4.2.6 Ethernet Services (EthS) (L.34.1.4.6, M.2.1.2)

Qwest has extended our SONET and converged IP core network to support Ethernet Services. These established capabilities enable our delivery of Networx EthS that will bring Federal Agencies to next-generation networking.

Qwest provides comprehensive Ethernet Services (EthS) to Agencies by directly leveraging our Synchronous Optical Network (SONET) and Internet Protocol (IP)/Multi-Protocol Label Switching (MPLS) data transport backbones and access infrastructure. Qwest's EthS offering meets all Networx service requirements. Networx defines two sections for EthS: Ethernet Private Line (E-Line) and Ethernet Private Local Area Network (E-LAN). Qwest will provide E-Line services using our Ethernet over SONET network and provide E-LAN services using Virtual Private Local Area Network Service (VPLS) over our IP/MPLS Wide Area Network (WAN).

The Qwest approach to scalable EthS is built upon the principle of addressing and anticipating a global IP networking environment. Qwest does so by using a packet-based infrastructure that delivers end-to-end high-value services via broadband access over high-capacity optical transport and employing integrated management and service controls. Qwest provides Agencies a reliable and secure end-to-end service with the following features and benefits realized with the Qwest global IP network.

Figure 4.2.6-1 provides an easy reference to correlate narrative requirements to our proposal response.

Figure 4.2.6-1. Table of EthS Narrative Requirements

Req_ID	RFP Section	Proposal Response
31665	C.2.7.1.1.4(8)	4.2.6.3.1
31668	C.2.7.1.1.4(11)	4.2.6.3.1
31686	C.2.7.1.1.4(14)(a)	4.2.6.3.1
31687	C.2.7.1.1.4(14)(b)	4.2.6.3.1
31688	C.2.7.1.1.4(14)(c)	4.2.6.3.1
31689	C.2.7.1.1.4(14)(d)	4.2.6.3.1
31690	C.2.7.1.1.4(14)(e)	4.2.6.3.1
31691	C.2.7.1.1.4(14)(f)	4.2.6.3.1
31692	C.2.7.1.1.4(14)(g)	4.2.6.3.1
31693	C.2.7.1.1.4(14)(h)	4.2.6.3.1
31694	C.2.7.1.1.4(14)(i)	4.2.6.3.1
31711	C.2.7.1.1.4(21)(a)	4.2.6.3.1
31712	C.2.7.1.1.4(21)(b)	4.2.6.3.1
31714	C.2.7.1.1.4(23)(a)	4.2.6.3.1
31715	C.2.7.1.1.4(23)(b)	4.2.6.3.1
31716	C.2.7.1.1.4(23)(c)	4.2.6.3.1
31717	C.2.7.1.1.4(23)(d)	4.2.6.3.1
31718	C.2.7.1.1.4(23)(e)	4.2.6.3.1
31721	C.2.7.1.2.1(1)	4.2.6.3.2

4.2.6.1 Reserved (L.34.1.4.6 (a))

4.2.6.2 Reserved (L.34.1.4.6 (b))

4.2.6.3 Satisfaction of EthS Requirements (L.34.1.4.6 (c))

Qwest's EthS provides dedicated and shared transport connectivity between two or more designated end points. Agency applications traverse with minimal protocol conversion. EthS uses two different technical approaches to service delivery, including SONET with Ethernet interfaces and Layer 2 Virtual Private Network (L2VPN) over Qwest's robust carrier grade private MPLS infrastructure.

Qwest delivers EthS by providing solutions using the Qwest Domestic SONET and MPLS Network and local access providers. Qwest will engineer, monitor, and manage EthS end-to-end to ensure scalability, interoperability,

and high availability to Agencies. EthS provides required capacity and bandwidth for transport of the Government's data traffic, using and conforming to the Metro Ethernet Network (MEF), Institute of Electrical and Electronics Engineers (IEEE), Internet Engineering Task Force (IETF), International Telecommunications Union (ITU), Ethernet in the First Mile, and 10Gbps Ethernet Alliance standards. Qwest currently does not support the optional Circuit Emulation Service Definitions specification draft as defined in the MEF. Qwest is closely following other standards, such as 802.17 and G.nni, and will adhere to them when standardized.

Qwest provides comprehensive end-to-end EthS solutions with our EthS portfolio, including full support of all required standards, and will allow Government users globally to connect their geographically distributed (inter- or intra-city) Agency locations to create virtual Local Area Networks (LANs) across WANs/Metropolitan Area Networks (MANs) using both E-Line and E-LAN. These services include support for all types of network topologies such as point-to-point, point-to-multipoint, and multipoint-to-multipoint.

E-Line: Qwest's E-Line services are provided over Qwest's state-of-the-art SONET and Dense Wave Division Multiplexing (DWDM) systems, built on Qwest's domestic [redacted] fiber-optic network. The SONET Four-fiber Bi-directional Line-switched Ring (4F-BLSR) architecture and wavelength networks use two distinct DWDM backbones. Furthermore, the SONET 4F-BLSR network routes the working and protect channels on separate fibers, virtually eliminating service disruptions. [redacted]

Qwest's SONET network is deployed on a footprint of Continental United States (CONUS) Points of Presence (POPs). Hundreds of aggregation points expand the network reach. Multiplexing and concatenation (standard

and virtual) are standard features of the network. All services are comprised of local access, backbone network, and appropriate SEDs.

Qwest's EthS provides dedicated or shared duplex bandwidth profiles at rates of 1Mbps through 1Gbps to meet all current and future Networx requirements. Qwest's SEDs have the required User-to-Network Interfaces (UNI) with either SONET or Wavelength Division Multiplexing (WDM) interfaces on the backend with dedicated bandwidth on the Qwest Time Division Multiplexing (TDM) backbone. Qwest is currently providing this service to several Agencies, including National Aeronautics and Space Administration and Energy Sciences Network.

[redacted] depicts a high-level diagram of Qwest's implementation of E-Line services. Qwest's E-Line services are provided from the Service Delivery Point (SDP) SED across both metro and long-haul networks with Ethernet-SONET protocol conversions only at the ingress and egress. Qwest E-Line services are available both intra- and inter-city between Agency sites. The services are provisioned over Qwest on-net and off-net facilities using facilities of other service providers if needed.

[redacted]

[redacted] Since Qwest E-Line services are provisioned on the SONET or DWDM network, it is fully transparent to all Agency protocols at L2 and L3 and does not interact with customer protocols such as 802.1q, 802.1p, and Quality of Service (QoS). Qwest can provide full or shared reservation of bandwidth on our SONET network for the E-Line service.

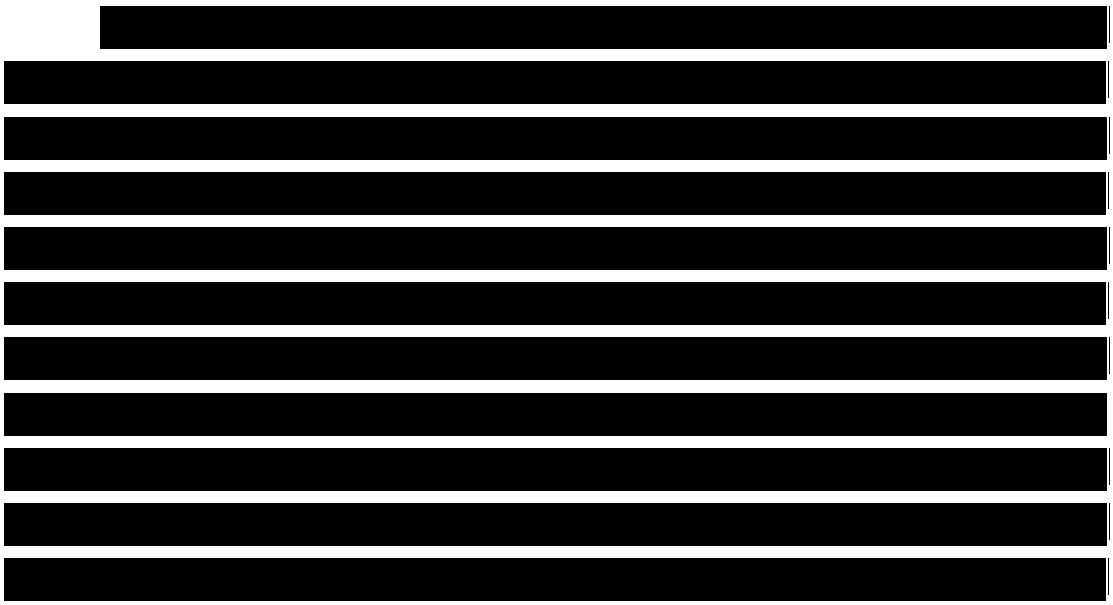
E-LAN: Qwest's E-LAN service is provided by Qwest through our high-capacity IP/MPLS core network backbone as shown in [redacted] Several Qwest services, including E-LAN, are converged under a unified

[redacted]

IP/MPLS service suite. Qwest's IP/MPLS network is constructed using highly available resilient components engineered to support the convergence of many technologies. It combines Ethernet, Asynchronous Transfer Mode (ATM), Frame Relay (FR), IP, and other protocols to form a solution platform capable of being customized to meet many different requirements.

Qwest's E-LAN services are supported using VPLS. This functionality provides Ethernet Layer 2, fully meshed, secure connectivity across a MAN or WAN.

VPLS is the implementation of a LAN or bridged network environment between multiple locations. VPLS provides Ethernet ports to Agencies that are set up as part of the same LAN across the WAN. Normally a LAN is restricted to an office floor or building. However, with VPLS, the LAN is configured across and between buildings, states, and countries. Traditional Ethernet networks are comprised of locations in the same local area. Qwest E-LAN service is available in the CONUS and supports a variety of access methods including, but not limited to, Ethernet as a native mode LAN interface.



[redacted]

At the Qwest POP, PE devices create unique EVCs for each Agency, and each EVC is separated from the other using VPLS. The EVC does not have any geographical boundaries, compared to a physical LAN switch, allowing flexibility in refining and expanding the E-LAN scope of coverage. The EVC creates a Closed User Group (CUG) for each VPLS enterprise providing privacy and security comparable to FR Service and ATM Service. Through the Qwest E-LAN provisioning process, each SDP is automatically associated with the appropriate EVC in a full mesh providing a degree of connection simplicity. E-Line services are provisioned over a private SONET backbone with dedicated bandwidth to ensure security and privacy.

Both E-Line and E-LAN services can be provided either across MAN or WAN networks. Local access uses Qwest on-net facilities or off-net service providers. Qwest On-Net networks span metro regions across the CONUS and are comprised of both SONET and Native Ethernet switched networks. Qwest also has long-established relationships with other service providers to

provision access via ELA and special access offerings for national coverage. Qwest's SONET and private IP/MPLS backbone have hundreds of POPs across the CONUS where all the local access networks are interconnected. This provides Government Agency networks both MAN and WAN connectivity in any desired topology.

Qwest has access devices that provide a variety of connectivity options to Qwest's PE devices including, but not limited to, Ethernet over copper, Ethernet over TDM, and Ethernet over fiber.

4.2.6.3.1 Satisfaction of EthS Capability Requirements (L.34.1.4.6(c), C.2.7.1.1.4)

Figure 4.2.6-4 summarizes Qwest's response to the EthS capabilities listed in RFP C.2.7.1.1.4. Qwest fully complies with all mandatory stipulated and narrative capabilities requirements for EthS. The text in Figure 4.2.6-4 is intended to provide the technical description required per L.34.1.4.6(c) and does not limit or caveat Qwest's compliance in any way.

More information about how Qwest supports these capabilities follows the figure.

Figure 4.2.6-4. Qwest's Technical Approach to EthS Capabilities

ID #	Capability	[redacted]
1	End-to-End Delivery	[redacted]
2 [Optional]	UNI to Layer 2 and Layer 3 Clients	[redacted]

ID #	Capability	[redacted]
3	EVC Support	[redacted]
4	Delivery of EthS via a UNI at Agency SDP	[redacted]
5 [Optional]	CE Support for FR, ATM, TDM	[redacted]
6	Point and Multipoint EVCs	[redacted]
7	EVC Multiplexing	[redacted]
8	Bandwidth Profiles Supported	[redacted]
9	Rate-Limited Throughput	[redacted]
10	Rate-Limiting at SDP	[redacted]
11	Bandwidth Profiles per EVC	[redacted]
12	Privacy and Security	[redacted]
13	Service Attributes	[redacted]

ID #	Capability	Qwest's Approach
		[redacted]
14	Performance Monitoring	[redacted]
15	Maintenance Functions	[redacted]
16 [Optional]	Last Mile Media	[redacted]

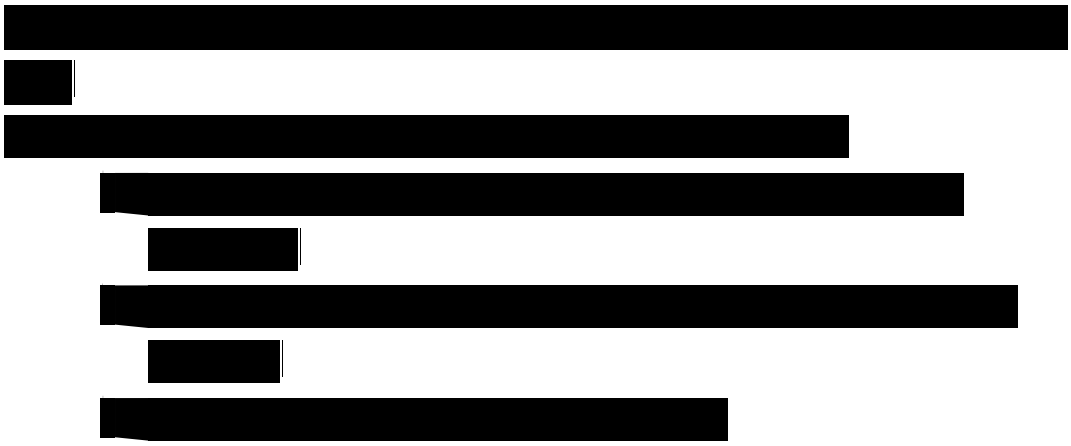
ID #	Capability	[redacted]
17 [Optional]	Access Methods	[redacted]
18	Network Topologies	[redacted]
19	Geographical Diversity	[redacted]
20	Bridging Support	[redacted]
21	VC Sizes	[redacted]
22	Notification of Protection updates	[redacted]
23	Transport Methods and Protocol Internetworking	[redacted]
24 [Optional]	Quality of Service	[redacted]

ID #	Capability	[redacted]
25	Traffic Reconfiguration Support	[redacted]

Ingress/Egress Bandwidth Profiles Supported per UNI (Req_ID 31665, C.2.7.1.1.4 (8))

Qwest supports ingress/egress profiles per UNI as follows:

[redacted]



Performance Monitoring: Signal Failure (Req_ID 31686, C.2.7.1.1.4 (14)(a))

Qwest meets the performance monitoring capabilities for signal failure. Qwest network devices can detect signal failures, and Qwest monitoring systems will generate alarms in real time. These will be reported in the Qwest Control Networx Portal for Agency visibility.

Performance Monitoring: Signal Degradation (Req_ID 31687, C.2.7.1.1.4 (14)(b))

Qwest meets the proactive performance monitoring requirements for signal degradation for EthS. Qwest network devices detect signal degradations based on multiple parameters (i.e., receive signal strength), and Qwest monitoring systems generate alarms in real time.

The NEs that support EthS capture and maintain performance data on equipment and circuits. Qwest uses [redacted] performance management tool to collect performance data from the NEs on a pre-established time cycle [redacted]. We analyze the data immediately and store it for trend analysis and reporting. If the collected performance parameters indicate degradation in signal quality, alarms are generated to alert technicians of the condition. Severe errors (such as Loss of Signal) immediately generate alarms to the NOC.

Qwest supports real-time monitoring and performance statistics and maintains a central data repository for key network performance information including signal degradation. These performance indicators are generated by a combination of system-specific statistics. Logs and traps are generated by our network management system and sent to the Network Monitoring Team. Data is analyzed, formatted, and sent to operations, engineering, and planning for pro-active network enhancement and performance management. Qwest's centralized engineering team applies a consistent performance management model to all data services, including EthS.

Performance Monitoring: Connectivity or Loss of Connectivity (Req_ID 31688, C.2.7.1.1.4 (14)(c))

Qwest meets the proactive performance monitoring capabilities for connectivity or loss of connectivity. Qwest network devices automatically detect connectivity status, and Qwest's configurable monitoring systems generate alarms in real time.

Performance Monitoring: Frame Loss (Req_ID 31689, C.2.7.1.1.4 (14)(d))

Qwest supports performance monitoring for EthS. In regard to E-Line, the service is transparent to the upper layer. In regard to E-LAN, Qwest network devices can detect frame losses and errors, and Qwest monitoring systems will generate alarms in real time.

Proactive Performance Monitoring of E-Line frame loss is accomplished by careful monitoring of the SONET NEs used to transport E-Line service as well as monitoring of the E-Line NEs used to deliver the service.

E-Line service is provisioned over Qwest's SONET network. Therefore, not only does E-Line benefit from SONET protection-switching that guarantees high availability, but also from all the proactive performance monitoring capabilities that Qwest has already deployed for our SONET

network. Proactive monitoring for SONET performance degradation and frame loss correlates closely to monitoring for E-Line frame loss.

Qwest analyzes the collected data in several ways:

- Logs and traps are generated by our network management system and sent to the Network Monitoring Team for immediate review.
- Performance results are compared to the performance thresholds that are set to trigger alarms.
- When automated analysis indicates performance thresholds are in jeopardy, trouble tickets are generated automatically and sent to the attention of on-duty operations technicians and engineers.
- Performance results are calculated and displayed on network scorecards and are available through the Qwest Control Networx Portal.
- Data is analyzed, formatted, and sent to operations, engineering, and planning for pro-active network enhancement and capacity planning. Qwest maintains a central data repository for storage of key network performance information.

In summary, proactive data collection and analysis of the SONET transport and E-Line NEs enable Qwest to proactively monitor E-Line for frame loss and other errors.

Performance Monitoring: Error Frames (Req_ID 31690, C.2.7.1.1.4 (14)(e))

Qwest meets the performance monitoring capabilities for errored frames for EthS. In regard to E-Line, the service is transparent to the upper layer. In regard to E-LAN, Qwest network devices can detect frame losses and errors, and Qwest monitoring systems will generate alarms in real time.

Proactive Performance Monitoring of E-Line errored frames is accomplished by careful monitoring of the SONET NEs used to transport E-Line service as well as monitoring of the E-Line NEs used to deliver the service.

Performance Monitoring: Looping (Req_ID 31691, C.2.7.1.1.4 (14)(f))

Qwest meets the proactive performance monitoring capabilities for looping of EthS. Qwest SONET systems can generate physical and logical layer loopbacks for any PM functions.

Performance Monitoring: Denial of Service (Req_ID 31692, C.2.7.1.1.4 (14)(g))

Qwest meets the performance monitoring capabilities for DoS for EthS. Qwest MPLS PE devices have anti-DoS protection capabilities. Using protocols including [redacted] and external security devices, the Qwest NOC is informed in real time about DoS attacks.

The NEs that support EthS capture and maintain performance data on equipment and circuits. Qwest uses [redacted] performance management tool to collect performance data from the NEs on a pre-established time cycle [redacted]. We analyze the data immediately and store it for trend analysis and reporting. If the collected performance parameters indicate degradation in signal quality, alarms are generated to alert technicians of the condition. Severe errors (such as Loss of Signal) immediately generate alarms to the Operations Center.

Performance Monitoring: Misinserted Frames (Req_ID 31693, C.2.7.1.1.4 (14)(h))

Qwest meets the performance monitoring capabilities for mis-inserted frames. Qwest PE devices or SEDs detect and inform our NOC via Simple Network Management Protocol if there are dropped packets because of mis-inserted frames.

Performance Monitoring: Maintenance Parameters (Req_ID 31694, C.2.7.1.1.4 (14)(i))

Qwest meets the performance monitoring capabilities for maintenance parameters such as environmental, errored seconds, and utilizations. Reports are generated, as required, for desired parameters.

Point-to-Point Ethernet Connections (Req_ID 31711, C.2.7.1.1.4 (21)(a))

EthS will support point-to-point virtual connections up to 1Gbps by using the Qwest MPLS infrastructure, as well as use of Qwest's SONET infrastructure. Tested and proven Juniper and Cisco edge devices perform this function.

Multipoint-to-Multipoint (Req_ID 31712, C.2.7.1.1.4 (21)(b))

EthS will support multipoint-to-multipoint virtual connections up to 1Gbps by using the Qwest MPLS infrastructure. Tested and proven Juniper and Cisco edge devices perform this function.

Limitations Transporting Native Ethernet over WDM Gear (Req_ID 31714, C.2.7.1.1.4 (23)(a))

There are no limitations for transporting native Ethernet over WDM gear. For the EthS/ELAN service, Qwest supports CWDM/DWDM in the access network.

Limitations When Using GFP, LCAS, and Virtual Concatenation Technologies (Req_ID 31715, C.2.7.1.1.4 (23)(b))

For VCAT, all the virtual concatenation channels must be on the same path. Within Qwest's network we use a number of devices to support VCAT and LCAS.

Ethernet over ATM (Req_ID 31716, C.2.7.1.1.4 (23)(c))

To support Ethernet over ATM, the Agency SED connecting into the SDP is required to support RFC 1483 (now RFC 2684, Bridged Ethernet over ATM). The SED will encapsulate Ethernet frames over ATM for transport to

the PE Router, where these Ethernet frames are then un-encapsulated for forwarding into the VPLS network.

Ethernet over FR (Req_ID 31717, C.2.7.1.1.4 (23)(d))

To support Ethernet over FR, the Agency SED connecting into the SDP is required to support RFC 1490 (now RFC 2427, Bridged Ethernet over FR). The SED will encapsulate Ethernet frames over FR for transport to the PE Router, where these Ethernet frames are then un-encapsulated for forwarding into the VPLS network.

Ethernet over MPLS (Req_ID 31718, C.2.7.1.1.4 (23)(e))

Qwest supports Ethernet over MPLS using the [redacted] for our EthS/E-LAN service by using VPLS to support Ethernet Encapsulation over MPLS. For those locations requiring ATM or FR access into the VPLS network, Qwest will support these access methods. The Agency SED connecting into the SDP is required to support RFC 1483 (now RFC 2684, Bridged Ethernet over ATM) or RFC 1490 (now RFC 2427, Bridged Ethernet over FR). The SED will encapsulate Ethernet frames over ATM/FR for transport to the PE Router, where these Ethernet frames are then un-encapsulated for forwarding into the VPLS network.

4.2.6.3.2 Satisfaction of EthS Feature Requirements (L.34.1.4.6(c), C.2.7.1.2)

Qwest E-Line and E-LAN services satisfy all the mandatory EthS feature and technical requirements.

Figure 4.2.6-5 summarizes Qwest's technical approach to satisfy the feature requirements of EthS. Qwest fully complies with all mandatory stipulated and narrative feature requirements for EthS. The text in Figure 4.2.6-5 provides the technical description required per L.34.1.4.6(c) and does not limit or caveat Qwest's compliance in any way.

Figure 4.2.6-5. Qwest's Approach to Meet Technical and Feature Requirements

ID #	Name of Feature	[redacted]
1	Bandwidth-on-Demand	[redacted]
2	Reserved Protection Bandwidth	
3	Shared Protection Bandwidth	[redacted]

Bandwidth-on-Demand (Req_ID 31721, C.2.7.1.2.1(1))

Qwest will support bandwidth-on-demand in instances where the bandwidth profile being requested can be supported in the current physical interface speed. For example, 10/100BaseT interface can be upgraded anywhere from 10Mbps to 100Mbps in 10Mbps increments. A GE interface can be upgraded anywhere from 100Mbps to 1000Mbps in 100Mbps increments. For the future, Qwest is examining options such as reconfigurable optical add/drop multiplexers and/or generalized MPLS (GMPLS) that will enhance our ability to provision new bandwidth in the network on demand.

4.2.6.3.3 Satisfaction of EthS Interface Requirements (L.34.1.4.6 (c), C.2.7.1.3)

Qwest EthS satisfies all mandatory and several optional UNI interface requirements as listed in the Networx RFP (specifically, section C 2.7.3.1). Using the native capabilities of the Qwest local broadband infrastructure combined with Incumbent Local Exchange Carrier (ILEC) and Competitive Local Exchange Carrier (CLEC) supplier arrangements, Qwest is able to offer

a variety of Ethernet access options for both E-Line and E-LAN, as shown in ***Figure 4.2.6-6***. Qwest E-LAN UNI and SEDs are provided, as specified in the Networx RFP, at speeds ranging from 1Mbps up to 1000Mbps in both copper and fiber media types for both E-Line and E-LAN services. For E-Line-based EthS, 10G interfaces are available. E-LAN-based EthS SEDs are customized depending on the access method or features.

Qwest fully complies with all mandatory stipulated and narrative interface requirements for EthS. The text in Figure 4.2.6-6 is intended to provide the technical description required per L.34.1.4.6(c) and does not limit or caveat Qwest's compliance in any way.

Figure 4.2.6-6. Qwest EthS SDP to Qwest Edge Connectivity

UNI Type	Interface Type	Standard	Freq. of Operation Fiber Type	Payload Data Rate or Bandwidth	Signaling Protocol Type/Granularity	[redacted]
1	Optical	IEEE 802.3z	1310 nm	1.25Gbps	Gigabit Ethernet	
2	Optical	IEEE 802.3z	850 nm	1.25Gbps	Gigabit Ethernet	
3	Optical	IEEE 802.3	1310 nm	125Mbps	Fast Ethernet	
4 [Optional]	Optical	IEEE 802.3ae	1310 nm	10Gbps	10GBASE-SR (65 meters)	
5 [Optional]	Optical	IEEE 802.3ae	850 nm	10Gbps	10GBASE-SW	
6 [Optional]	Optical	IEEE 802.3ae	1550 nm	10Gbps	10GBASE-ER	
7 [Optional]	Optical	IEEE 802.3ae	1310 nm	10Gbps	10GBASE-LR	
8 [Optional]	Optical	IEEE 802.3ae	1550 nm	10Gbps	10GBASE-LW	
9 [Optional]	Optical	IEEE 802.3ae	1310 nm	10Gbps	CWDM 10GBASE-LX4 (300 meters)	
10 [Optional]	Optical	IEEE 802.3ae	1310 nm	10Gbps	CWDM 10GBASE-LX4 (10,000 meters)	
11 [Optional]	Optical	IEEE 802.3ae	1310 nm	10Gbps	CWDM 10GBASE-LW (10,000 meters)	

UNI Type	Interface Type	Standard	Freq. of Operation Fiber Type	Payload Data Rate or Bandwidth	Signaling Protocol Type/Granularity	[redacted]
12 [Optional]	Optical	IEEE 802.3ae	1550 nm	10Gbps	10GBASE-EW (40,000 meters)	
13 [Optional]	Electrical	IEEE 802.3ae	N/A	10Gbps	10 Base	
14	Electrical	IEEE 802.3	N/A	100Mbps	100 Base	
15	Optical	IEEE 802.3	N/A	1Gbps	1000 Base	
16 [Optional]	Optical	ITU-T G.707	1310 nm	STM-4	SDH STM-1, VC-11 (DS1), VC-12 (E1)	
17 [Optional]	Optical	ITU-G.707	1300 nm	STM-4c	VC-4-4c	
18	Optical	IEEE 802.3z IEEE 802.3ab	Multimode	1Gbps	1000BASE-LX	
19	Optical	IEEE 802.3z IEEE 802.3ab	Multimode	1Gbps	1000BASE-SX	
20 [Optional]	Electrical (Copper)	IEEE 802.3z	N/A	1Gbps	1000BASE-CX	
21 [Optional]	Electrical (Twisted pair)	IEEE 802.3ab	N/A	1Gbps	1000BASE-T	
22 [Optional]	Optical	GR-253, ITU-T G.707	1310 nm	10Gbps	SONET or SDH	

Qwest can deliver service to Agencies via multiple access methods. In the first/last mile, Qwest supports Ethernet delivery over Digital Subscriber Line and broadband Ethernet access. Another access methods supported by Qwest for Ethernet delivery is Local Multipoint Distribution System. Qwest has many options for delivering service in the last mile through local access alliances, on-net facilities, and custom builds. We have procedures in place to provide real-time monitoring and performance statistics of these methods. We have strict guidelines on how we interconnect to LECs, including dual

entrance facilities and detailed operations agreements. Qwest has physical connectivity with a broad range of CLECs, ILECs, and fiber providers.

Qwest will provide connections between the Agency's LANs, providing SDP-to-SDP connectivity across both the MANs and WANs. Connectivity is provided through the use of two primary service components: ELA and E-LAN port. ELA provides the last mile transport to the Qwest E-LAN or E-Line POP.

ELA is provided in two forms; EoS or Native Ethernet Local Access (ELA-Native). The default access methods for E-LAN and E-Line are Native Ethernet Access and EoS, respectively. EoS access can also be used for E-LAN where required. Ethernet Local Access over SONET (ELA–EoS) is provisioned as an Ethernet interface over a SONET network, as illustrated in [redacted] The Ethernet SDP is provided on a Qwest-provided or GFP SONET mux at the Agency location. The Ethernet traffic is then mapped into a circuit across a SONET network/backbone back to the Agency location. By its nature, this is a dedicated connection, so each port is dedicated to the Agency. ELA-EoS is provisioned using either Qwest on-net E-Line network or ILEC/CLEC supplier arrangements.

ELA-Native is a type of local loop provided via a shared metro optical Ethernet network at speeds ranging from 1Mbps to 1,000Mbps, as illustrated in [redacted]. The Ethernet SDP is provided on an Ethernet switch placed by an ELA supplier. Qwest's ELA supplier networks provide point-to-point Ethernet connection over a shared Ethernet switched aggregation network

back to a Qwest switch that aggregates ELA at the Qwest POP. At the Qwest POP, the ELA aggregation switch connects to the Qwest PE router. Access is delivered to the Qwest E-LAN backbone via trunk ports at key aggregation points. ELA-Native uses a QoS mechanism within the switched infrastructure to provide packet delivery and capacity controls.

Qwest will work to augment ELA to meet the developmental changes of Agencies as the need arises.

4.2.6.4 EthS Quality of Service (L.34.1.4.6 (d))

Qwest understands and fully complies with the applicable Key Performance Indicators (KPIs) as defined in the Networx RFP. Qwest EthS provides several performance metrics designed to measure and maintain the service quality. ***Figure 4.2.6-9*** summarizes the comparison of the performance standards.

Figure 4.2.6-9. Qwest Meets all EthS KPIs and Acceptable Quality Levels (AQLs) and Exceeds Routine Availability Service Level.

Key Performance Indicators	Service Level	Acceptable Quality Level (AQL)	Performance Standard (Level/threshold)	[redacted]
Availability (EthS)	Routine (Single Connection)	99.5%	≥ 99.5%	
	Critical (Double Connection) [Optional]	99.99%	≥ 99.99%	
Latency (EthS)	(CONUS)	100ms	≤ 100ms	
	(OCONUS)	200ms	≤ 200ms	
Jitter (Packet)	Routine	10ms	10ms	

Key Performance Indicators	Service Level	Acceptable Quality Level (AQL)	Performance Standard (Level/threshold)	[redacted]
Grade Of Service (Packet Delivery Rate)	Routine	99.95% at all times	≥ 99.95% at all times	[redacted]
	Critical [Optional]	99.99% at all times	≥ 99.99% at all times	[redacted]
Time to Restore (TTR)	Without Dispatch	4 hours	≤ 4 hours	[redacted]
	With Dispatch	8 hours	≤ 8 hours	[redacted]
Grade of Service (Failover Time)	Routine	1 minute	1 minute	[redacted]
	Critical [Optional]	100 ms	≤ 100 ms	[redacted]

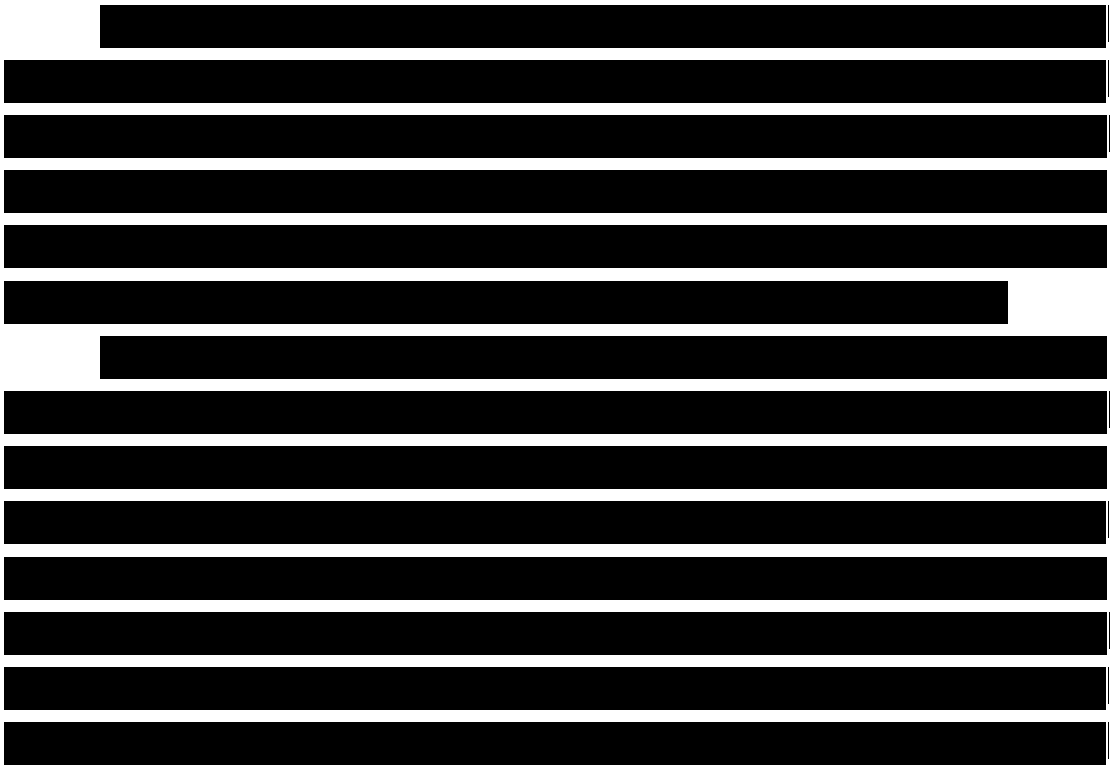
The Qwest E-Line network is designed to meet a performance metric of [redacted] percent availability [redacted] TTR and Grade of Service (Failover Time) performance standards are easily met using the robust SONET infrastructure.

The Qwest IP/MPLS network over which E-LAN-based EthS is provided is designed as part of a geographically distributed and redundant topology. Network latency and jitter is controlled and minimized by strategically placing core and edge NEs within major U.S. cities. E-LAN PE devices have high speed MPLS tunnels to all other PE devices, creating primary and secondary paths in the case of failure. Network hardware and software components are configured in a redundant fashion, further increasing overall availability and improving efficient allocation of support resources. Network support staff can dedicate more time to resolving outages and thereby lessen the TTR. All of the improvements to packet performance metrics, such as availability, latency, jitter, packet delivery, and TTR, result in a general improvement in the Grade of Service.

For Network KPIs, we use the statistical analysis system to display the Network Reliability Scorecard with the KPIs measured against objectives and an indication of whether the objectives are met or missed for each reporting period. The scorecard is our tool to show both upper management and network management the current health of the network.

For EthS, all of the performance metrics listed in the table above are assessed on an individual site or site-pair basis where applicable. This data is used to ensure that all Service Level Agreements (SLAs) are systematically being supported by the network. Additionally, key network infrastructure interfaces (Aggregation Ports/Network to Network Interfaces, and Ethernet trunk ports) are monitored for packet/cell loss (including errors and discards) and availability in order to ensure that no customer SLA issues are traceable to network infrastructure ports.

4.2.6.5 Qwest's EthS Exceeds Service Requirements (L.34.1.4.6 (e))



[redacted]

[redacted]

In addition, Qwest offers a large number of other features when an Agency's mission requires Ethernet high availability. Qwest EthS can provide customized solutions designed to exacting redundancy, resiliency, and failover protection requirements. Per request, Qwest will provide the following high availability options on Agency connections:

- Fault-tolerance – EthS SED build-out augmented with redundant power supplies

- Load sharing – EthS SED configured using 802.3ad standard. Link Aggregation Control Protocol is part of the IEEE specification (802.3ad) that allows bundling of several physical ports to form a single logical channel.
- EthS configured using 802.3ad standard. Two ports operate in pairs where the failure of one diverts all remaining traffic to the other working port.
- Failover protection. In the Core IP/MPLS network, protection is offered by using MPLS fast re-route with highly resilient failover comparable to SONET failovers

4.2.6.6. Experience with EthS Delivery (L.34.1.4.6(f))

Qwest has significant experience with delivering L2VPN and Ethernet metro local access services. Both of these services are closely related to EthS. Layer 2 VPN services employ relatively new technology and standards, with approximately one or two years of use in the general commercial and Government space. Qwest has several years of experience delivering similar services, Network-based IP VPN via the MPLS RFC 2547bis standard and legacy L2VPN services (ATM and FR), which allows us to draw upon this knowledge base and effectively deliver L2VPN service as specified in the Networx RFP.

For example, Qwest has successfully offered ATM service within the 14-state U.S. West territory since [redacted] and nationwide since [redacted]

[redacted]

Qwest also has been delivering Metro EthS [redacted] Over the metro networks, Qwest has been providing E-Line and E-LAN services to enterprises, state governments, and hospitals. [redacted] Qwest also has established working relationships with domestic Ethernet suppliers to deliver Ethernet access loops to our IP product suite. We have successfully established, operated, and maintained Ethernet interconnect points all over the United States with our suppliers. Today, many customers are successfully provisioned over our off-Net ELA network.

Qwest already serves many Government Agencies at the Federal and state levels and also serves thousands of large enterprise customers. Qwest's long legacy of service to Federal Government customers extends beyond the Qwest experience of the past nine years (and on the local side, as U.S. West) to include our prior experience doing business as Pacific Northwest Bell, Mountain Bell, and Northwestern Bell. [redacted] Qwest is both a Local Exchange Carrier and an Inter-Exchange Carrier. This perspective provides insight into the purchasing of local access and delivery of service to customers in both market segments. Agencies benefit from Qwest's

experience by obtaining the most value for every dollar spent on combined local and long-haul services.

4.2.6.7. Characteristics and Performance of Access Arrangements (L.34.1.4.6(g))

Qwest realizes that a key differentiator is the ability to ensure robust access through both the ILECs and CLECs. Qwest can deliver EthS to Agencies via multiple access methods. In the first/last mile, Qwest supports Ethernet delivery over copper, fiber, Gigabit Passive Optical Network, and coaxial cable. Another access methods supported by Qwest for Ethernet delivery is Local Multipoint Distribution System. Qwest has many options for delivering service in the last mile through local access suppler arrangements, on-Net facilities, and custom builds. We have procedures in place to provide real-time monitoring and performance statistics of these methods. We have strict guidelines on how we connect to Local Exchange Carriers. We require dual entrance facilities, OC-48 capacity, and operations agreements. Qwest has physical connectivity with Postal Telephone and Telegraphs, CLECs, ILECs, and fiber providers to deliver outstanding service to anywhere Agencies might require service.

Qwest will provide connections between the Agency's LANs, providing SDP-to-SDP connectivity across both the MAN and the WANs. Connectivity is provided through the use of two primary service components: ELA and E-LAN port(s). ELA provides the last mile transport to the Qwest EthS POP.

ELA is provided in two forms; EoS or ELA-Native. The default access method for E-LAN is Native Ethernet Access and for E-Line is EoS. EoS can also be used for E-LAN where required. ELA–EoS is provisioned as an Ethernet interface over a SONET network, as illustrated in Figure 4.2.6-8. The Ethernet SDP is provided on a SONET multiplexer SED or GFP at the Agency location. The Ethernet traffic is then mapped into a circuit across a

SONET network/backbone back to the customer location. By its nature, this is a dedicated connection, so each port is dedicated to the customer. ELA-EoS is provisioned using either Qwest on-Net E-Line network or ILEC/CLEC supplier arrangements.

ELA-Native is a type of local loop provided via a shared metro optical Ethernet network at speeds ranging from 1Mbps to 1,000Mbps, as illustrated in Figure 4.2.6-7. The Ethernet SDP is provided on an Ethernet switch. Qwest provides a point-to-point Ethernet connection over a shared Ethernet switched aggregation network back to a Qwest switch that aggregates ELA at the Qwest POP. At the Qwest POP, the ELA aggregation switch connects to the Qwest PE router. Access is delivered to the Qwest E-LAN backbone via trunk ports at key aggregation points. ELA-Native uses a QoS mechanism within the switched infrastructure to provide packet delivery and capacity controls. Qwest will work to augment ELA to meet the developmental changes of Agencies as the need arises.

A key aspect of access service involves the provisioning interval from order entry to generation of the service order completion notice. Qwest has leveraged our experience as an ILEC and as a Federal provider to build a long and excellent track record in on-time delivery service, with reliable service delivery intervals. Qwest has maintained an excellent service delivery interval for our Government customers.

Our provisioning performance has direct benefits to Agencies as it drives aggressive timelines for service transition. Effective transition allows Agencies to take advantage of next-generation services to achieve higher operational efficiency and lower unit costs. [redacted] Our team facilitates a smooth transition, minimizes costs,

and reduces the time that the two networks, the old and the new, need to operate simultaneously.

To provide access services, Qwest has a broad variety of agreements with local carriers to ensure flexibility, quality, and reliability. Qwest has strict quality standards for how we connect with other carriers to maintain this high level of performance. Section 3.2.1 of this Technical Volume provides more information regarding our approach to access arrangements, including wireline access arrangements and broadband access arrangements.

4.2.6.8 Approach for Monitoring and Measuring EthS KPIs and AQLs (L.34.1.4.6(h))

For all EthS requested in Networx, Qwest executes several gates of testing beginning at proof-of-concept and continuing through the lifecycle of the product to ensure services perform as specified. Additionally, Qwest thoroughly tests all equipment and software loads in our labs before deploying them on our network. This ensures that bugs or incompatibility problems are identified in our test environment, virtually eliminating the possibility that a new hardware or software install will create a service interruption. A version of all NEs and corresponding software is maintained in Qwest labs to provide direct, organic support in the event that trouble occurs.

Software upgrades are always tested in Qwest labs to ensure that they will operate appropriately prior to deployment on our live NEs. Software upgrades are non-service impacting wherever possible and can be reverted to the previous version if the software load is not successful. Our procurement processes ensure that vendors execute extensive testing of incremental additions such as optical transponders, switching blades, and Small Form-factor Pluggable (SFP) Gigabit Interface Converter modules prior to shipping to Qwest. Before handing any service over to Agencies, provisioned circuits are tested to ensure they meet our standards.

For EthS, the NEs capture and maintain performance data on equipment and circuits. [redacted] Qwest uses this data in several ways:

- We compare performance results to the performance thresholds that we set to trigger alarms.
- Results can create auto-generated trouble tickets in our trouble ticketing system based on defined alarm thresholds.
- Results are calculated and displayed on the network scorecard. Required KPIs and AQLs can be viewed in the Qwest Control Networx Portal.

On a 24x7x365 basis, Qwest monitors all NEs of the EthS and SEDs. This monitoring includes, but is not limited to:

- General NE requirements validation: System turn-up, Craft/EMS/Network Management System (NMS) interfaces, security, software management, electrical and mechanical compliance, alarming, safety, systems connectivity, fault management, and performance management
- Validate NEBS: GR-63-Core (transportation and storage stress, operating temperature and humidity, heat dissipation, equipment shock, vibration, and acoustic noise) and GR-1089-CORE (ESD, EMI, EMC, electrical safety, corrosion, bonding, and grounding)

Qwest maintains a central data repository for key network performance information. These performance indicators are generated by a combination of system-specific statistics. Logs and traps are managed by our NMS and sent to the Network Monitoring Team. Data is analyzed, formatted, and sent to

operations, engineering, and planning for pro-active network enhancement and capacity planning. Qwest's centralized engineering team applies a consistent capacity management model to all data services.

On our transport network, new NEs undergo a comprehensive testing process before they are deployed in the network. All the functional aspects that are deployed are tested to ensure that the equipment performs properly. Before any circuit is placed into service, the metrics are measured, and circuits must exceed every AQL to ensure that circuits are ready to carry traffic.

For E-Line-based EthS, the NEs capture and maintain performance data at the equipment and circuit level. We use Qwest's performance management tools to retrieve performance data from NEs. This data is used in several ways:

- Results are compared to thresholds to trigger alarms.
- Results create auto-generated trouble tickets for immediate resolution.
- Results are used to calculate the KPIs to ensure we are meeting our AQLs.

For the E-LAN-oriented services, Qwest has deployed a set of network probes that connect across the IP/MPLS cloud and measure the network from an end-device perspective. The probes are deployed in all TeraPOPs, provide a full mesh view of all the point-to-point SLA metrics, and are assessed on an individual site or site-pair basis where applicable.

For E-LAN-based EthS 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 Agency CE devices. This service

requires access from the probes to the Agency CE devices and is therefore not enabled unless specifically ordered by the Agency.

4.2.6.9 EthS Support of Time-Sensitive Traffic (L.34.1.4.6(i))

E-Line-based EthS is a dedicated service provisioned over the SONET network that provides fixed bandwidth and a standardized availability of [redacted] percent or better. The service platforms introduce minimal latency and jitter (well within the KPIs required by Networx). As a consequence, it is ideal for supporting time-sensitive traffic as degradations to voice and video quality are minimal. Various SEDs may provide different mechanisms for dealing with load conditions.

Qwest's E-LAN-based EthS solution ensures the quality of time-sensitive traffic through the combination of our network access architecture and our Class of Service (CoS) attributes. Our network access architecture and four-tier CoS capabilities provide EthS that supports data, video, and voice. The Qwest EthS QoS parameters are detailed in Figure 4.2.6-9.

Qwest can ensure that time-sensitive IP packets are assigned a higher priority than other traffic. This is accomplished by the proper selection and configuration of SEDs as well as the proper configuration of CoS templates for the Qwest IP ports associated with E-LAN access. Qwest will work with each Agency to design a CoS plan that meets application requirements.

4.2.6.10 EthS Support for Integrated Access (L.34.1.4.6(j))

E-Line-based EthS provides a single high-bandwidth interface to the customer. This bandwidth is provided with a single performance level and is compliant with the KPIs and AQLs of Networx. Integrated access for EthS may be implemented through different SEDs or by bundling with another service (such as Private Line Service or Direct Internet Access). Using multiplexing, Agencies can designate channels on the EthS access circuit to terminate to other applications such as voice, Internet, or ATM/FR. Also,

dedicated network builds can provide Agencies flexibility to obtain different protection schemes as required.

Qwest's national network and our associated NEs for electrical and optical transport, ELA, Metro Optical Ethernet, and SONET can be used as an access method for E-LAN-based EthS.

Qwest EthS enables Agencies to integrate their LAN/WAN enterprise networks into a single logical Ethernet LAN. Qwest EthS provides Agencies the ability to reliably and transparently transport all application traffic such as voice, video, Internet, and control traffic.

Qwest's Layer 2 Ethernet network is completely integrated into our MPLS-based L2VPN VPLS so that separate VLANs or ports can be used by each traffic type (e.g., voice, video, data, Internet). Qwest also supports direct Layer 3 access with IP-based CoS based on the DiffServ model to ensure proper prioritization of data on the same MPLS network. This prioritization uses class-based weighted fair queuing, priority queuing, and the setting of appropriate Type of Service bits in the IP packet header.

Government Agencies can be assured of an integrated solution that will provide a reliable, virtually error-free data transport highway no matter what telephony, IP, or data services are used. Qwest takes complete end-to-end responsibility for the planning, engineering, provisioning, monitoring, and trouble management for all Ethernet access methods.

4.2.6.11 Infrastructure Enhancements and Emerging Services (L.34.1.4.6(k))

Ethernet interfaces are now available on Qwest's Multi Service Provisioning Platforms (MSPPs), and the use of new technologies such as VCAT, GFP, and LCAS further enables efficient transport of services. SONET and Wavelength service internetworking are addressed largely through the introduction of the MSPP. In the event that end-to-end interoperability is

required and different access methods have been applied, wavelengths based upon G.709 optical transport networks (OTNs) ensure complete transparency.

The E-LAN service is delivered as an MPLS L2VPN VPLS. MPLS is a mature technology, and implementations of VPLS are stable. Equipment vendors such as Cisco and Juniper continue to add enhancements to their current implementations to offer greater functionality for capabilities such as auto-discovery; 10GigE; bandwidth-on-demand; Operations, Administration, and Management (OAM); MPLS-NNI; Inter-domain VPLS; and VPLS with Traffic Engineering (VPLS-TE). Qwest will continue to test and evaluate such vendor implementations in order to offer a more robust and full-featured product to the Agencies.

Vendor and carrier interoperability is the biggest challenge with enhancements and improvements that are likely to become commercially available in the future. This is particularly challenging for features such as end-to-end OAM, MPLS-NNI, and Inter-domain VPLS, which typically cross carrier (and therefore vendor) boundaries. Scaling problems with VPLS are also an uncharted territory for most carriers. There are few networks that have been in operation for more than a few years offering VPLS services across 100s or 1,000s of nodes. The solution for such issues is for carriers (including Qwest) to continue to gain operational maturity and for the equipment vendors to continue to develop more mature, stable, and interoperable implementations of features and capabilities based on real-world scaling of large carrier deployments.

Qwest is always testing and evaluating new technologies. When a decision is approved for new technology or an enhancement to an existing one, Qwest begins our change management process that involves planning,

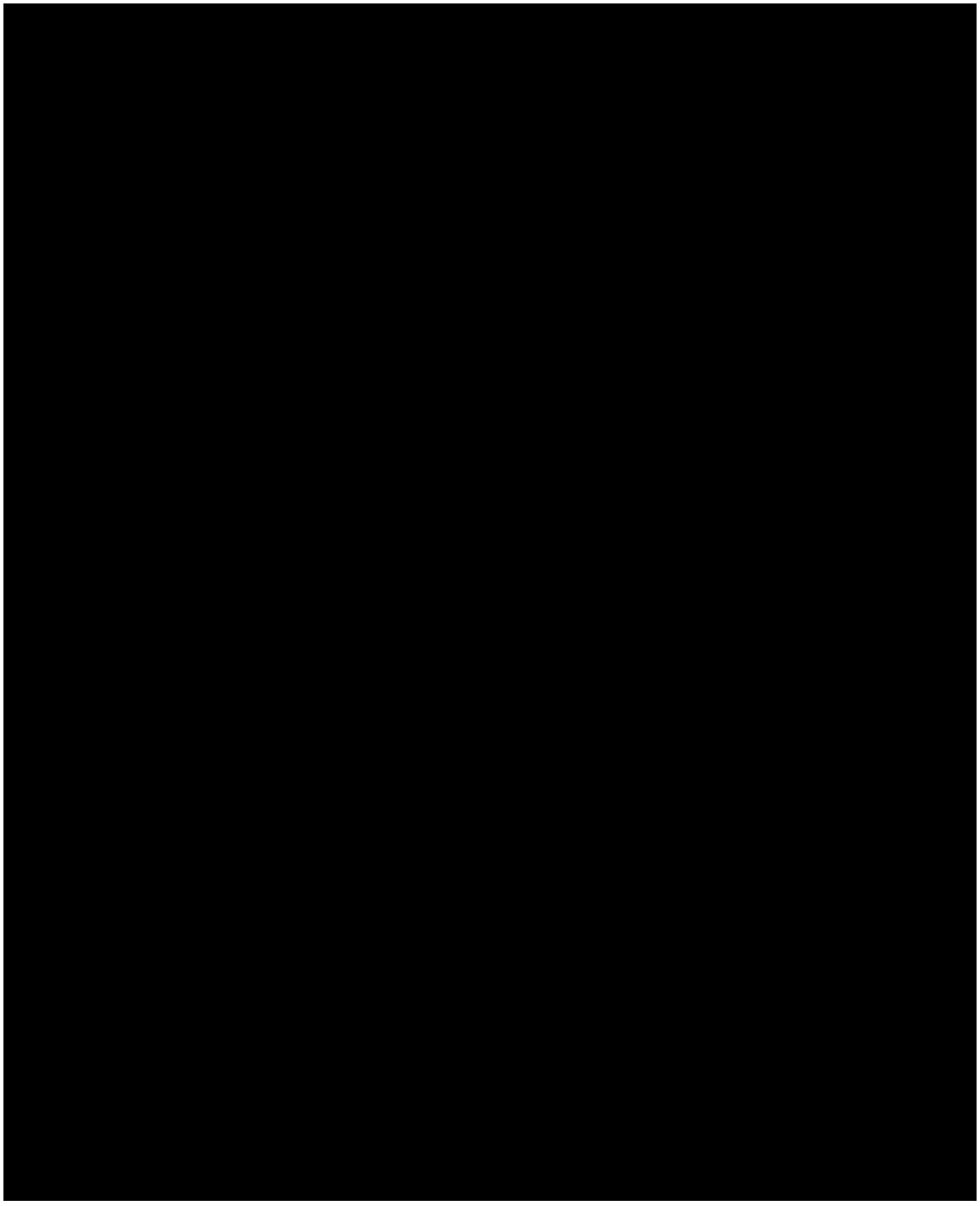
project management, testing, implementation, and ultimately Agency migration and then decommissioning of the old technology.

4.2.6.12 Approach for Network Convergence (L.34.1.4.6(l))

Qwest is committed to the elimination of single-purpose, stovepipe networks that create planning, operations, and interoperability issues for Agencies. Qwest's approach for network architecture evolution guides our investments and provides the overall direction for our technology evolution and services convergence.

As the Qwest IP/MPLS network becomes the converged core transport network for all packet and cell-based services, the integration of control planes between those services, and the transport network becomes more critical. An integrated service control system enables service convergence that complements network convergence. Together, these capabilities define an adaptable, enabled, and integrated architecture for Qwest's future services that meet changing Agency needs. [redacted] illustrates this strategy.

Convergence of networks not only allows Qwest to eliminate multiple physical network overlays, it also eliminates separate control planes. For example, legacy control protocols such as Private Network-to-Network Interface and Signaling Transfer Point are no longer required to provision and manage stand-alone L2 services. Common, unified IP/MPLS signaling and



routing protocols are used to provision and manage L2 and L3 VPN services, greatly simplifying the overall network architecture. This has the side effect of simplifying management and maintenance on the network, which improves quality and reliability.

[redacted]

4.2.6.13 IP-PSTN Interoperability (L.34.1.4.6(m))

IP and Public Switched Telephone Network (PSTN) operability are not applicable to E-Line-based EthS since Qwest's approach is to offer E-Line over our existing SONET backbone with Ethernet interfaces and SONET transparent to addresses. E-LAN-based EthS is provisioned on the converged MPLS backbone, where PSTN interoperability is supported.

[redacted]

4.2.6.14 Approach for IPv4 to IPv6 Migration (L.34.1.4.6(n))

Qwest is well positioned to migrate our network from IPv4 to IPv6.

[redacted]

[redacted]

4.2.6.15 Satisfaction of NS/EP Requirements (L.34.1.4.6(o))

Qwest uses a structured multi-layered approach to supporting National Security and Emergency Preparedness (NS/EP) that is designed to address each required function. Qwest has organizationally and strategically integrated risk management and security to encompass information technology and physical security. Our priorities are to protect our customers from the physical layer up through the entire OSI stack, including all facets of cyber security.

Our approach ensures that Qwest complies with and provides priority for the Government's telecommunications requirements for NS/EP survivability, interoperability, and operational effectiveness during an emergency threat, whether caused by natural hazards, manmade disasters, infrastructure failures, or cyber events.

[redacted]

Specifically, in accordance with RFP Section C.5.2.2.1, *NS/EP Basic Functional Requirements Matrix for Networx Services*, Qwest supports the following basic functional requirements for EthS:

- **Enhanced Priority Treatment** (C.5.2.1(1)) – EthS supporting NS/EP missions are provided preferential treatment over all other traffic.
- **Secure Networks** (C.5.2.1(2)) – EthS supporting NS/EP missions have protection against corruption of, or unauthorized access to, traffic and control, including expanded encryption techniques and user authentication, as appropriate.
- **Non-Traceability** (C.5.2.1(3)) – EthS users are able to use NS/EP services without risk of usage being traced (that is, without risk of user or location being identified).
- **Restorability** (C.5.2.1(4)) – Should a service disruption occur, EthS supporting NS/EP missions are capable of being re-provisioned, repaired, or restored to required service levels on a priority basis.
- **International Connectivity** (C.5.2.1(5)) – According to RFP Section C.5.2.2.1, this requirement is not applicable to EthS.
- **Interoperability** (C.5.2.1(6)) – EthS will interconnect and interoperate with other Government or private facilities, systems, and networks that will be identified after contract award.
- **Mobility** (C.5.2.1(7)) – The EthS infrastructure supports transportable, re-deployable, or fully mobile voice and data

communications (i.e., Personal Communications Service, cellular, satellite, high frequency radio).

- **Nationwide Coverage** (C.5.2.1.(8)) – EthS is readily available to support the national security leadership and inter- and intra-Agency emergency operations, wherever they are located.
- **Survivability/Endurability** (C.5.2.1(9)) – EthS is robust to support surviving users under a broad range of circumstances, from the widespread damage of a natural or man-made disaster up to and including nuclear war.
- **Voice Band Service** (C.5.2.1(10)) – According to RFP Section C.5.2.2.1, this requirement is not applicable to EthS.
- **Broadband Service** (C.5.2.1(11)) – EthS provides broadband service in support of NS/EP missions (e.g., video, imaging, Web access, multimedia).
- **Scaleable Bandwidth** (C.5.2.1(12)) – NS/EP users are able to manage the capacity of EthS to support variable bandwidth requirements.
- **Affordability** (C.5.2.1(13)) – EthS leverages network capabilities to minimize cost (for example, use of existing infrastructure, commercial-off-the-shelf technologies, and services).
- **Reliability/Availability** (C.5.2.1(14)) – EthS perform consistently and precisely according to their design requirements and specifications and are usable with high confidence.

Details of how Qwest supports all 14 basic functional requirements listed in RFP Section C.5.2.2.1 are provided in Section 3.5.1, *Approach to Satisfy NS/EP Functional Requirements*, in this Technical Volume.

4.2.6.16 Support for Signaling and Command Links (L.34.1.4.6(p))

This requirement is not applicable to EthS, as there is no interaction with the Signaling System 7 network or satellite command links.

4.2.6.17 Service Assurance in the National Capital Region (L.34.1.4.6(q))

As discussed in Section 3.2, *Approach to Ensure Service Quality and Reliability*, Qwest provides network services in the NCR with a robust network architecture designed and engineered to ensure service continuity in the event of significant facility failures or catastrophic impact. Qwest will continue to engineer critical services to meet each Agency's requirements to eliminate potential single points of failure or overload conditions that may affect their network service performance.

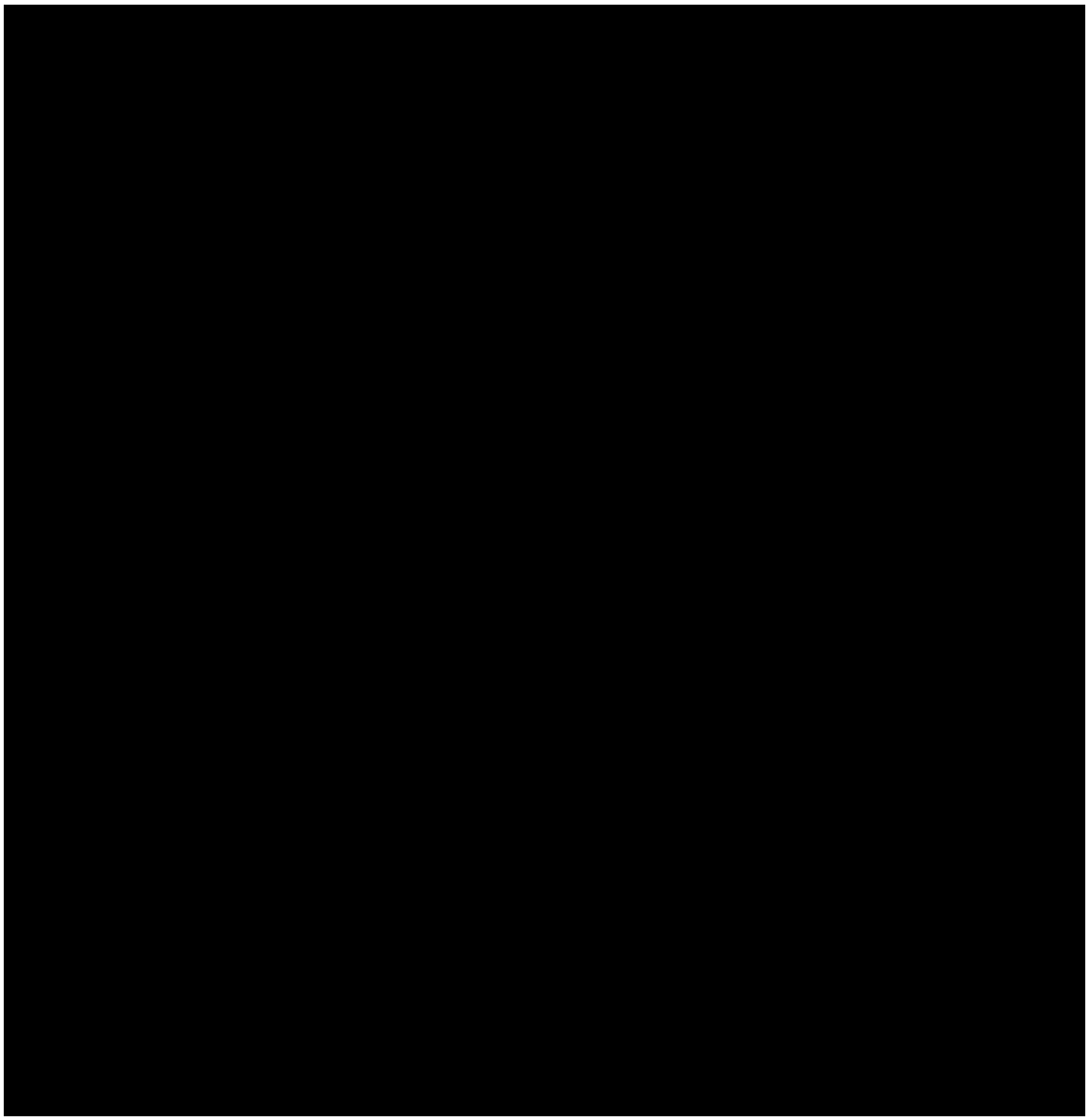
[redacted] Qwest also provides functionality that enables Government Emergency Telecommunications Service priority calling mechanisms. Qwest will provide full NS/EP Functional Requirements Implementation Plan (FRIP) documentation upon contract award when requested to proceed with plan delivery. Qwest will update plans, including Part B addressing our strategy for supporting Agency NCR requirements, in accordance with RFP Section C.7.16.

Qwest understands the Government's requirement to assure performance of network services in and around the NCR. [redacted]

[redacted]

[redacted] shows the logical configuration of the major transport facilities as well as the services provided at each POP.

[redacted]



[redacted]. This configuration enables these three locations to participate in the routing of access and backbone traffic, providing significant load-balancing and reconfiguration options in the event of a switch, router, or even a complete POP failure. Qwest has recently acquired OnFiber, a metro SONET and Ethernet provider with yet another diverse network in the NCR. This gives Qwest at least three regional fiber optic networks to use to ensure redundancy and survivability in the greater D.C. area. In effect, this means that Qwest can circumvent Washington, D.C. and continue to provide services in an emergency.

[redacted] Qwest pre-subscribed this infrastructure from an ILEC and numerous CLECs. As presented in Section 3.2.2, *Arrangements with Other Service Providers for Carrying and Exchanging Traffic*, Qwest connects to several major ILEC POP locations through SONET-protected ring networks to ensure multiple access paths to ILEC services, including voice termination and fiber access. The use of CLECs, which provide infrastructure that is generally separate from the

ILECs, gives another level of resiliency to the architecture because these services would not be affected by an ILEC facility failure.

The route-diverse SONET backbone and access networks that service the NCR enable the transport of services to any Qwest POP nationwide. [redacted] As with voice services, critical Qwest customers can be dual-homed to ensure extremely high availability of their data services—again protected from any single point of failure in the NCR.

[redacted]

Qwest will address the strategy, technical systems, and administration, management, and operation requirements for the NCR in part B of our NS/EP FRIP (a draft appears as Appendix 2 to the Technical Volume).

4.2.6.18 Approach to Satisfying Section 508 Requirements (L.34.1.4.6(r))

According to RFP Section C.6.4, *Section 508 Provisions Applicable to Technical Requirements*, Section 508 provisions are not applicable to EthS. Qwest has fully described our approach to satisfying Section 508 requirements for applicable, offered services in Section 3.5.4, *Approach for Meeting Section 508 Provisions*, of this Technical Volume.

4.2.6.19 EthS Impact on Network Architecture (L.34.1.4.1(s))

The delivery of EthS has little impact on the network architecture of the underlying SONET network. Since the only change to the SONET network is an additional Add/Drop Multiplexer in the POP with Ethernet interface cards, it is unlikely that any adverse security, quality, reliability, or performance issues will arise. The Qwest SONET network has been operating at a high level of

performance for more than nine years and has all major routes already incorporated into the network as well as the capacity to handle E-Line transport well into the future. The network will continue to evolve as Agency needs change.

Since Qwest is proposing to use dedicated SONET or DWDM capacity to provision E-Line service, security on the network is the same as any SONET, Private Line Service, or Optical Wavelength Services. It is difficult to gain unauthorized entry into a physical layer service, and any tapping into the line would be intrusive and detected immediately. The E-Line service is provisioned on dedicated full-time physical circuits. Each Agency circuit will have its own dedicated path between two endpoints.

The E-Line service rides the reliable Qwest 4F-BLSR network where availability is consistently high [redacted] system wide). The E-Line service benefits from the 24x7x365 surveillance and alarm monitoring across all Networx services. Technicians are well trained and consistently deliver a highly reliable service.

The E-LAN service is provided using MPLS technology that has been deployed in the Qwest network for a number of years. EthS will use the same architecture that is used for MPLS L2VPN service. The impact of offering this optional service on the network architecture is not expected to be significant due to the fact that it is relying on an architecture that has already been deployed.

E-LAN services offered over an MPLS L2VPN implementation will meet the security standards of MPLS VPNs in general. Traffic belonging to a particular service instance is separated from all other traffic types, and the NEs used to offer EthS services are private in that they will not be directly connected to the Internet, eliminating the risk of attacks originating from the Internet.

Like the MPLS L2VPN service, the EthS will have available multiple classes of service to allow the Agency to prioritize different traffic types. EthS is provisioned over a packet-switched network and therefore will not have TDM channels allocated for traffic. Capacity planning rules and capacity modeling will ensure that adequate bandwidth is available for the service to burst up to full port speed if necessary.

Since the E-LAN service is built over an MPLS Fast-ReRoute protected backbone, the backbone network is able to recover from any link or node failures within tens of milliseconds. Due to the packet-switched nature of the backbone network, the network will reroute around failures almost instantaneously, providing a high degree of reliability to the E-LAN service.

The E-LAN service will run over an OC-192 packet-switched network that is carrying more than four billion minutes of VoIP traffic every month. This is proof that the network that will offer the E-LAN service is capable of meeting the most stringent requirements for latency, jitter, packet-loss, and reliability.

4.2.6.20 Optimizing the Engineering of EthS (L.34.1.4.6(t))

[redacted]

[redacted]

4.2.6.21 Vision for Service Internetworking (L.34.1.4.6(u))

[redacted]

[redacted]

[redacted]

4.2.6.22 Support for Government EthS Traffic (L.34.1.4.6(v))

There are no units for EthS in the Government's traffic model. All elements of our EthS offering, however, are highly scalable and leverage the substantial capacity of the Qwest network. We, therefore, do not anticipate any issues in managing Networx requirements for EthS.