3.2 APPROACH TO ENSURE SERVICE QUALITY AND RELIABILITY (L.34.1.3.2)

Getting the backbone network to a customer and ensuring that end-to-end quality meets an Agency's needs requires a flexible approach for access, the right networking technology, and strict network planning and engineering rules. Qwest brings Agencies all of this on a proven converged platform that also enables service continuity.

For several decades, Qwest has envisioned, designed, engineered, deployed, and operated highly-reliable network services. To accomplish our performance goals, Qwest uses a comprehensive quality assurance plan, quality control techniques, best practices for network design and operations, and industry standard proven technologies to ensure high service quality, and reliability. Many service providers design, purchase, and piece together different technologies, building hybrid networks consisting of disconnected architectures and miscellaneous equipment. Thus, user services are not fully integrated, controlled or managed, which in turn compromises service continuity, quality, and reliability.

Qwest's unified network architecture exponentially increases service quality and reliability because it is built on self-healing SONET rings of fiber buried four feet below ground in protective conduits along railroad right of ways. Our fiber network facilities are built to exacting standards for environmental and power redundancy. Additionally, our architecture provides multiple levels of redundancy including switched redundancy at each Point of Presence (POP), plus connectivity to at least three other POPs to ensure service continuation in the event of a switch or path failure. Within 100 milliseconds of a failure, traffic is automatically routed around the failure, and undetected by users.

Qwest recognizes the Government's concern about access arrangements' quality and reliability between SDPs, and SDPs and POPs, because while our backbone services are reliable, the key measure of our customers' experience is total service satisfaction from end-to-end. Qwest must also ensure that our connections with other service providers including Local Exchange Carriers (LECs), Competitive LECs (CLECs), Interexchange Carriers (IXCs), and wireless access providers meet our requirements for quality and reliability.

To accomplish our requirements for quality and reliability, Qwest has developed a technical approach that combining Commitment, Implementation, and Surveillance and Reporting to achieve the results shown in ***Figure 3.2-1***.

Figure 3.2-1. Qwest's Technical Approach Ensures the Delivery of the Highest Quality and Reliable Services to Agencies

Commitment	Implementation	Surveillance and Reporting	Results
Delivering Service Complying with or Exceeding Requirements Wherever Possible	Quality Assurance and Quality Control	Quality Control and Reliability Issues	Delivery of the highest quality services meeting SLAs and AQLs
Maintainability	Proven and Tested Products and Systems	Performance and Repair Trends	Continuous improvement of service responsiveness
Network and Systems Interoperability	International and Industry Standards	Protocol Errors	Enhanced platforms for performance and reliability
Usability, Security, and Service Reliability	Security Systems	Security Threats	Maintain service reliability avoid service corruption and disruption
Ease of Expandability	Project Planning	Utilization Percentages	Improved strategic planning network build outs and service expansion
Lowest Risk	Strategic Risk Management Planning	Risk Events	Protection of service quality and reliability as well as reduced impact if risk events occur

Section 3.2.1 describes Qwest's access arrangements, characteristics, performance, and technical capabilities.

Section 3.2.2 describes Qwest's arrangements for exchanging traffic with other providers, and how we maintain service quality during failures. To provide access services, Qwest has a broad variety of agreements with local carriers to ensure flexibility, responsiveness, quality, and reliability. Qwest has strict quality standards directing how we connect with other carriers to maintain this high level of

performance. Qwest monitors its services 24x7x365 to ensure that we maintain the highest quality of services and optimize reliability for our customers. Surveillance monitoring and reporting includes performance measurements and capacity utilization, as well as fault and trouble analysis.

Section 3.2.3 conveys how Qwest has designed and engineered its network architecture, implemented system tools, and made full use of standard protocols to handle congestion and failures to ensure resiliency, capacity, and avoidance to meet performance goals, Key Performance Indicators (KPIs), and quality of service.

Section 3.2.4 describes the methods Qwest uses to test our services against our engineering designs, as well as to probe and continually monitor our services to ensure that we meet the AQLs for KPIs. Each of Qwest's backbone data networking services provides the capability of ensuring the delivery of time-sensitive data.

Section 3.2.5 explains the technologies that Qwest uses to provide high quality, real-time services.

Figure 3.2-2 provides an easy reference to correlate narrative requirements to our proposal response.

Figure 3.2-2. Responses to Narrative Mandatory Service Requirements

Req_ID	RFP Section	RFP Requirement	Proposal Response
2266	E.2.2	The Networx Services Verification Test Plan shall describe the process and procedures for verification testing individual services ordered under the contract.	3.2.4
2267	E.2.2	The Networx Services Verification Test Plan shall detail the standard test procedures that will be used by the contractor to verify, at a minimum, that the services delivered under the contract meet the KPI/ AQL thresholds for the ordered service as specified in Section C.2, Technical Requirements, prior to delivering the ordered service to the customer	3.2.4
2262	E.2.2	The Networx Services Verification Test Plan shall also describe the change procedures for adding service-specific test plan attachments.	3.2.4
7676	E.2.2 (1)	At a minimum the contractor must state: 1) how it proposes to notify the GSA CPO of any changes to its Networx Verification Test Plan, such as the addition of a service-specific test plan;	3.2.4
7675	E.2.2 (2)	At a minimum the contractor must state: 2) how it plans to request and receive approval from GSA.	3.2.4

Req_ID	RFP Section	RFP Requirement	Proposal Response
2264	E.2.2	The contractor shall detail in the Networx Services Verification Test Plan how it proposes to perform verification testing on any awarded service at the time of initial service delivery to an Agency.	3.2.4
2809	C.2.16.2.4. 1.4(2)	Technical Capabilities: The following Satellite Access Arrangement capabilities are mandatory unless marked optional: 2. The contractor shall define the contours of the SatAA coverage (i.e., foot print) maps and shall continue to provide any changes to satellite foot print for the frequency band(s) for each satellite providing the access arrangement.	3.2.1.5.1

3.2.1 Characteristics and Performance of Access Arrangements to the Qwest Network (L.34.1.3.2(a), C.2.16)

Qwest is providing Switched and Dedicated access arrangements as illustrated in [redacted] which depicts [redacted] SDP/POP configurations.

[redacted]

Qwest's access arrangements provide for 1) Connectivity of the SDP to the Qwest POP and 2) connectivity where the SDP is located in a Qwest POP. Qwest is offering two major categories of access: Circuit Switched and Dedicated Access Arrangements.

Circuit Switched Access Arrangements

Qwest offers switched access arrangements from the local Central Office (CO) servicing the SDP. Qwest pre-subscribes IXC service to support Qwest's Voice Service (VS), Circuit Switched Data Service (CSDS), Toll-Free Service (TFS) and Combined Services (CS). Qwest offers a full-range of developed, implemented and managed traditional domestic and non-domestic switched access.

Qwest owns and operates one of the largest dial-up access networks in the nation. With coverage of over 80 percent of all the CONUS local calling areas and a total of over one million ports for both analog and Integrated Services Digital Network (ISDN), Qwest is a leading provider of this service to major Internet Service Providers (ISPs) as well as Government Agencies, [redacted]

Qwest continually monitors our dial access network to ensure there are enough ports in each location to ensure low call blocking percentages as well as identifying issues that require trouble management.

Dedicated Access

Qwest uses our own and leased access facilities to connect Agency locations to Qwest network services. Qwest uses a variety of technologies – everything from dark fiber to emerging standards like Worldwide Interoperability for Microwave Access. In each case, Qwest performs network engineering and planning ensuring that the access from our backbone to the Agency's location meets our strict standards for high quality, reliable services.

1. Wireline Access Arrangement (WLNAA) – Qwest is offering a full range of Wireline Access speeds: Analog, Subrate DS-0 through OC-192c, ISDN Primary Rate Interface (PRI), Dial Access Line, E-1, E-3 (non-domestic), and Dark Fiber Strands.

2. Broadband Access Arrangement (BBAA) - Qwest will provide Digital Subscriber Line (DSL) services up to 6 Mbps at all mandatory servicing wire centers, and Ethernet services ranging in speeds up to 10 Gbps at selected POPs.

3. Wireless Access Arrangement (WLSAA) - Qwest will provide Broadband Wireless service [redacted] Broadband Wireless Service has been developed, implemented, and managed using wireless point-to-point protocol-transparent (i.e., physical level) transmission connection between an SDP and the

Qwest POP for Networx services (e.g., VS, Network Based Internet Protocol VPN (NBIP-VPNS), and VTS).

4. Satellite Access Arrangement (SatAA) - Qwest is offering Satellite Access Arrangements [redacted] to support Agency performance metrics for availability and disaster recovery. In compliance with NS/EP requirements, the command and control link is encrypted.

[redacted] This combination enables Qwest to leverage our own capabilities as an ILEC in 14 states in the western United States as well as those of other ILECs and CLECs to provide robust access solutions that meet Agencies' needs.

To ensure the service quality and reliability of these access services that connect to our backbone, Qwest uses the same discipline and approach that are used to maintain our own facilities-based portions of the service.

[redacted]

3.2.1.1 Circuit Switched Access Arrangements (C.2.16.1)

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3.2.1.1.1 Voice Service (VS)

Qwest offers switched access arrangements to support VS from the local CO servicing the SDP. Qwest pre-subscribes IXC service to Qwest VS. Qwest is

offering a full-range of developed, implemented and managed traditional domestic and non-domestic switched access to comply with the following applicable standards: American National Standards Institute (ANSI) T1.101, ANSI ISDN, International Telecommunications Union (ITU)-TE.164, ANSI Signaling System 7 (SS7) and LSSR FR-64, at a minimum.

Approach for Monitoring and Measuring VS KPIs & AQLs

[redacted]

[redacted]

Qwest's Switch Management Center performs daily fault management for Signaling and Voice Operations. This center, [redacted] is fully staffed 24x7x365. In the event of a catastrophic center failure, a [redacted] can be made fully operational [redacted] We perform quarterly failover exercises to ensure proper operations and support functions are maintained.

Switch Management uses various Network Management Systems (NMSs) to deliver an alert/log status for operator review and action. [redacted] They correct and document actions taken to mitigate the alarm condition. They also coordinate additional resources needed for repair and restoration with Field Operations and advanced Technical Support.

3.2.1.1.2 Circuit Switched Data Service (CSDS)

Qwest offers switched access arrangements to support CSDS from the local CO servicing the SDP. Qwest pre-subscribes IXC service to the Qwest CSDS. Qwest is offering a full range of traditional developed, implemented, and managed domestic switched access to comply with the following standards, as applicable: ANSI T1.101, ANSI ISDN, ITU-TE.164, ANSI SS7 and LSSR FR-64, at a minimum.

Approach for Monitoring and Measuring CSDS KPIs and AQLs

[redacted]

The Qwest Team's daily processes and procedural techniques include gathering CSDS network statistics and ongoing monitoring and measurement of KPIs and AQLs including:

[redacted]

The SDSC manages and controls the Qwest Team's CSDS network elements as follows:

[redacted]

3.2.1.1.3 Toll-Free Service (TFS)

Qwest offers switched access arrangements to support TFS from the local CO servicing the SDP. Qwest presubscribes IXC service to the Qwest TFS. Qwest is offering a full-range of developed, implemented, and managed traditional domestic switched access services to comply with the following applicable standards: ANSI T1.101, ANSI ISDN, ITU-TE.164, ANSI SS7 and LSSR FR-64, at a minimum.

Approach for Monitoring and Measuring TFS KPIs and AQLs

[redacted]

[redacted]

Qwest maintains a central data repository for key network performance information. These performance indicators are generated by a combination of system specific statistics (e.g., call attempts generated by the SSP, monitoring tools, and call detail collection). Logs and traps are generated by the SSPs, STPs, and SCPs and sent to the Network Monitoring team for instant responses. Data is analyzed, formatted, and sent to operations, engineering and planning for proactive network enhancement and capacity planning.

[redacted]

The Switch Management Center described above in Section 3.2.1.1.1, VS, also supports TFS Signaling and Voice Operations.

3.2.1.1.4 Combined Services (CS)

Qwest offers switched access arrangements to support CS from the local CO servicing the SDP. Qwest pre-subscribes IXC service to Qwest's CS. Qwest is offering a full range of developed, implemented, and managed traditional domestic switched access to comply with the following applicable standards: ANSI T1.101, ANSI ISDN, ITU-TE.164, ANSI SS7 and LSSR FR-64, at a minimum.

Approach for Monitoring and Measuring CS KPIs and AQLs

[redacted]

Qwest maintains processes whereby daily network statistics are gathered for the ongoing monitoring and measurement of KPIs and AQLs in the voice network.

[redacted]

The Switch Management Center described above in Section 3.2.1.1.1 also supports CS Signaling and Voice Operations.

3.2.1.2 Dedicated Access Arrangements (C.2.16.2, C.2.16.2-1)

Qwest is offering four types of access arrangements to support the various transport services required for Networx. [redacted]

[redacted]

3.2.1.2.1 Wireline Access Arrangement (WLNAA) (C.2.16.2.1, C.2.16.2.1.1)

Qwest is offering a full range of traditional domestic and non-domestic wireline access with the following speeds: Analog, subrate DS-0 through OC-192c, ISDN PRI, Dial Access Line, E-1, E-3, and Dark Fiber Strands. [redacted]

[redacted]

depicts the Wireline arrangements.

[redacted]

Table 3.2.1.2.1-1 Table of ICB CLINs and Case Numbers

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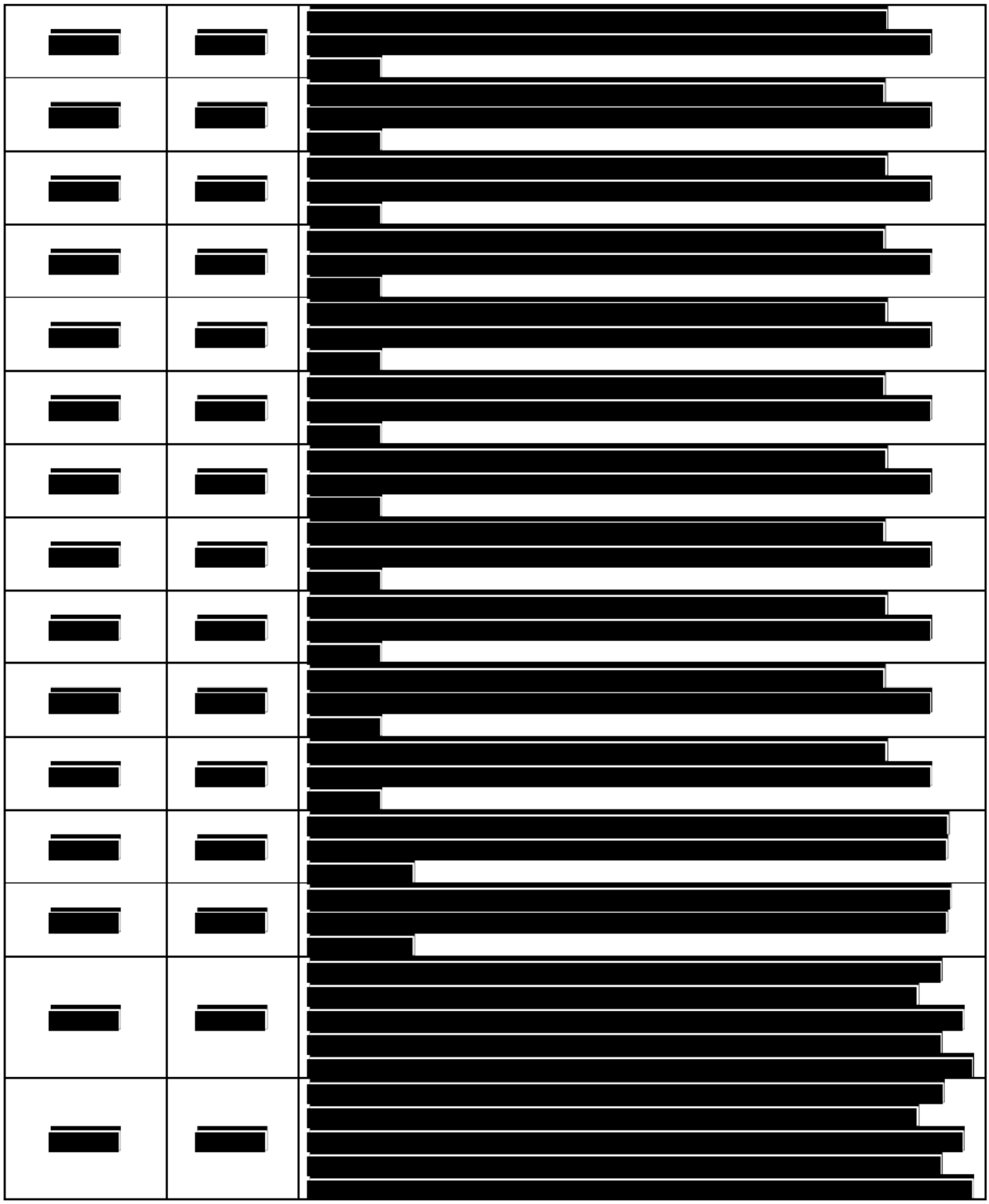

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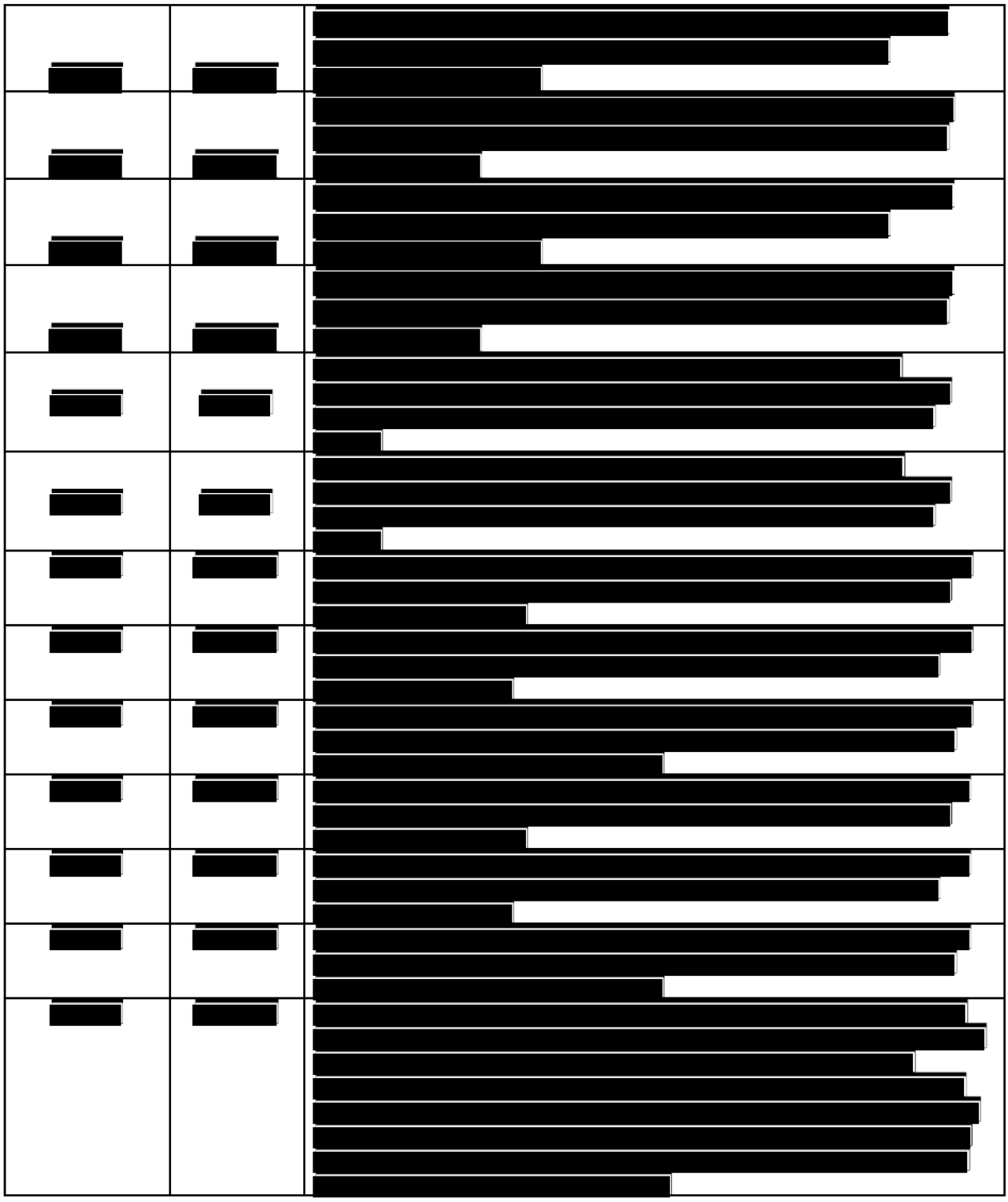

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3.2.1.2.1.1 Custom Access Arrangements

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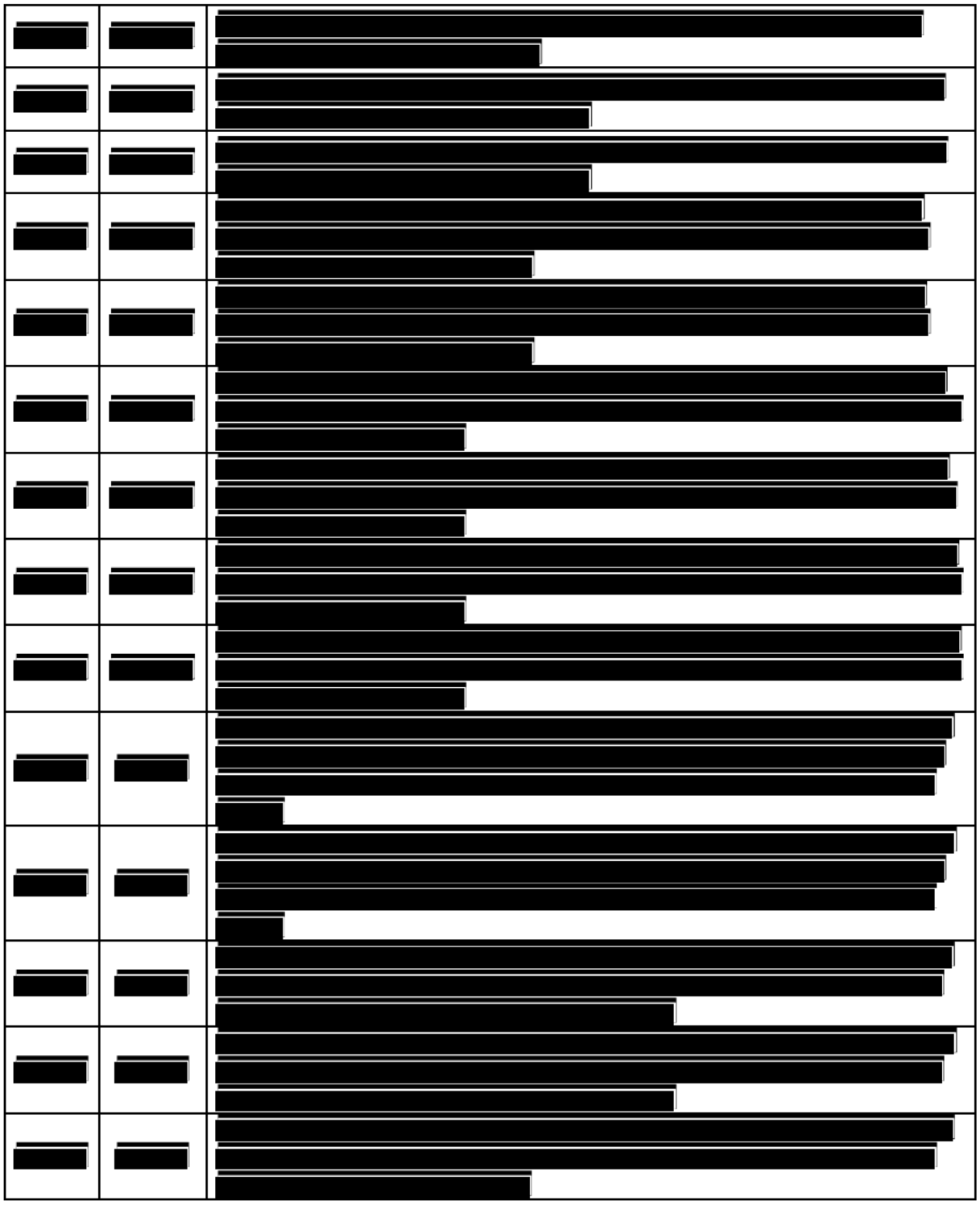

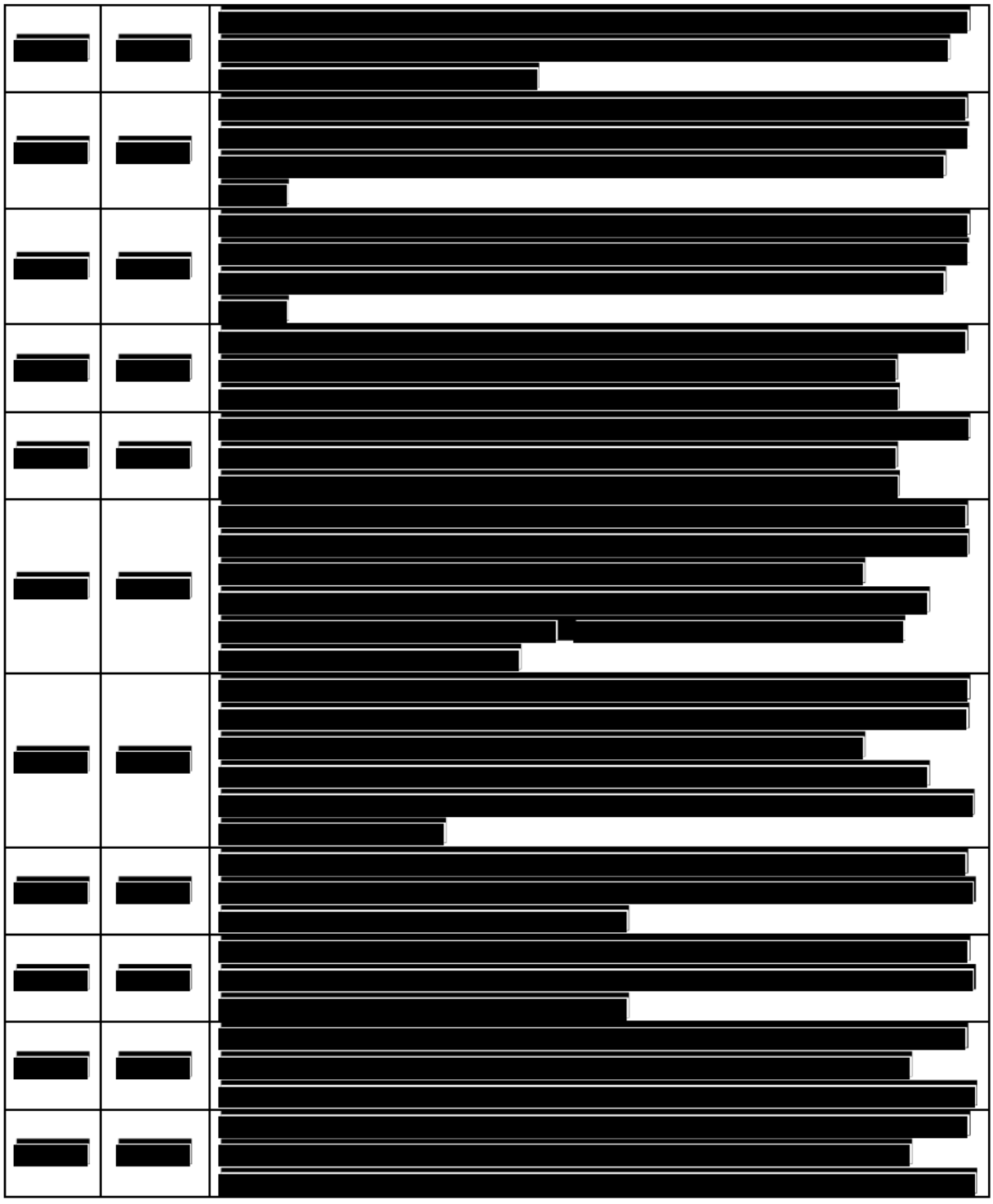

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3.2.1.2.2 WLNAA Characteristics and Performance (C.2.16.2.1.1.2)

Qwest's developed, implemented, and managed wireline service access arrangements comply with the following applicable standards to the service being offered, at a minimum:

1. ANSI T1.102/107/403/503/510 for T1
2. ANSI T1.607/610 for ISDN PRI
3. Telcordia PUB GR-499-CORE for T3
4. ANSI T1.105 and 106 for SONET
5. Telcordia PUB GR-253-CORE for SONET
6. ITU-TSS G.702 and related recommendations for E1 and E3
7. Frequencies grid and physical layer parameters for Optical Wavelength
   a. Dense Wavelength Division Multiplexing (DWDM): ITU G.692 and G.694 as mandatory and G.709 and G.872 as optional

b. WDM: ITUG.694.2 and Telcordia GR 253

8. Applicable Telcordia for DWDM systems including: GR-1073, GR-1312, GR-2918, GR-2979 and GR-3009

9. EIA/TIA-559, Single Mode Fiber Optic System Transmission Design

10. Telcordia GR-20-CORE for Generic Requirements for Optical Fiber and Optical Fiber Cable GR-253 (SONET), and GR-326 (Connector)

Qwest's established policies and procedures ensure WLNAA service will provide required performance characteristics as follows:

[redacted]

- Bit error rate acceptable standards

[redacted]

Approach for Monitoring and Measuring WLNAA KPIs and AQLs

[redacted]

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3.2.1.2.3 Satisfaction of WLNAA Capability Requirements (C.2.16.2.1.1.4)

Qwest fully complies with all mandatory stipulated and narrative features, capabilities, and interface requirements for WLNAA. [redacted]

[redacted]

Figure 3.2.1-5. Qwest's WLNAA Technical Capabilities

ID #	Name of Capability	Qwest's Approach
1. a.	Integrated access of different services (e.g., VS, Internet Protocol Service (IPS), and CS) over pre-allocated channels for channelized transmission service (e.g. Channelized T1)	[redacted]
1.b.	Integrated access of different services (e.g., VS, IPS, and CS) over the same channel (e.g., Unchannelized T3, SONET OC-3c) of IP packets for Converged IP Services	[redacted]
1.c.	Integrated access of different services (e.g., VS, IPS, and CS) over the same access circuits for both VS and TFS	[redacted]
2.	Transparent to any protocol used by the Government-furnished property (GFP)	[redacted]
3.	Transparent to all bit sequences transmitted by the GFP	[redacted]
4.	Network-derived clocking	[redacted]

ID #	Name of Capability	Qwest's Approach
	The following categories of WLNAA shall be supported:	[redacted]
a.	**T1**. This category of WLNAA access arrangement shall support a line rate of 1.544 Mbps, which may be used to provide channelized or unchannelized T1 access arrangement as follows:	[redacted]
a. (1)	**Channelized T1**. In this mode, 24 separate DS0s clear channels of 56/64 kb/s shall be supported.	[redacted]
a. (2)	**Unchannelized T1**. In this mode, a single 1.536 Mbps information payload shall be supported.	[redacted]
b.	**Fractional T1**. This category of WLNAA access arrangement shall support two, four, six, eight, or twelve adjacent DS0 clear channels over an interface of T1 with a line rate of 1.544 Mbps.	[redacted]
c.	**ISDN PRI**. This category of WLNAA shall support 23 separate DS0 clear channels of 56/64 kbps over an interface of ISDN PRI (23B+D) with a line rate of 1.544 Mbps.	[redacted]

ID #	Name of Capability	Qwest's Approach
d.	**T3**. This category of WLNAA shall support a line rate of 44.736 Mbps, which may be used to provide channelized or unchannelized T3 access arrangement as follows:	[redacted]
d. (1)	**Channelized T3**. In this mode, 28 separate DS1 channels of 1.536 Mbps information payload rate shall be supported.	[redacted]
d. (2)	**Unchannelized T3.** In this mode, a single 43.008 Mbps payload shall be supported.	[redacted]
e.	**Fractional T3**. This category of WLNAA shall support three, four, five, or seven adjacent DS1 clear-channels.	[redacted]
f.	**E1** (Non-domestic). This category of WLNAA shall support a line rate of 2.048 Mbps, which may be used to provide channelized or unchannelized E1 service as follows:	[redacted]
f. (1)	**Channelized E1.** In this mode, 30 separate DS0 clear channels shall be supported.	[redacted]
f. (2)	**Unchannelized E1**. In this mode, a single 1.92 Mbps information payload shall be supported.	[redacted]
g.	**E3** (Non-domestic). This category of WLNAA shall support a line rate of 34.368 Mbps, which may be used to provide channelized or unchannelized E3 service as follows:	[redacted]
g. (1)	**Channelized E3**. In this mode, 16 separate E1 channels shall be supported.	[redacted]
g. (2)	**Unchannelized E3.** In this mode, a single 30.72 Mbps information payload shall be supported.	[redacted]
h.	**SONET OC-3.** This category of WLNAA shall support a line rate of 155.520 Mbps, which may be used to provide channelized OC-3 or	[redacted]

ID #	Name of Capability	Qwest's Approach
	concatenated OC-3c access arrangement as follows:	
h. (1)	**Channelized OC-3**. In this mode, three separate OC-1 channels, each with an information payload data rate of 49.536 Mbps, shall be supported.	[redacted]
h. (2)	Concatenated OC-3c. In this mode, a single channel equivalent to information payload data rate of 148.608 Mbps shall be supported.	[redacted]
i.	**SONET OC-12** (Optional). This category of WLNAA shall support a line rate of 622.080 Mbps, which may be used to provide channelized OC-12 or concatenated OC-12c access arrangement as follows.	[redacted]
i. (1)	Channelized OC-12. In this mode, 4 separate OC-3 channels, each with an information payload data rate of 148.608 Mbps, shall be supported.	[redacted]
i. (2)	Concatenated OC-12c. In this mode, a single channel equivalent to an information payload data rate of 594.432 Mbps shall be supported.	[redacted]
j.	**SONET OC-48** (Optional). This category of WLNAA shall support a line rate of 2.488 Gbps, which may be used to provide channelized OC-48 or concatenated OC-48c service as follows:	[redacted]
j. (1)	Channelized OC-48. In this mode, 4 separate OC-12 channels, each with an information payload data rate of 594.432 Mbps, shall be supported.	[redacted]
j. (2)	Concatenated OC-48c. In this mode, a single channel equivalent to an information payload data rate of 2.377728 Gbps shall be supported.	[redacted]
k.	**SONET OC-192** (Optional). This category of WLNAA shall support a line rate of 10 Gbps, which may be used to provide channelized OC-192 or concatenated OC-192c service as follows:	[redacted]
k. (1)	Channelized OC-192. In this mode, 4 separate OC-48 channels, each with an information payload data rate of 2.488 Gbps, shall be supported.	[redacted]
k. (2)	Concatenated OC-192c. In this mode, a single channel equivalent to an information payload data rate of 9.510912 Gbps shall be supported.	[redacted]
l.	**Dial Access Line**. This category of WLNAA shall support 2 wire analog lines and trunks without access integration for voice service (VS)	[redacted]
m.	**DS0.** This category of WLNAA shall support information payload data rates of 56 kbps and 64 kbps.	[redacted]

ID #	Name of Capability	Qwest's Approach
		[redacted]
n.	**Subrate DS0**. This category of WLNAA shall support Subrate DS0 at information payload data rates of 4.8, 9.6, and 19.2 kbps.	[redacted]
o.	**Optical Wavelength.** Bi-directional wavelengths (WDM and ASTN) connections to an optical network for the following speeds: a. OC-48 b. OC-192 c. OC-768 (Optional)	[redacted]
p.	**Dark Fiber** (Optional). Dark Fiber shall support the following capabilities:	
p. (1)	Deployed f ber shall support both single-mode and multimode fibers	[redacted]
p. (2)	Deployed f bers shall be capable of supporting a minimum of 80 DWDM wavelengths or user data with spacing as specified in ITU-T G.694.1	[redacted]
p. (3)	Deployed f bers shall be capable of operating in the "C", and "L" bands. Support for the "S" band will also be required when commercially available.	[redacted]

3.2.1.2.3.1 Optical Wavelength Service (OWS) Access

[redacted]

[redacted]

Figure 3.2.1-5. Qwest's WLNAA Technical Capabilities

ID #	Name of Capability	Qwest's Approach
1. a.	Integrated access of different services (e.g., VS, Internet Protocol Service (IPS), and CS) over pre-allocated channels for channelized transmission service (e.g. Channelized T1)	
1.b.	Integrated access of different services (e.g., VS, IPS, and CS) over the same channel (e.g., Unchannelized T3, SONET OC-3c) of IP packets for Converged IP Services	
1.c.	Integrated access of different services (e.g., VS, IPS, and CS) over the same access circuits for both VS and TFS	
2.	Transparent to any protocol used by the Government-furnished property (GFP)	
3.	Transparent to all bit sequences transmitted by the GFP	
4.	Network-derived clocking	

ID #	Name of Capability	Qwest's Approach
	The following categories of WLNAA shall be supported:	[redacted]
a.	**T1**. This category of WLNAA access arrangement shall support a line rate of 1.544 Mbps, which may be used to provide channelized or unchannelized T1 access arrangement as follows:	[redacted]
a. (1)	**Channelized T1**. In this mode, 24 separate DS0s clear channels of 56/64 kb/s shall be supported.	[redacted]
a. (2)	**Unchannelized T1**. In this mode, a single 1.536 Mbps information payload shall be supported.	[redacted]
b.	**Fractional T1**. This category of WLNAA access arrangement shall support two, four, six, eight, or twelve adjacent DS0 clear channels over an interface of T1 with a line rate of 1.544 Mbps.	[redacted]
c.	**ISDN PRI**. This category of WLNAA shall support 23 separate DS0 clear channels of 56/64 kbps over an interface of ISDN PRI (23B+D) with a line rate of 1.544 Mbps.	[redacted]

ID #	Name of Capability	Qwest's Approach
d.	**T3**. This category of WLNAA shall support a line rate of 44.736 Mbps, which may be used to provide channelized or unchannelized T3 access arrangement as follows:	[redacted]
d. (1)	**Channelized T3**. In this mode, 28 separate DS1 channels of 1.536 Mbps information payload rate shall be supported.	[redacted]
d. (2)	**Unchannelized T3.** In this mode, a single 43.008 Mbps payload shall be supported.	[redacted]
e.	**Fractional T3**. This category of WLNAA shall support three, four, five, or seven adjacent DS1 clear-channels.	[redacted]
f.	**E1** (Non-domestic). This category of WLNAA shall support a line rate of 2.048 Mbps, which may be used to provide channelized or unchannelized E1 service as follows:	[redacted]
f. (1)	**Channelized E1.** In this mode, 30 separate DS0 clear channels shall be supported.	[redacted]
f. (2)	**Unchannelized E1**. In this mode, a single 1.92 Mbps information payload shall be supported.	[redacted]
g.	**E3** (Non-domestic). This category of WLNAA shall support a line rate of 34.368 Mbps, which may be used to provide channelized or unchannelized E3 service as follows:	[redacted]
g. (1)	**Channelized E3**. In this mode, 16 separate E1 channels shall be supported.	[redacted]
g. (2)	**Unchannelized E3.** In this mode, a single 30.72 Mbps information payload shall be supported.	[redacted]
h.	**SONET OC-3.** This category of WLNAA shall support a line rate of 155.520 Mbps, which may be used to provide channelized OC-3 or	[redacted]

ID #	Name of Capability	Qwest's Approach
	concatenated OC-3c access arrangement as follows:	
h. (1)	**Channelized OC-3**. In this mode, three separate OC-1 channels, each with an information payload data rate of 49.536 Mbps, shall be supported.	[redacted]
h. (2)	Concatenated OC-3c. In this mode, a single channel equivalent to information payload data rate of 148.608 Mbps shall be supported.	[redacted]
i.	**SONET OC-12** (Optional). This category of WLNAA shall support a line rate of 622.080 Mbps, which may be used to provide channelized OC-12 or concatenated OC-12c access arrangement as follows.	[redacted]
i. (1)	Channelized OC-12. In this mode, 4 separate OC-3 channels, each with an information payload data rate of 148.608 Mbps, shall be supported.	[redacted]
i. (2)	Concatenated OC-12c. In this mode, a single channel equivalent to an information payload data rate of 594.432 Mbps shall be supported.	[redacted]
j.	**SONET OC-48** (Optional). This category of WLNAA shall support a line rate of 2.488 Gbps, which may be used to provide channelized OC-48 or concatenated OC-48c service as follows:	[redacted]
j. (1)	Channelized OC-48. In this mode, 4 separate OC-12 channels, each with an information payload data rate of 594.432 Mbps, shall be supported.	[redacted]
j. (2)	Concatenated OC-48c. In this mode, a single channel equivalent to an information payload data rate of 2.377728 Gbps shall be supported.	[redacted]
k.	**SONET OC-192** (Optional). This category of WLNAA shall support a line rate of 10 Gbps, which may be used to provide channelized OC-192 or concatenated OC-192c service as follows:	[redacted]
k. (1)	Channelized OC-192. In this mode, 4 separate OC-48 channels, each with an information payload data rate of 2.488 Gbps, shall be supported.	[redacted]
k. (2)	Concatenated OC-192c. In this mode, a single channel equivalent to an information payload data rate of 9.510912 Gbps shall be supported.	[redacted]
l.	**Dial Access Line**. This category of WLNAA shall support 2 wire analog lines and trunks without access integration for voice service (VS)	[redacted]
m.	**DS0.** This category of WLNAA shall support information payload data rates of 56 kbps and 64 kbps.	[redacted]

ID #	Name of Capability	Qwest's Approach
		[redacted]
n.	**Subrate DS0**. This category of WLNAA shall support Subrate DS0 at information payload data rates of 4.8, 9.6, and 19.2 kbps.	[redacted]
o.	**Optical Wavelength.** Bi-directional wavelengths (WDM and ASTN) connections to an optical network for the following speeds: a. OC-48 b. OC-192 c. OC-768 (Optional)	[redacted]
p.	**Dark Fiber** (Optional). Dark Fiber shall support the following capabilities:	
p. (1)	Deployed fiber shall support both single-mode and multimode f bers	[redacted]
p. (2)	Deployed fibers shall be capable of supporting a minimum of 80 DWDM wavelengths or user data with spacing as specified in ITU-T G.694.1	[redacted]
p. (3)	Deployed fibers shall be capable of operating in the "C", and "L" bands. Support for the "S" band will also be required when commercially available.	[redacted]

3.2.1.2.4 Satisfaction of WLNAA Feature Requirements (C.2.16.2.1.2)

Figure 3.2.1-6 presents Qwest's approach to the Government's requirements for WLNAA technical features.

Figure 3.2.1-6. Qwest's WLNAA Features

ID #	Feature	Qwest Technical Approach
1	Access Route or Path Diversity	[redacted]

		[redacted]
2	Access Route or Path Avoidance	[redacted]

3.2.1.2.5 WLNAA Interfaces (C.2.16.2.1.3)

Qwest supports the following User-to-Network Interfaces (UNIs) shown in ***Figure 3.2.1-7*** at the SDP by deploying CLEC/ILEC services via [redacted] Qwest fully complies with all mandatory stipulated and narrative features, capabilities, and interface requirements for WLNAA. [redacted]

Figure 3.2.1-7. WLNAA Methods Ensure Compliance with UNI Interface Standards

UNI Type	Interface Type and Standard	Signaling Type Interface Methods
1	ITU-TSS V.35	[redacted]
2	EIA RS-449	[redacted]
3	EIA RS-232	[redacted]
4	EIA RS-530	[redacted]
5	T1 (with ESF) [Std: Telcordia SR-TSV002275; ANSI T1.403)	[redacted]
6	ISDN PRI [Std: ANSI T1.607/610]	[redacted]
7	T3 [Std: Telcordia GR400-CORE]	[redacted]
8	E1 (Std:ITU-TSS	[redacted]
9	E3 (Std: ITU-TSS G.702) (Non-domestic)	[redacted]
10	SONET OC-3 (Std: ANSI T1.105 and 106)	[redacted]
11	SONET OC-3c (Std: ANSI T1.105 and 106)	[redacted]
12	SONET OC-12 (Std: ANSI T1.105 and 106) (Optional)	[redacted]
13	SONET OC-12c (Std: ANSI T1.105 and 106) (Optional)	[redacted]
14	SONET OC-48 (Std: ANSI T1.105 and 106) (Optional)	[redacted]
15	SONET OC-48c (Std: ANSI T1.105 and 106) (Optional)	[redacted]
16	SONET OC-192 (Std: ANSI T1.105 and 106) (Optional)	[redacted]
17	SONET OC-192c (Std: ANSI T1.105 and 106) (Optional)	[redacted]

[redacted]

[redacted]

3.2.1.2.6.1 Maryland Procurement Office (MPO) Optical Wavelength Service (OWS) Camp Williams, UT Build-out [redacted]

[redacted]

[redacted]

3.2.1.2.6.2 Maryland Procurement Office (MPO) Optical Wavelength Service

[redacted]

[redacted]

3.2.1.2.6.3 Maryland Procurement Office (MPO) Dedicated Access

[redacted]

[redacted]

3.2.1.3 Broadband Access Arrangements (BBAA) (C.2.16.2.2)

[redacted] Qwest will provide DSL and Ethernet access services that are designed to interoperate with services delivered to Agency specified locations/equipment and to the Qwest POPs. Both BBAA service types provide for Ethernet handoffs that interface with Qwest's Provider Edge (PE) routers/switches and support the telecommunications service offerings as designated in the service/access matrix shown in Figure 3.2.1-3, *Qwest's Selection of Arrangements for Service Types*.

Qwest is not proposing Cable High-Speed Service or Fiber-to-the-Premise (FTTP).

3.2.1.3.1 BBAA Characteristics and Performance (C.2.16.2.2.1.1, C.2.16.2.2.1.2, C.2.16.2.2.1.3, C.2.16.2.2.1.4)

Qwest offers Agencies the low cost of DSL access with nationwide coverage. Qwest's Ethernet offers Agencies the best of Ethernet local access conforming to IEEE 802.3 and supporting multiple media types for Local Area Networks, Wide Area Networks, and Metropolitan Area Networks.

3.2.1.3.1.1 DSL

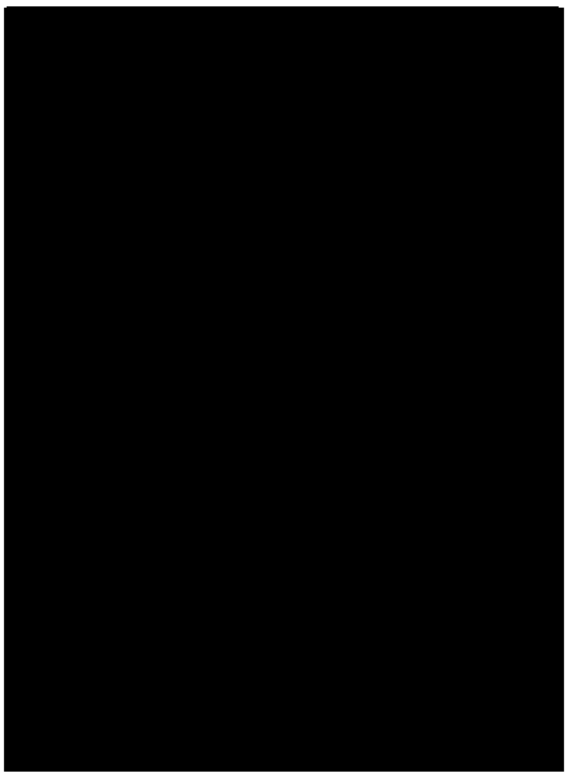
DSL access is rapidly becoming a cost-effective alternative to traditional dedicated access circuits. Qwest is offering DSL services via the ILECs, including Qwest Local and Covad network services. This reach enables Qwest to provide network services such as IPS, ATMS, Frame Relay Service and NBIP-VPNS to Agencies. Qwest has developed, implemented, and managed BBAAs for DSL and comply with the following applicable standards, at a minimum, to the service being offered:

1. Asymmetric and Symmetric Digital Subscriber Line (ADSL and SDSL):
   a. ADSL and DSL Forums
   b. ITU-TSS Recommendation G.992 for ADSL (interoperable DSL modem and DSLAM line card)
   c. ANSI T1.413 (compatible DSL modem and DSLAM line card from the same manufacturer)
2. ISDN Digital Subscriber Line
   a. ISDN Forum

[redacted]

3.2.1.3.2 Ethernet Local Access (ELA)

[redacted]



[redacted]

[redacted]

CLIN	Case Number	Country/Jurisdiction ID	Case Description
[redacted]			

CLIN	Case Number	Country/Jurisdiction ID	Case Description
			[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

[redacted].2.1.3.4 Ethernet Access Bandwidth on Demand

Centurylink is offering Ethernet Bandwidth on Demand. For this service,

[redacted]

[redacted]

3.2.1.4 Wireless Access Arrangement (WLSAA) (C.2.16.2.3)

[redacted]

[redacted]

3.2.1.4.1 WLSAA Characteristics and Performance (C.2.16.2.3.1.2, C.2.16.2.3.1.3, C.2.16.2.3.1.4, C.2.16.2.3.3.1)

Qwest is offering the following symmetric data rates:

- DS-1
- NxDS1s (where N=2 through 27)
- DS-3

Qwest supports the following interfaces using the interface methods specified in ***Figure 3.2.1-12***. Qwest fully complies with all mandatory stipulated and narrative features, capabilities, and interface requirements for WLSAA. The content in Figure 3.2.1-12 is intended to provide the technical description required and does not limit or caveat Qwest's compliance in any way.

Figure 3.2.1-12. WLSAA Interface Methods Ensure Compliance with UNI Interface Standards

UNI Type	Interface Type and Standard	Interface Methods/ Signaling Type
1	ITU-TSS V.35 (Specific to Broadband Wireless)	[redacted]
2	EIA RS-449 (Specific to Broadband Wireless)	[redacted]
3	EIA RS-232 (Specific to Broadband Wireless)	[redacted]
4	EIA RS-530 (Specific to Broadband Wireless)	[redacted]
5	T1 (with Extended Super Frame *(ESF)) [Std: Telcordia SR-TSV- (S002275; ANSI T1.403] (Specific to Broadband Wireless)	[redacted]
6	T3 [Std: Telcordia GR-400-CORE] (Specific to Broadband Wireless)	[redacted]

Approach for Monitoring and Measuring WLSAA KPIs and AQLs

[redacted]

[redacted]

[redacted]

3.2.1.5 Satellite Access Arrangement (SatAA) (C.2.16.2.4)

Qwest is offering SatAA with our partner [redacted] to provide speeds of T1 through DS3 to support Agency performance metrics for availability and disaster recovery. In compliance with NSEP requirements, the command and control link is encrypted. SatAA service has been developed, implemented, and managed supporting the following frequencies

a. C-Band. Uplink: 5.9 to 6.4 GHz; Downlink: 3.7 to 4.2 GHz; Bandwidth: 500 MHz

b. Ku-Band. Uplink: 14 to 14.5 GHz; Downlink: 11.7 to 12.2 GHz; Bandwidth: 500 MHz

c. Ka-band. Uplink: 30 to 31 GHz; Downlink: 20 to 21 GHz; Bandwidth: 500 MHz (when available commercially)

Qwest's SatAA is supported by [redacted] Qwest's teammate [redacted] will provide access to its Virtual Teleport Network (VTN). [redacted]

[redacted]

3.2.1.5.1 Satellite Access Arrangement (SatAA) Characteristics and Performance

Qwest is offering the following satellite transponders' bands frequency allocations and channel bandwidth (FCC) as applicable:

Frequency:

- C-Band. Uplink: 5.9 to 6.4 GHz; Downlink: 3.7 to 4.2 GHz; Bandwidth: 500 MHz
- Ku-Band. Uplink: 14 to 14.5 GHz; Downlink: 11.7 to 12.2 GHz; Bandwidth: 500 MHz

- Ka-band. Uplink: 30 to 31 GHz; Downlink: 20 to 21 GHz; Bandwidth: 500 MHz

Standards:

- Transmission Control Protocol-Internet Protocol Performance Enhancement Proxy (PEP) for Satellite transmission (IETF RFC 3135)
- TIA-1008 [also known as IP over Satellite (IPoS)]
- Transmission Performance and GFP Interfaces
  - ANSI T1.102/107/403/503/510 for T1 data rate
  - Telcordia PUB GR-499-CORE for T3 data rate
  - ITU-TSS G.702 and related recommendations for E1
  - ANSI T1.105 and 106 for SONET
  - USB 2.0 (USB Implementers' Forum)
  - IEEE 802.3, including 10 Base-T/TX/FX and 100 Base-TX/FX

Interfaces: Qwest fully complies with all mandatory stipulated and narrative features, capabilities, and interface requirements for SatAA. The content in Figure 3.2.1-14 is intended to provide the technical description required and does not limit or caveat Qwest's compliance in any way.

Figure 3.2.1-14. Interfaces

UNI Type	Interface Type and Standard	Payload Data Rate or Bandwidth	Signaling Type
1	ITU-TSS V.35	Up to 1.92 Mbps	Transparent
2	EIA RS-449	Up to 1.92 Mbps	Transparent
3	EIA RS-232	Up to 19.2 Kbps	Transparent
4	EIA RS-530	Up to 1.92 Mbps	Transparent
5	T1 [Std: Telcordia SR-TSV-002275; ANSI T1.403]	Up to 1.536 Mbps	Transparent
6	T3 [Std: Telcordia GR400-CORE]	Up to 43.008 Mbps	Transparent
7	E1 (Std: ITU-TSS G.702) (Nondomestic)	Up to 1.92 Mbps	Transparent
8	USB 2.0 (high speed) (Optional)	Up to 43 Mbps (Note maximum serial bus speed is limited to 480 Mbps)	Transparent
9	Air link interface (C-band, Ku-band, and Ka-band earth station)	Up to 43.008 Mbps	Transparent

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.2.2 Arrangements with Other Service Providers for Carrying and Exchanging Traffic (L.32.1.3.2(b))

Carrier Arrangements for Traffic Exchange

Qwest has carrier agreements and interconnections with more than [redacted] carriers. Qwest requires that connectivity with CLECs and ILECs be through SONET-ring protected networks using dual entrances into our POPs to mitigate the impact of fiber cuts. In particular, any carrier with whom Qwest enters into an interconnect arrangement is required to meet Qwest's stringent quality and reliability requirements. For all maintenance, installation, cross-connect, addition, upgrade, modification, or other alteration within the facility, Qwest and other service providers comply with all manufacturers' specifications and meet all industry quality assurance standards (for example, Network Equipment Building Systems, IEEE, and Telcordia).

Qwest has comprehensive Master Services Agreements for bandwidth services and voice call origination and termination, as shown in [redacted]

Inter-Exchange Carrier (IXC)	
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	

Qwest's IXC Carrier Management organization is responsible for establishing, developing, and managing relationships with other IXCs to enable Qwest to deliver the highest quality off-network long-distance switched and private line long-haul services at the best possible rates. The team works aggressively to obtain the lowest cost for all services through contract negotiations with current

vendors and by establishing new vendor relationships with other IXC service providers.

IXC Carrier Management also develops vendor performance management tools and reports, which enable Qwest to manage IXC service providers to the same aggressive service levels that Qwest has committed to our customers.

In addition, we have [redacted] over and above the necessary connections with the ILECs, as shown in [redacted]

CLEC and Number of Buildings		CLEC and Number of Buildings	
[redacted]			

As with IXC carrier management, our CLEC management team is responsible for establishing, developing, and managing relationships with CLEC vendors that enable the best possible rates and service reach. The team works aggressively to obtain the lowest cost for all services through contract negotiations with current vendors and by establishing new vendor relationships with other CLEC service providers.

CLEC Carrier Management also works to create internal efficiencies that lead to lower costs for Qwest. Some examples include ordering circuits on five-year terms, reducing billing of early termination liability charges, and determining need of usage for CLEC services in on-net areas.

Carrier management continually reviews our carrier partners' performance for price and technical performance. Each agreement ensures the proper optimization of the relationship to cover the life cycle of a service request – from

technical issues for provisioning to provisioning timeframes, billing, monitoring, and trouble management.

[redacted]

[redacted]

Cellular Roaming

Qwest's cellular roaming solution ensures both broad domestic and international mobile access. Roaming and affiliate agreements provide extensive coverage areas in second- and third-tier markets.

[redacted]

Domestic Roaming Partners			
[redacted]			

Domestic Roaming Partners			
[redacted]			

Qwest's Wireless Solution also enables international roaming via the following partners, as shown in [redacted]

[redacted]

International Roaming Partners			
[redacted]			

3.2.3 Congestion Flow Strategies, Control and Redundancy (L.34.1.3.2(c))

Qwest has tremendous backbone bandwidth based on our implementation of DWDM and aggressive capacity planning to ensure no congestion in our data and voice services networks. [redacted] Our network planning engineers examine all failure modes and design network capacity and switch or router redundancy to ensure performance during failures.

While Qwest engineers our network to handle congestion, our primary approach to maintaining service quality is to plan, engineer, and operate the network to avoid congestion and single points of failure.

Physical Plant Resiliency

[redacted]

[redacted]

[redacted]

Optical Transport Architecture Resiliency

The next step in redundancy and resiliency is our backbone optical transport system:

[redacted]

[redacted]

Data Transport Services, ATM, FR, and IP-based Resiliency

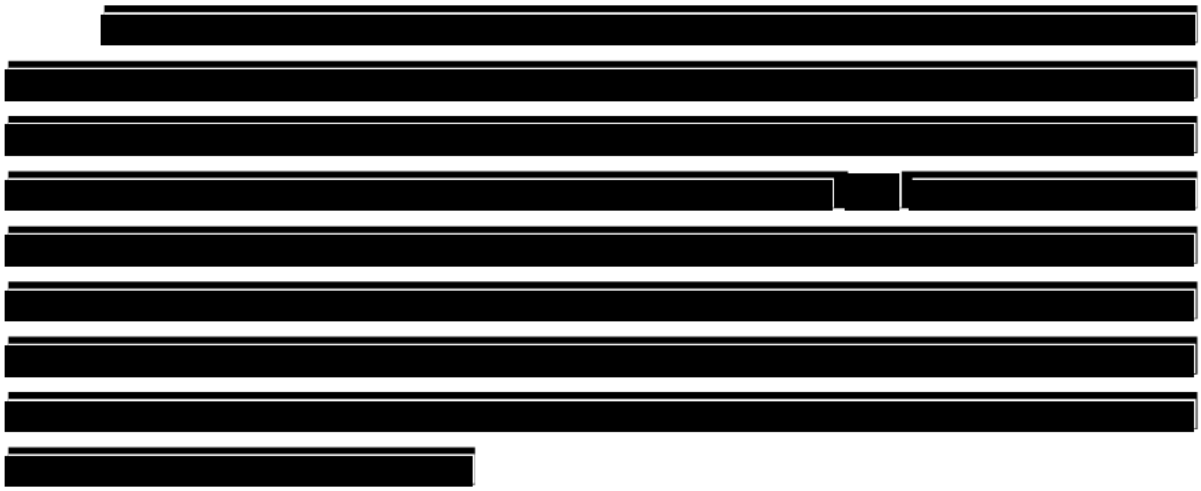
[redacted]

[redacted]

To ensure high availability of our VoIP, IP, ATM, FR and other IP-based services, Qwest [redacted] shows a diagram of our typical TeraPoP data network architecture. [redacted]

Qwest networks are built with significant extra capacity to allow for bursting, and to absorb changes in traffic patterns when failure conditions exist. Qwest also adopts a stringent capacity-planning methodology to ensure there is enough room in the backbone network to accommodate traffic surges in the event of micro bursts,

denial of service attacks, or link failures. By rigorously following such capacity planning rules, we ensure that the Qwest backbone network will maintain service quality for Agencies.



For the integrated Qwest ATM and FR network, there is a second set of statistics that we watch closely in conjunction with the monitoring of the usage statistics.

[redacted]

The combination of our backbone core and access architecture, the use of advanced MPLS-based traffic engineering, and our conservative backbone and access router link upgrade policy significantly limits the potential for degraded customer service during potential failures.

Internet Services Resiliency

[redacted]

[redacted]

Qwest has the ability to respond to unusual and extreme traffic flows. [redacted]

Voice Services Architecture Resiliency

The Qwest long distance VS network provides the service and switching plane for generic VS and enhanced services, including toll free. [redacted]

Each [redacted] complex supports a particular set of serving areas in the national network. [redacted] Any voice traffic that originates and terminates on different switches will have [redacted]

[redacted]

Qwest currently uses a hubbing arrangement for internal tandeming of traffic. [redacted]

If a single circuit outage occurs, [redacted] recovers the majority of the traffic between two destinations. The amount of recovery depends on the extent of circuit damage and the traffic levels between two points. There are typically two to three IMT groups between any originating and terminating switch locations.

[redacted]

For congestion scenarios, Qwest may implement a directional reservation on a trunk group or trunk groups into a specifically congested area. These controls are put in place to ensure that circuits are reserved for calls leaving a specific area during a congestion event.

Qwest's current policy is to engineer traffic such that switches [redacted] of their CPU capacity during daily network busy hours.

Qwest VoIP and IP telephony services are built on the NGA. The NGA is built upon a highly reliable hardware platform. The hardware platform utilizes either [redacted] for all critical components.

All of the NGA complexes are interconnected via the Qwest internal IP backbone. [redacted] overhead factor, a complete single point outage can be fully handled by the redundant element, or, if a traffic spike occurs, it is easily absorbed under normal conditions.

For VoIP-originated and terminating traffic, Qwest has implemented [redacted] that throttles traffic on a per end-point basis. This functionality allows Qwest to limit traffic from specific [redacted] to prevent a single customer from flooding the network with traffic.

Local Access Loop Resiliency

For last-mile access into a customer facility, Qwest offers a local loop diversity option. Qwest's local loop diversity enhancement includes:

- A defined relationship is maintained between the primary circuit and the diversely routed circuit(s)
- Resiliency is custom-engineered by Qwest based upon available facilities
- Both circuits are identified and maintained in the Qwest database systems as diversely related circuits

Network Access Resiliency

Qwest can also provide additional resiliency by enabling diversely routed access circuits to terminate at diverse Qwest equipment – either in the same POP or another POP.

Qwest has provisioning capabilities to ensure that a defined relationship is maintained between the primary circuit and the diversely routed circuit. This relationship includes:

[redacted]

Network access diversity is available in the following configurations (either separately or in combination where appropriate, subject to available network facilities and technical feasibility):

[redacted]

Quality of Service and Class of Service

For traditional data services, Qwest provides four classes of service for ATM and three for FR. The classes are mapped into virtual circuits with an associated traffic contract. [redacted] of their guaranteed minimum traffic rate under both expected and unexpected traffic loads. When combined, [redacted] also ensure that Agency performance will not be affected by the failure of a core switch or backbone trunk.

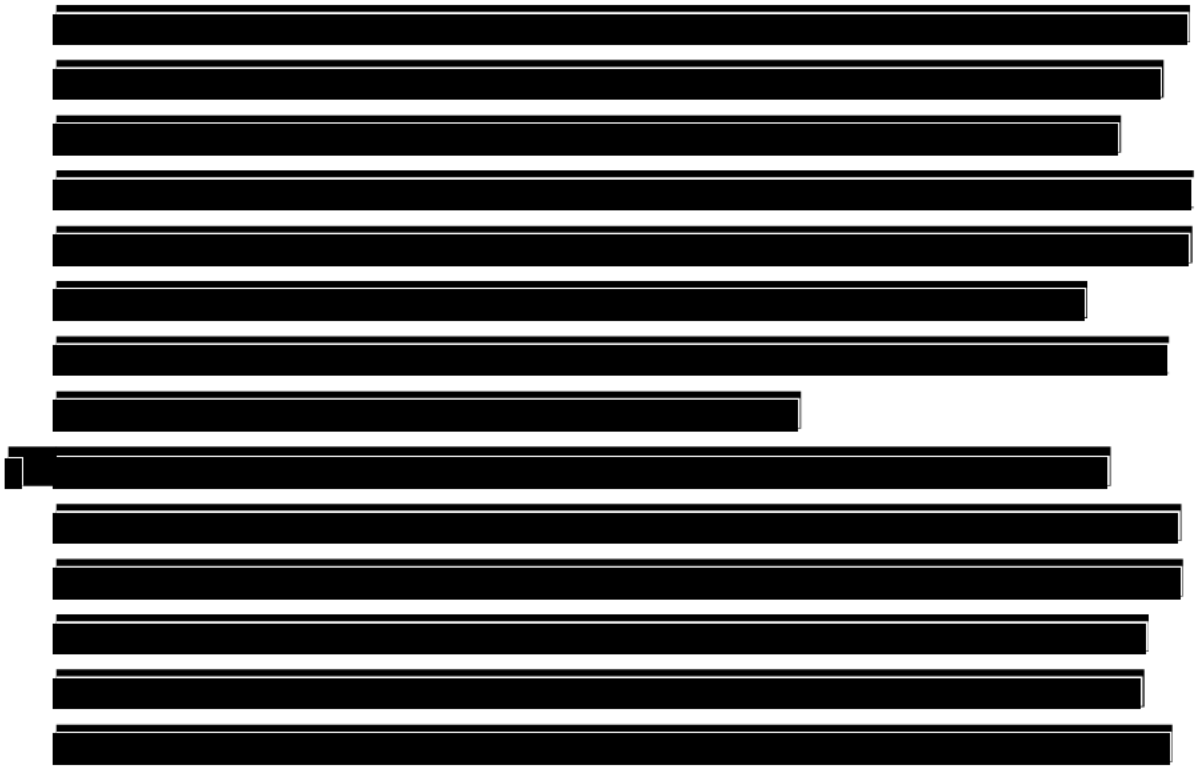
For our IP-based services, Qwest ensures that our MPLS core backbone design, bandwidth and bandwidth for the access routers have enough capacity to meet expected demand as well as unexpected peak demand. As described earlier, the network is designed so that no core route or backbone link failure will cause utilization to exceed [redacted] on any remaining backbone trunks.

In addition to using backbone capacity to ensure good performance in the event of failures or unexpected loads, Qwest is implementing [redacted]

PCS Resiliency

The base stations used to support our PCS services incorporate significant features to manage congestion and flow control, and maintain service during equipment failures.

[redacted]



Over the air, CDMA standards provide the best reliability. The use of CDMA spread spectrum is an efficient way to mitigate interference, and a call is typically carried in soft hand-off between the mobile and several base stations (up to six), thus reducing the impact of transmission failures, obstacles or interferences.

3.2.4 Approach to Performing Verification of Individual Services (L.32.1.3.2(d))

Standard Test Procedures (Req_ ID 2267)

Qwest will deliver the Networx Services Verification Test Plan which will detail the standard test procedures that will be used by Qwest to verify, at a minimum, that the services delivered under the contract meet the KPI/AQL thresholds including SDP-to-SDP measurements for the ordered service as specified in Section C.2, Technical Requirements, prior to delivering the ordered service to the customer.

Qwest is drafting a Networx Services Verification Test Plan in preparation for its delivery due date, which is 60 days after contract award.

Process and Procedures (Req_ID 2266)

The Networx Services Verification Test Plan will contain the individual service test plans that Qwest uses on a regular basis, as well as team member provided services. As new services are requested by the Government, these individual Service Test Plans will be incorporated into the Networx Services Verification Test Plan. The individual test plans will be reviewed with the Government prior to adding any new service to the Networx Program. The Government may comment and suggest changes or improvements to the service test plan to be considered for incorporation into the plan.

Testing at Time of Initial Service Delivery (Req_ ID 2264)

Each time a service is delivered to an Agency for the first time, the individual service test plan will be executed. Each individual service test plan will include validation of SDP-to-SDP AQL achievement. Qwest will provide a copy of the service test as part of the acceptance process each time a service is delivered to the Government.

Service-Specific Test Plan Attachments (Req_ ID 2262)

As new services are requested by the Government, Qwest will provide the associated Service Test Plans and they will be incorporated into the Networx Services Test Plan. The individual service test plans will be reviewed with the Government prior to adding any new service to the Networx Program. The Government may comment and suggest changes or improvements for the service test plan to be considered for incorporation into the plan.

GSA Approval (Req_ ID 7675)

The Qwest Networx CPO will be responsible for managing the approval process with the GSA for the Networx Services Verification Test Plan. Qwest will

submit the Plan for approval in accordance with Section E.2.2 and Section F and will delivery it at 60 days after Notice to Proceed.

Notice of Changes (Req_ ID 7676)

Each time Qwest's Networx Verification Test Plan is changed, due to such activities as addition of a service-specific test plan, Qwest will notify the Government prior to release of the plan. The Qwest CPO will have responsibility for communicating the test changes, so that the Government is assured that successful service implementation will include adequate testing. Qwest will use the contract modification process established by the GSA to offer new services under the Networx program. After approval from the GSA, Qwest will provide updates to relevant information such as the Networx Verification Test Plan as standard procedure.

Approach

[redacted]

[redacted]

[redacted]

3.2.4.1 POP-to-POP Monitoring as an Element in Networx AQL Verification

In addition to SDP-to-SDP monitoring, Qwest measures its own internal network SLAs. We use [redacted]

	Private Line	Optical WL over WDM	Ethernet	Dark Fiber

	Private Line	Optical WL over WDM	Ethernet	Dark Fiber
[redacted]				

[redacted] The data is used in several ways.

- [redacted]
- [redacted]
- [redacted]

For DFS, our testing processes before turning over the fiber to the customer include measuring the attenuation coefficient to verify that it is within specifications. [redacted]

For the data (Frame Relay (FR)/ATM; IP/MPLS networks), [redacted] and provide a full mesh view of all of the KPI metrics listed in [redacted] They

are assessed on an individual site or site-pair basis where applicable. This data is used to ensure all customer data network SLAs are systematically being supported by the network. Additionally, key network infrastructure interfaces (aggregation ports/network-to-network interfaces and ATM trunk ports) are monitored for packet/cell loss (including errors and discards) and availability, ensuring that no customer SLA issues are traceable to key network infrastructure ports.

[redacted]

[redacted]	FR	ATM	Network Based IP VPN	Converged IP	Internet Protocol	Layer 2 VPN
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]			[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]		[redacted]	[redacted]			
[redacted]						

[redacted]

For VPN services, Qwest provides (customer edge) CE-based performance measures, including PE to CE and CE to CE measurements. These measurements are in addition to the PE to PE measurements. Probes are distributed to each POP that has PE routers and measurements are taken from the probes to customer CE devices. This service requires access from the probes to the customer CE devices. It is, therefore, not enabled unless specifically ordered by the customer.

The Qwest ATM/Frame network uses [redacted]

Individual voice services leverage multiple NEs to provide a single service to the customer. Because of this integration, voice test and certification require these same elements, as well as interconnectivity and interaction in a lab environment.

Qwest certifies all voice services and products across [redacted] This includes all voice, combined, toll-free services, VoIP, and IP telephony services. Qwest maintains a reproduction of the field environment in the lab to test and certify these services. [redacted] lists some of the major NEs contained in the test facilities.

[redacted]

Switch	SCP	STP	Service Node
[redacted]	[redacted]	[redacted]	[redacted]

The test facilities incorporate all major elements of the VS. We develop test strategies and plans based on product and customer requirements and execute those plans to determine the conformance and quality of the product prior to live network implementation. [redacted] Where KPI and AQL compliance are identified, Qwest incorporates those measurements into test plans.

[redacted]

[redacted]

	Voice	Circuit Switched data	Toll-Free	Combined	VoIP Transport	IP Telephony
[redacted]						
[redacted]						
[redacted]						
[redacted]						
[redacted]						

In addition to the KPIs listed above, we collect performance indicators including:

[redacted]

Qwest maintains a test environment based on the live network architecture for VoIP and IP telephony. [redacted]

[redacted] able to provide proactive management alerts to our network management centers when problems are identified—and provide passive management techniques—to quickly identify and perform issue isolation to support prompt resolution. This combined approach enables Qwest to reduce increased mean time between failures, effectively supporting our world-class network operation.

To field test our wireless network, the Qwest Team has an ongoing process of [redacted]

3.2.5 Approach to Ensure the Quality of Time-Sensitive Traffic (L.34.1.3.2(e))

All of Qwest's data networking solutions provide proven, industry-standard methods to ensure the quality of time sensitive traffic. Our network engineering and capacity planning ensure our ability to meet the challenge of voice transport. Qwest uses [redacted]

[redacted] With the network acting as a nearly perfect channel for these service classes, IP packet delivery for VoIP or video conferencing (for example, H.323) is correspondingly very high (that is, packet loss is less than 0.05 percent). Since the traffic contract is obeyed end-to-end, no other traffic on the network can interfere with the minimum data rate in the virtual circuit's traffic contract parameters. Combined with the capacity planning described in Section 3.2.3, even failures of core ATM switches or backbone circuits will not reduce the network capacity to a point where it impacts customers' minimum traffic contract parameters.

Traditional IP networks have evolved around "best effort" service and typically have not provided guarantees for key performance criteria. The need to support real-time services on IP networks has driven the development of IP prioritization and queuing mechanisms as well as MPLS technology. The Qwest network is engineered to enable QoS to prioritize certain types of traffic over other types of traffic.

As described in Section 3.2.3, [redacted] This means that the VoIP traffic has a higher priority than VPN or Internet traffic. [redacted] as shown below, highlights the quality of service enabled by Qwest's converged IP MPLS.

Qwest's IP MPLS network employs standards-based MPLS and IP-based QoS mechanisms to enable high quality voice, video, and data over an IP backbone. The process of applying QoS in a network, as previously shown in Figure 3.2.5-1, consists of multiple actions, defined as follows:

[redacted]

[redacted] With strict priority queuing, the scheduler is more interested in serving traffic in the [redacted] maybe even at the expense of the other queues (that is, it is discriminatory) [redacted]

With strict priority queuing on the ATM or FR access method, the scheduler can starve out other queues by exclusively serving [redacted]

[redacted] shown below, describes how Agencies can segment and prioritize traffic.

In addition to the two different queuing methods—high priority queuing and strict priority queuing—[redacted] previously referenced, shows a typical MPLS-based VPN providing support for video and other applications. If all the sites are connected via T-1s, then without QoS, the video IP packets in general will be

[redacted]

dropped as often as other packets if the traffic flow into the destination site in the figure exceeds the capacity of the T-1. This causes significant degradation of the video quality. To ensure that each application gets its required bandwidth, Qwest will implement the following processes which are currently supported on our network:

- Each CE router would prioritize the traffic that enters the Qwest IP network. This ensures that congestion at the Agency location does not interfere with the transfer of time-sensitive traffic. In particular, strict queuing with a bandwidth guarantee for [redacted] traffic would be implemented.
- The Qwest IP network maintains the priority through the core network as well as protection of our MPLS, VPN, and VoIP traffic against impacts from other networks.
- The Agency selects a prioritization template that is enforced on the Qwest egress (MPLS PE) so that packets marked as [redacted] are forwarded first, and that sufficient bandwidth is allocated to meet the application's requirements.

These QoS actions ensure that low-latency, real-time applications, such as voice, can share the same access lines and core with non-real-time data applications. Our convergence approach means that Qwest data services will migrate to a common IP/MPLS network, so we can easily plan and identify any QoS issues. As described in Section 3.2.3, Qwest's backbone and access bandwidth planning methodology ensures that there is sufficient bandwidth to meet our customer's full port-limited capability, even in the event of core router failure or an access router or backbone trunk failure.