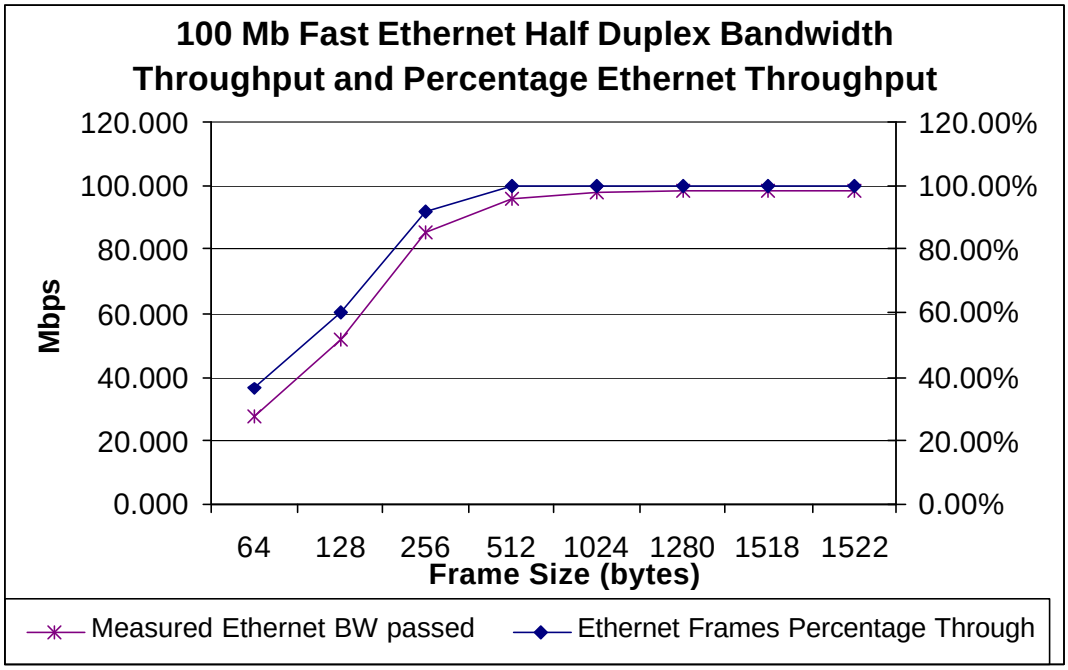

Figure 4-8: 100 Mb Fast Ethernet Half Duplex Throughput in Mbps and Percentage Throughput

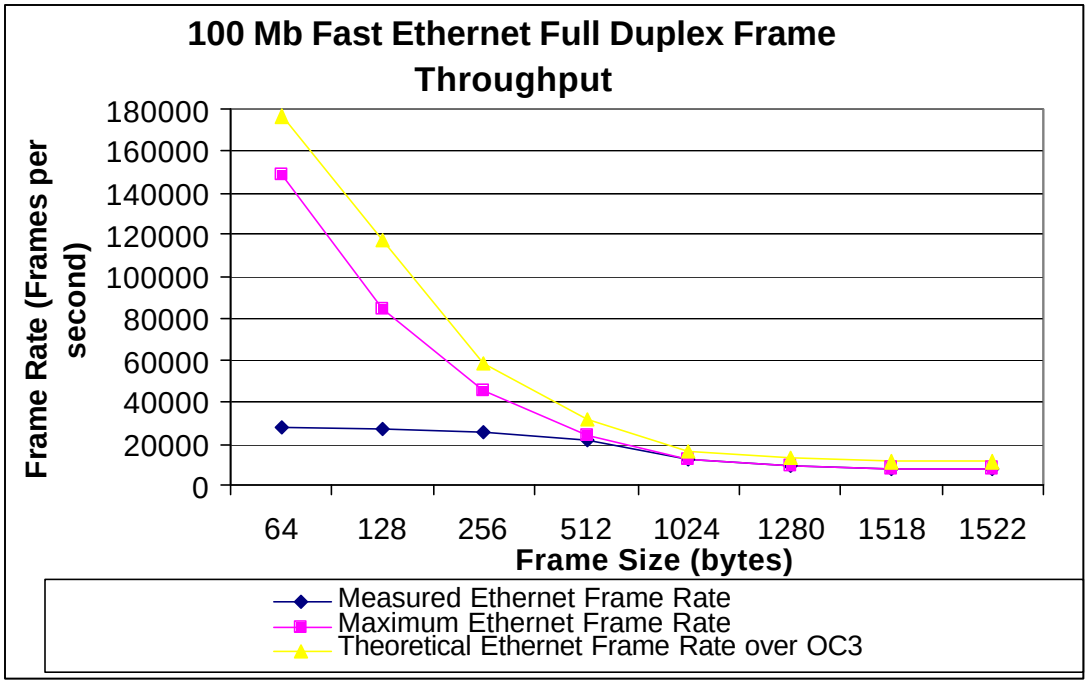

Figure 4-9: 100 Mb Fast Ethernet Full Duplex Throughput in FPS

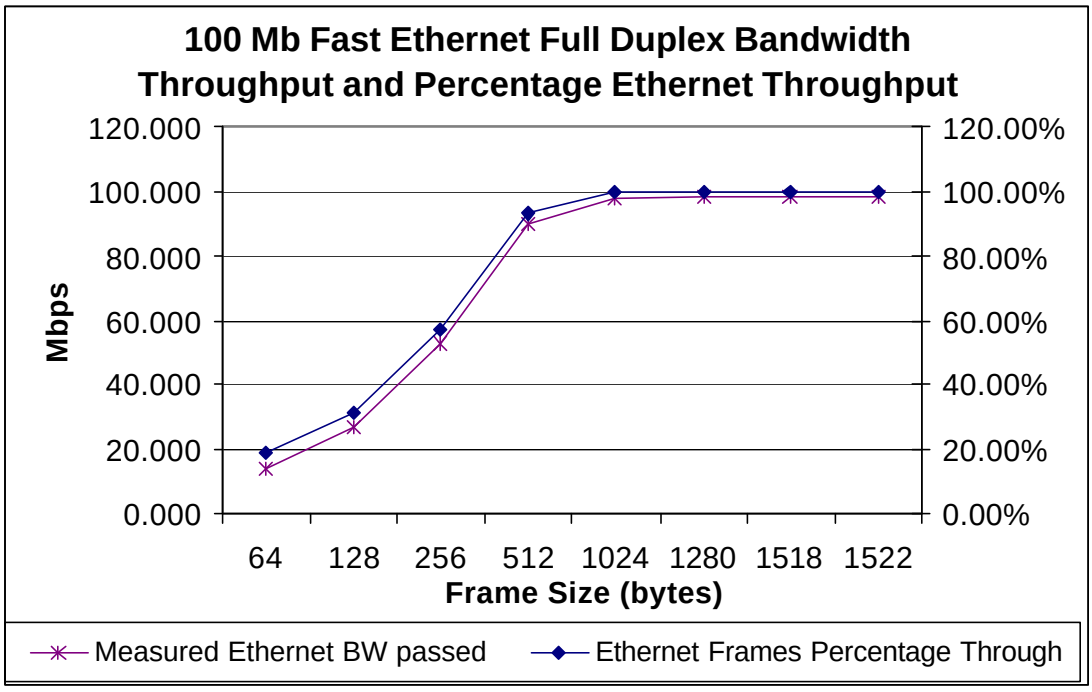

Figure 4-10: 100 Mb Fast Ethernet Full Duplex Throughput in Mbps and Percentage Throughput

4.2 LSS Availability Objectives

The availability objective for QWEST LSS is 99.95%. The availability of a service is a measure of the Scheduled Service Time that the service is usable by a customer. The availability is expressed as a percentage the service is performing in accordance with the service performance objectives over an average 12-month period. This percentage may be expressed as:

$$\text{Availability (\%)} = \frac{(\text{Scheduled Service Time} - \text{Outage Time}) \times 100}{\text{Scheduled Service Time}}$$

For calculation purposes, the LSS network includes all components of LSS: the LSS NI located on the customer's premises, Network Access to the QWEST ATM Network, and transport across the QWEST ATM Network. Overall service availability is dependent on four main factors:

- The proportion of time in which the accuracy objectives are met;
- The frequency of switching equipment outages;
- The frequency of transport system outages;
- Restoral times for outages.

Scheduled Service Time is the length of time, in hours, that the QWEST ATM Network is expected to provide service to QWEST LSS. The Scheduled Service Time for QWEST LSS is 8,756 hours during an average 12-month period. This allows for two hours every six months for network maintenance.

4.3 LSS Delay Objectives

Transit delay is measured from customer ingress NI to customer egress NI, and is defined as the time between when the last bit of the Ethernet or Token Ring frame enters the ingress port to when the first bit of the frame leaves the egress port. Components of LSS transit delay include:

- Processing delays at ingress and egress LSS network nodes
- Transmission delay which is dependent on LAN frame size (e.g., at 44.736 Mbps, transmission delay for a 256-byte frame is approximately 60 microseconds)
- Propagation delays (approximately 2 ms per 100 fiber miles)
- Processing delays at ATM nodes (e.g., switching/multiplexing delays) within the QWEST ATM Network
- Queuing delays at nodes within the ATM network

The maximum (worst case) LSS network transit delay is 20 milliseconds one-way for 256-byte LAN frames with a 10 Mb Ethernet NI. For a 45 Mb Fast Ethernet NI, the network transit delay objective is 30 milliseconds one-way for 256-byte frames. Transit delay is measured over any continuous 30-day period.

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5. Maintenance

5.1 Customer Responsibilities

The customer is responsible for the purchase, maintenance and installation of equipment and materials on the customer side of the Network Interface (NI).

Before calling QWEST Customer Service Center, the customer or their responsible agent must isolate the fault or trouble and verify the fault or trouble is not in the customer-owned cable or equipment. If the fault or trouble is isolated to the customer-owned equipment or cable, the customer is responsible for clearing the trouble and restoring the service to normal.

Joint testing between the NI and a QWEST Serving Wire Center (SWC) may sometimes be necessary to isolate the fault or trouble.

5.2 QWEST Responsibilities

QWEST is responsible for maintaining the transmission facility between the customer's NIs.

QWEST is to ensure the cable used between the NI and a customer LSS node is less than or equal to ten (10) meters in length.

Upon receipt of a trouble report, QWEST will initiate action within twenty (20) minutes to clear the trouble.

If the path between customer's NIs fails as a result of an electronics failure, the path will be restored within four (4) hours. If the path failure is caused by a cable failure, the maximum path restorable time will be eight (8) hours.

Battery backup is supplied for the LSS Network Node, which resides on the Customer's Premises.

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6. Definitions

6.1 Acronyms

ANSI	America National Standards Institute
AUI	Attachment Unit Interface
AUIC	Attachment Unit Interface Cable
ATM	Asynchronous Transfer Mode
BIT	Binary Digit
bps	Bits Per Second
CCC	Clear Channel Capability
CO	Central Office
CPE	Customer Provided Equipment
CRS	Cell Relay Service
CSMA/CD	Carrier Sense Multiple Access with Collision Detection
DTE	Data Terminal Equipment
EU	End-User
FPS	Frames Per Second
FT	Frame Time
Hz	Hertz (formerly cycle per second)
IEEE	Institute for Electrical and Electronic Engineers
kHz	Kilohertz (1,000 Cycles Per Second)
LAN	Local Area Network
LATA	Local Access and Transport Area
LSS	LAN Switching Service
Mbps	Megabit per Second
MIC	Medium Interface Cable
MSAU	MultiStation Access Unit
NC	Network Channel
NCI	Network Channel Interface
NI	Network Interface
OAL	Optical Access Link
OC	Optical Channel
POT	Point Of Termination
SONET	Synchronous Optical Network

SST	Scheduled Service Time
SWC	Serving Wire Center
UBR	Unspecified Bit Rate
UTP	Unshielded Twisted Pair

6.2 Glossary

Alternate Route

Places part of a customer's services over one route and the remainder of the services over a second route.

American National Standards Institute (ANSI)

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

Asynchronous Transfer Mode

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 necessary periodic.

Attachment Unit Interface (AUI)

The cable, connectors, and transmission circuitry used to interconnect the Physical Layer Signaling (PLS) and Medium Attachment Unit (MAU).

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 a system is designed to operate.

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 (bps)

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

Customer 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. 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 customer's premises.

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.

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

Carrier Sense Multiple Access with Collision Detection is a method of controlling access to a shared transmission path, particularly in local area networks.

Data Terminal Equipment (DTE)

Generics 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 Private Branch Exchange (PBX).

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 acoustic, electrical, or optical signals; it is equal to ten times the common logarithm of the ratio of the two signal powers.

Diversity

Routing of customer circuits or access lines over physically separated facilities.

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.).

Ethernet

Packet-switched local network design employing Carrier Sense Multiple Access with Collision Detection (CSMA/CD) as access control mechanism. Throughout this document, the term "Ethernet" is used interchangeably with the IEEE Std. 802.3 1993 Edition.

Fast Ethernet

A packet-switched local network design employing Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Type 100BASE-TX, as access control mechanism. Throughout this document, the term "Fast Ethernet" is used interchangeably with the IEEE Std. 802.3u 1995 Edition.

Impedance

The total opposition offered by an electric circuit to the flow of an alternating current of a single frequency. It is a combination of resistance and reactance and is measured in ohms.

LAN Switching Service (LSS)

A basic transport element designed to extend islands of Local Area Networks (LAN) across a limited geographic area (within a LATA).

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 of resources such as data storage devices and printers.

Medium Interface Connector (MIC)

A connector at which all transmitted and received signal specifications shall be met.

Megabit per Second (Mbps)

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

Multiplex

See Multiplexer

Multiplexer (Mux)

An equipment unit 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.

MultiStation Access Unit (MSAU)

The Wiring Concentrator used to star-wire the physical ring in a Token Ring LAN. Provides the capability of isolating a faulty station from the ring.

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 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 U S WEST's responsibility for the provision of service ends.

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).

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.

Serving Wire Center (SWC)

The term "Serving Wire Center" denotes a U S WEST Central Office (CO) 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.

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 (OC-1) level. Other rates defined as OC-n where n=3 through a number not yet firm are possible.

Throughput

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

Token Ring

Local network access mechanism and topology in which a token is passed from station to station in sequential order. Stations wishing to transmit must wait for the token to arrive before transmitting data. Throughout this document, the term "Token Ring" is used interchangeably with the IEEE Std. 802.5-1992 Edition.

Transparent

In communication systems, that property which allows transmission of signals without changing the electrical characteristics or coding beyond the specified limits of the system design.

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7. References

7.1 American National Standards Institute/Institute for Electrical and Electronic Engineers (ANSI/IEEE) Documents

IEEE Std. 802.1d-1990	IEEE Standards for Local and Metropolitan Area Networks: *Media Access Control (MAC) Bridges.*
ANSI/IEEE Std. 802.3-1993	Information Technology - Local and Metropolitan Area Networks - Part 3: *Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications* (same as ANSI/ISO 8802.3-1993)
ANSI/IEEE Std. 802.3u-1995	Local and Metropolitan Area Networks - *Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units and Repeater for 100 Mb/s Operation, Type 100BASE-T. Clauses 21-30. (Supplement to ISO/IEC 8802-3: 1993 [ANSI/IEEE Std 802.3, 1993])*
ANSI/IEEE Std. 802.5-1992	Local Area Networks: *Token Ring Access Method and Physical Layer Specifications* (same as ANSI/ISO 8802.5-1992)
ANSI T1.223-1991,	*Information Exchange - Structure and Representation of Network Channel (NC) and Network Channel Interface (NCI) Codes for the North American Telecommunications System.*

7.2 QWEST Technical Publications

Publication 77324	*QWEST DS3 Service*, Issue C, April 1993
Publication 77378	*ATM Service*, Issue E, October 2001

7.3 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.

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