

4.1.2 NETWORK-BASED IP VIRTUAL PRIVATE NETWORK SERVICES (NBIP-VPNS) (L.34.1.4, C.2.7.3, M.2.1.2)

Qwest achieved an industry first with our Network-Based IP VPN services. Our Networkx NBIP-VPNS uses the Qwest converged IP core to support any access method and deliver multiple classes of service.

Qwest's Network-Based Internet Protocol Virtual Private Network Services (NBIP-VPNS) are delivered using Qwest's Multi-Protocol Label Switching (MPLS)-based private IP network and Qwest integrated Secure Remote Access solutions. Qwest's NBIP-VPNS is ideal for seamless integration of customer sites with a variety of security and bandwidth requirements of up to OC-192. Qwest uses cutting-edge MPLS-based VPN, Label Switched Path (LSP) routing and Quality of Service (QoS) technology based on RFC 4364 standards defined by the Internet Engineering Task Force (IETF). In addition to a robust domestic capability, Qwest's NBIP-VPNS solutions connect VPN users from domestic and non-domestic locations using the Qwest network and our multiple international MPLS service provider suppliers with end-to-end Qwest responsibility.

Leading-edge Inter-Autonomous System (AS) MPLS connections into the Qwest private MPLS VPN network enhance Qwest's ability to provide seamless, standards-based MPLS VPNs around the world. Qwest currently provides world-class customer support, NBIP-VPNS access, and transport solutions and integrated router-based solutions to demanding Government and commercial customers [REDACTED]

4.1.2.1 Qwest's Technical Approach to NBIP-VPNS (L.34.1.4.1, C.2.7.3.1-2.7.3.1.3)

Qwest NBIP-VPNS enables the Government to create secure VPNs that range from dial-up voice and ISDN Internet access to dedicated high-speed optical connections. Qwest has dedicated support organizations, coordinated by the Qwest Network CPO, to engineer, install, maintain, and evolve our delivered service to meet the Government's NBIP-VPNS requirements. Qwest delivers NBIP-VPNS using Provider Edge (PE) network routers. [REDACTED]

This PE platform leverages the tremendous backbone bandwidth of our 10 Gbps-based private MPLS core. Its "any access anywhere" design is completely in step with the Network requirements for flexible, dedicated access. As required, Qwest supports a full range of wireline access and broadband access methods for this service. Qwest provides end-to-end engineering, monitoring, and trouble management to ensure service excellence for the NBIP-VPNS customer.

4.1.2.1.1 Approach to NBIP-VPNS Delivery (L.34.1.4.1(a))

Qwest's approach to NBIP-VPN service delivery encompasses the network platforms, people, and operational processes that deliver exceptional services. Qwest collaborates with our customers to identify requirements and deliver the services that best suit their needs. Our NBIP-VPNS architecture takes full advantage of MPLS-enabled convergence to create one of the most efficient network platforms in the industry. Our network and suppliers provide the underlying service delivery infrastructure, ensuring worldwide continuity of service for Agencies. Our NBIP-VPNS leverages the high-performance Qwest

network widely in use by some of the most demanding Government customers today, [REDACTED]

Proven Engineering Practices

Qwest network planning and engineering organizations have created a highly robust, private MPLS core [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Qwest continually monitors network performance and capacity utilization end-to-end to ensure the highest performance for all Qwest customers.

Standards-Based, Global Network

Domestically, Qwest's NBIP-VPNS uses Qwest's nationwide OC-192 private MPLS core network as its backbone. The OC-192 backbone is explained in greater detail in Section 3.3, *Approach to Network Architecture*.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

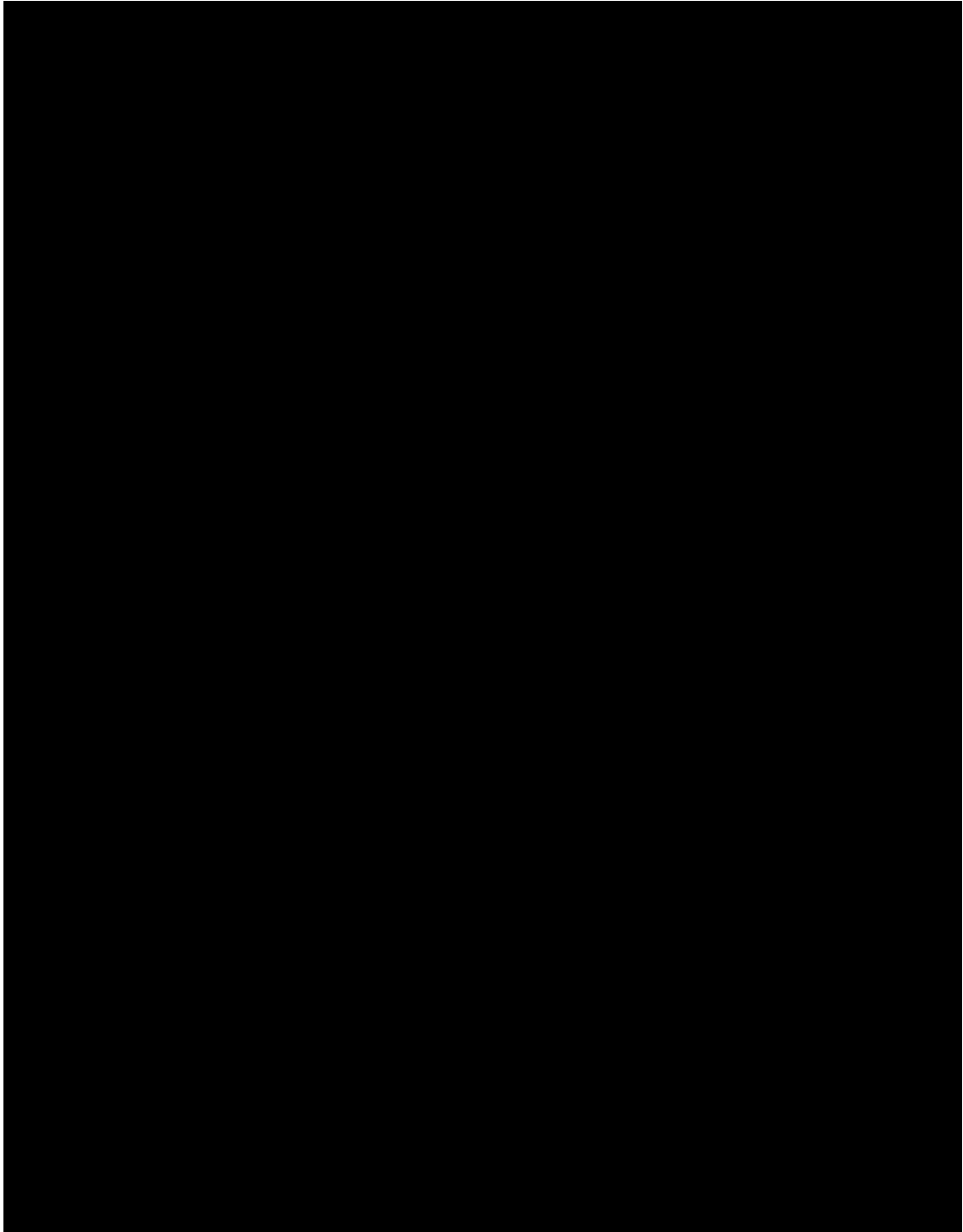
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



[REDACTED]

The Qwest NBIP-VPNs consists of a global private routed infrastructure AS ID with [REDACTED] major TeraPOPs that are interconnected with OC-192 wavelengths. To access this infrastructure, Qwest has [REDACTED] regional IP POPs connected via SONET circuits [REDACTED]. We also maintain approximately [REDACTED] dial-access POPs for CONUS LATA coverage. In addition, there are more than [REDACTED] network access points domestically

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Qwest uses our MPLS core to provide bandwidth for a completely private MPLS VPN network to build multiple VPNs based on IETF RFC 4364.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Alternate access approaches supported by our NBIP-VPNS include Digital Subscriber Line (DSL) and dial access. [REDACTED]

[REDACTED]

Dial access for both voice services and ISDN BRI and PRI access is provided by Qwest's nationwide dial access network— [REDACTED] ports and local access across the country.

Qwest's OC-192 backbone spans the Asia Pacific region, Hawaii, and CONUS, with [REDACTED] public and private peering points [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Qwest extends our domestic nationwide NBIP-VPNS network footprint to the global community through extension of Qwest-owned PE access POP facilities [REDACTED]

[REDACTED], enabling direct on-net NBIP-VPNS services in the Asia Pacific Rim region.

Qwest is able to deliver unparalleled global network reach through strategic relationships with key best-of-breed international network suppliers, summarized in [REDACTED]. Understanding that local knowledge is key,

[REDACTED]

Qwest has peering arrangements that give our customers the benefit of a single service provider, thereby ensuring service consistency, while at the same time giving them the confidence that our regional suppliers understand their region better than anyone else. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] We continuously monitor monthly, quarterly, and yearly KPI performance metrics. Qwest has designed and implemented service improvements and new access and features to remain competitive. [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]

Qwest's secure remote access service provides a multi-faceted secure client, strong authentication, and a diverse access technology solution to the Federal Government. Secure remote access integrates seamlessly into the Qwest NBIP-VPNS solution:

- A premium VPN IPsec client that supports interoperable access flexibility, VPN security tunnel enablement, strong authentication, firewall integration, end-user control, grouping, messaging, tracking, and reporting
- Secure remote access User-to-Network Interfaces (UNIs) include high-speed Internet ISDN BRI; enterprise-class integrated Asymmetric Digital Subscriber Line (ADSL) and Symmetric Digital Subscriber Line (SDSL); global roaming dial-up Internet access; integration of V.90, V.92, ISDN, Commitment to Customers

As the first major operator in the U.S. to offer IP Network-based VPN services, Qwest has been designing high-performance, secure NBIP-VPNS and PBIP-VPNS solutions for Government customers and Fortune 500 financial, healthcare, manufacturing and high-technology companies since 1999. Qwest's engineering and program management expertise, as well as hands-on technical integration experience with all facets of dedicated, remote, and satellite-based NIPB-VPNS access solutions, reduces the Government's operational risks. Qwest's network technology management,

architecture, planning, engineering, and operations organizations are all aligned to ensure network availability and feature flexibility.

Qwest will work with Agencies to recommend and help select the right SED to meet their requirements. Qwest takes complete responsibility for the provisioning of any NBIP-VPNS. This includes the ordering and installation of the SED, the ordering and provisioning of the requested access method, configuration of the NBIP-VPNS, and complete test and turn-up.

Once provisioned, a key element of service delivery involves the operational support that ensures the service meets performance goals. [REDACTED]

[REDACTED]

[REDACTED] The Qwest NOCs are staffed with highly trained and experienced personnel who understand the Government's network and internetworking equipment.

NOC senior management continually reviews KPIs and best practices, verifying that appropriate preventive steps are taken to avoid problems and validate that customer service meets Acceptable Quality Levels (AQLs). From a single, accountable one-call-resolve support structure, to convenient, quick Web-based management and reporting tools, Qwest will address any issues that affect service. The portal accessible management tools enable dynamic

management, including support for Agency-initiated adjustments of allocated bandwidth in near real time.

**4.1.2.1.2 Benefits of Qwest’s NBIP-VPNS Technical Approach
(L.34.1.4.1(b))**

Qwest NBIP-VPNS offers a converged networking service based on leading technologies that will allow Agencies to build networks using legacy ATM and FR protocols, as well as advanced IP-centric, MPLS-based solutions. **Figure 4.1.2-4** summarizes the key features and benefits of our NBIP-VPNS.

Figure 4.1.2-4. Qwest’s NBIP-VPNS Features and Benefits

Feature	[REDACTED]	[REDACTED]
High-Availability, High-Capacity 10 Gbps-based MPLS Core	[REDACTED]	[REDACTED]
MPLS Fast Re-Route (FRR)	[REDACTED]	[REDACTED]
Private, Internet-free Core and Edge Routers for NBIP-VPNS	[REDACTED]	[REDACTED]
Flexible and standards-based access protocols that include High-level Data Link Control, Point-to-Point Protocol (PPP), Multilink Point to Point Protocol (MLPPP), FR, ATM, DSL, T-1, Digital Signal Level-3 (DS-3), Optical Carrier Level x (OC-x), and Ethernet	[REDACTED]	[REDACTED]
CoS Mechanisms with four CoSs and Class-Based Weighted Fair Queuing.	[REDACTED]	[REDACTED]

Feature	[REDACTED]	[REDACTED]
Extranet access to NBIP-VPNS Internet VPN servers.	[REDACTED]	[REDACTED]
Qwest has more than 900,000 dial-up ports. Nationwide and international Wi-Fi and dial-up roaming is provided by our industry leading supplier, I-Pass.	[REDACTED]	[REDACTED]
User configurable network-based firewall; Qwest has provided network-based IPS firewall services for more than five years with user controlled configurations.	[REDACTED]	[REDACTED]
Qwest has 15 carrier-neutral Layer 3 facilities and 11 CyberCenters™.	[REDACTED]	[REDACTED]
Qwest has multiple worldwide Internet service provider suppliers, such as Telstra, BT/Infonet and Equant.	[REDACTED]	[REDACTED]

Qwest's NBIP-VPNS facilitates the Federal Enterprise Architecture (FEA) objectives as summarized in **Figure 4.1.2-5**.

Figure 4.1.2-5. Qwest's NBIP-VPN Support to FEA Objectives

FEA Objective	[REDACTED]	[REDACTED]
Improve utilization of Government information resources to focus on core Agency mission and service delivery to citizens by using the FEA.	[REDACTED]	[REDACTED]
Enhances cost savings and cost avoidance through a mature FEA, Government-wide.	[REDACTED]	[REDACTED]
Increases cross Agency and inter-Government collaboration.	[REDACTED]	[REDACTED]

4.1.2.1.3 Solutions to NBIP-VPNS Problems (L.34.1.4(c))

Qwest has extensive experience in the delivery of NBIP-VPNS, and we apply this knowledge to ensure the delivery of high-quality NBIP-VPNS to Agencies. Extensive pre-deployment laboratory system and integration testing identifies the majority of problems, and Qwest's proactive network and configuration management/fault management systems and methods are leveraged to quickly resolve unforeseeable operational issues.

Qwest's NBIP-VPNS will meet the individual service requirements requested by Agencies. Qwest's Network CPO and NOC will ensure service delivery and continuing operations. [REDACTED] summarizes the typical problems we encounter in meeting NBIP-VPNS requirements and our solution.

Figure 4.1.2-6. Qwest's Approach to Common NBIP-VPNS Delivery Challenges

[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

4.1.2.1.4 Synchronization Network Architecture (L.34.1.4(d))

Time of Day Synchronization (IP Network)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

4.1.2.2.1 NBIP-VPNS Quality of Service (L.34.1.4.2(a))

The Qwest fiber network that supports NBIP-VPNS has tremendous backbone capacity and high availability. In general, most Service Delivery Point (SDP) outages are caused by either customer site power failures or local access facility failures. We have compiled statistics over the past four years on the performance of networks for similar requirements. [REDACTED]

[REDACTED]

Figure 4.1.2-9 summarizes our compliance with Networkx requirements for NBIP-VPNS services:

Figure 4.1.2-9. Qwest Compliance with Government NBIP VPNS Performance Metrics

Key Performance Indicator (KPI)	Service Level	Performance Standard (Threshold)	Acceptable Quality Level (AQLs)	[REDACTED]
Latency (CONUS)	Routine	70 ms	≤ 70ms	[REDACTED]
Latency (OCONUS)	Routine	150 ms	≤ 150ms	[REDACTED]
Availability	Routine	99.9%	≥ 99.9%	[REDACTED]
	Critical (Optional)	99.99%	≥ 99.99%	[REDACTED]
Time to Restore	Without Dispatch	4 hours	≤ 4 hours	[REDACTED]
	With Dispatch	8 hours	≤ 8 hours	[REDACTED]

All Qwest IP-based services are supported by a highly robust, highly available transport infrastructure. Qwest engineers monitor and manage end-to-end transport solutions. Qwest will support availability from our NOC [REDACTED]

[REDACTED]

[REDACTED]

4.1.2.2.2 Approach for Monitoring and Measuring NBIP-VPNS KPIs and AQLs (L.34.1.4.2 (b))

Qwest monitors and measures the KPIs and AQLs via an automated process that pulls data from the root source, summarizes it, and displays it via Web tools. These Web tools display actual results and indicate via red/green colorizing whether or not goals are met. Our approach is to completely automate displaying results from data collection to Web display so that the focus is on results rather than “report generation.” Further, our automated process ensures that business rules are established and there is no chance of manipulating the data.

For Network KPIs, we use the Statistical Analysis System to display the Network Reliability Scorecard with the KPIs, the 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. The scorecard is reviewed daily, both at the executive level to ensure the proper attention and focus, and by our network management teams to ensure AQL levels are consistently met.

For all Networkx services, we use the [REDACTED] trouble ticketing system. [REDACTED]

[REDACTED]

[REDACTED] From this system, we collect many useful metrics that we use internally to evaluate and improve our processes including Time to Restore (TTR). The calculation for TTR uses the same business rules as the Government requires for its services.

For the NBIP-VPNS, all of the AQL/KPI metrics listed in Figure 4.1.2-9 are assessed on an individual site or site-pair basis where applicable. This data is used to ensure that all Agency data network AQLs are systematically being supported by the network. Additionally, key network infrastructure interfaces (Aggregation Ports/Network to Network Interfaces, Trunk Ports) are monitored for Packet/Cell Loss (including errors and discards) and availability ensuring that no Agency AQL issues are traceable to key network infrastructure ports.

Qwest will ensure the services delivered to Agencies follow a stringent reporting, management, and network capacity strategy to verify that all AQLs are delivered at a consistent acceptable level. Qwest NOC network management systems collect performance data directly from the NBIP-VPNS routers via SNMP. Performance data is collected from the network and SEDs at industry-standard five-minute intervals. The NBIP-VPNS performance data information is distributed to Qwest's NOC, which continuously monitors the performance of the Qwest OC-192 IP MPLS network. NBIP-VPNS utilization is monitored by the Qwest NOC, which is responsible for reporting statistics to the Data Network Planning and Design Group. This information is distributed to internal databases where it will be posted to the Qwest Control Network Portal. This portal provides Agencies with performance statistics to verify that customer-specified AQLs are met.

[REDACTED]

[REDACTED]

[REDACTED]

Use of Statistical Sampling in lieu of Direct KPI Measurements

Qwest does not propose to use statistical sampling in lieu of direct KPI measurements. While our approach to KPI measurements does use probe measurements, the measurements are taken on the actual network data and are direct, unfiltered measurements, not statistical extrapolations.

The Use of Government Furnished Property

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

4.1.2.2.3 NBIP-VPNS Performance Improvements (L.34.1.4.2(c))

[REDACTED] In the event an Agency has a specific business need or application problem, Qwest is willing to discuss service enhancements. Qwest will operate in good faith to engineer an NBIP-VPNS solution to serve unique Agency needs. Qwest is able to leverage our vast NBIP-VPNS product portfolio, which includes a variety of SED providers and specific NBIP-VPNS solutions. Through a special combination of vendor solutions and talented engineering capabilities, Qwest will serve all Agencies' business needs.

4.1.2.2.4 Additional NBIP-VPNS Performance Metrics (L.34.1.4.2(d))

[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]

[REDACTED]

4.1.2.3 Satisfaction of NBIP-VPNS Specifications (L.34.1.4.3)

Qwest will support all capabilities and locations and will deliver design expertise and knowledge while complying with all technical service requirements specified by the Networx RFP. Qwest's NBIP-VPNS delivers a broad range of service features, functionality, and technical capabilities, all delivered from our standards-based MPLS VPN internetworking platform. Qwest's NBIP-VPNS solutions will connect VPN users from Asia, Europe, South America, Africa, Australia, and all U.S. territories by using Qwest's Global NBIP-VPNS interconnections and provider supplier networks. Qwest has implemented encryption support and MPLS-based CUG context designs to support functions such as data concealment, virtual route forwarding, and tunneling protocols. Qwest's NBIP-VPNS MPLS CUG allows our converged IP NBIP-VPN platform to support [REDACTED] that originates from multiple access types in the same CUGs to communicate on an uninterrupted basis. [REDACTED]

[REDACTED]

4.1.2.3.1 Satisfaction of NBIP-VPNS Requirements (L.34.1.4.3(a))

Qwest's NBIP-VPNS provide IP MPLS VPN Intranet and Extranet based on RFC 4364 standard (MPLS VPNs via iBGP VPN Virtual Route Forwarding (VRF)). [REDACTED]

[REDACTED]

Qwest's NBIP-VPNS infrastructure complies with the accepted industry standards design development efforts Secure Sockets Layer (SSL) and IPsec

committees, and Layer 3 and Pseudo-Wire forums. [REDACTED]

[REDACTED]

[REDACTED] Qwest supports [REDACTED] authentication for all NBIP-VPNS mobile remote access Government customer user sessions. [REDACTED]

[REDACTED]

Qwest provides several security layers to our NBIP-VPNS customers. The nature of RFC 4364 makes it impossible for anyone that is not part of the CUG to even see that a VPN exists. In fact, there are no routes to a CUG port if the access port is not part of the same CUG. [REDACTED]

[REDACTED]

VPN policy control is applied via the Qwest NOC. Qwest's security management system includes all necessary parameters for each VPN profile.

[REDACTED]

[REDACTED] Qwest allows an Agency to provide temporary access users from a list of alternative authentication measures that include: 1) Contract provided 2) Third Party and 3) Agency provided.

[REDACTED]

Qwest's "any access approach" for our NBIP-VPNS includes the full QoS capability for several access methods, including:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

Qwest supports the required access methods from the same location where available. Multiple modes of access will enhance the availability of services at a site. Since varied modes may often follow different paths to network aggregation points, this is the best option for diverse access.

The Qwest mobile client and other SED-enabled VPN connections provide the flexibility necessary for mobile users to move within a VPN site and access sites on the same VPN. Qwest will work with Agencies to engineer this type of mobile authentication as the technology becomes available. [REDACTED]

[REDACTED] This service supports both voice-grade dial services as well as ISDN access for 56 Kbps to 128 Kbps (and more) digital access.

4.1.2.3.1.1 Satisfaction of NBIP-VPNS Capabilities Requirements (L.34.1.4.3(a), C.2.7.3.1.4)

Figure 4.1.2-14 summarizes our approach to the NBIP-VPNS required capabilities. Qwest fully complies with all mandatory stipulated and narrative capabilities requirements for NBIP-VPNS. The text in Figure 4.1.2-14 provides the technical description required per L.34.1.4.3(a) and does not limit or caveat Qwest’s compliance in any way.

Figure 4.1.2-14. Qwest’s Technical Approach to NBIP-VPNS Capabilities

ID #	Name of Capability	[REDACTED]
1	Tunneling Standards	[REDACTED]
2	Encryption Levels	[REDACTED]
3	Authentication Services	[REDACTED]
4	Reserved	[REDACTED]
5	IPv4 Support	[REDACTED]
6	IPv6 Support	[REDACTED]
7	QoS Support	[REDACTED]
8	Reserved	[REDACTED]
9	Access QoS Support	[REDACTED]
10	Application-level QoS Support	[REDACTED]
11	Access Methods Supported	[REDACTED]
12	Fast Dial Access	[REDACTED]
13	Reserved	[REDACTED]

ID #	Name of Capability	[REDACTED]
14	Isolation of Traffic and Routing Information	[REDACTED]
15	Layered Security Architecture	[REDACTED]
16	NBVPN Management	[REDACTED]
17	Mobile User Support	[REDACTED]
18	Multiple VPN Support	[REDACTED]
19	Network Design and Engineering Services	[REDACTED]
20 [Optional]	Dynamic Bandwidth Adjustment Support	[REDACTED]
21	Secure Routing Service	[REDACTED]
22	Encryption, Decryption, Key Management Support	[REDACTED]
23	Support for Agency Security Mechanisms	[REDACTED]
24	Authentication Server Choices	[REDACTED]

Qwest's NBIP-VPNS solution's infrastructure complies with the accepted industry standards design development efforts, SSL and IPsec committees, and Layer 3 and Pseudo-Wire forums. Based on Qwest's private MPLS architecture, NBIP-VPNS solutions can connect Agency locations and trusted business suppliers via leased lines [REDACTED]

[REDACTED]

4.1.2.3.1.2 Satisfaction of NBIP-VPNS Feature Requirements (L.34.1.4.3(a), C.2.7.3.2-C.2.7.3.2.1)

Figure 4.1.2-15 summarizes our approach to the NBIP-VPNS required features. Qwest fully complies with all mandatory stipulated and narrative features requirements for NBIP-VPNS. The text in Figure 4.1.2-15 provides the technical description required per L.34.1.4.3(a) and does not limit or caveat Qwest’s compliance in any way.

Figure 4.1.2-15. Qwest’s Technical Approach to NBIP-VPNS Features

ID #	Name of Feature	[REDACTED]
1	Class of Service (CoS)	[REDACTED]
2	High-availability options for CPE	[REDACTED]
3	Internet Gateway Service	[REDACTED]
4	Interworking Services	[REDACTED]
5	Key Management	[REDACTED]

ID #	Name of Feature	[REDACTED]
6 [Optional]	Non-peered Private IP Network	[REDACTED]
7	Security services	[REDACTED]

**4.1.2.3.1.3 Satisfaction of NBIP-VPNS Interface Requirements
(L.34.1.4.3(a), C.2.7.3.3-C.2.7.3.3.2)**

Qwest also supports all interfaces for NBIP-VPNS, as shown in **Figure 4.1.2-16**. Qwest fully complies with all mandatory stipulated and narrative features requirements for NBIP-VPNS. The text in Figure 4.1.2-16 provides the technical description required per L.34.1.4.3(a) and does not limit or caveat Qwest’s compliance in any way.

Figure 4.1.2-16. Qwest Provided NBIP-VPNS Interface at the SDP

UNI Type	Network Service	Network-Side Interface	[REDACTED]	[REDACTED]
1	Ethernet Access	1. 1 Mbps up to 10 Gbps (Gigabit Ethernet) 2. 10 Gbps (Optional)	[REDACTED]	[REDACTED]
2	Private Line Service	1. DS-0 2. Fractional T-1 3. T-1 4. Fractional T-3 5. T-3 6. OC-3c (Optional) 7. OC-12c (Optional) 8. OC-48c (Optional) 9. OC-192 (Optional)	[REDACTED]	[REDACTED]
3	IP over SONET Service (Optional)	1. OC-3c 2. OC-12c 3. OC-48c 4. OC-192c	[REDACTED]	[REDACTED]

Note that the mandatory interfaces list mandates inclusion of SEDs that exceed the scope of the mandatory SED suites. Qwest has identified potential SEDs for each required interface.

In addition, as shown in **Figure 4.1.2-17**, Qwest's NBIP-VPNS supports all interfaces for remote access.

Figure 4.1.2-17. Summary of Remote Access Interface Support for Qwest's NBIP-VPNS

UNI Type	Network Service	Network-Side Interface	[REDACTED]	[REDACTED]
1	Voice Service	Analog dial-up at 56 Kbps	[REDACTED]	[REDACTED]
2	DSL Service	xDSL access at 1.5 to 6 Mbps downlink, and 384 Kbps to 1.5 Mbps uplink	[REDACTED]	[REDACTED]
3	Cable High-Speed Access	320 Kbps up to 10 Mbps	[REDACTED]	[REDACTED]
4 (Optional)	Multimode/Wireless LAN Service	MWLANS User-to-Network Interfaces: Air link: 2.4 GHz (Physical Interface is Type II PCMCIA card of handheld computers and card/chip in PDA).	[REDACTED]	[REDACTED]
5 (Optional)	Wireless Access	Wireless Access Arrangement Interfaces: Air link: 2.4 GHz (Physical Interface is Type II PCMCIA card of handheld computers and card/chip in PDA).	[REDACTED]	[REDACTED]
6 (Optional)	Satellite Access	Satellite Access Arrangement Interfaces: V.35, RS-449, RS-232, RS-530, T-1, T-3, E-1, and Air link.	[REDACTED]	[REDACTED]
7	Circuit-Switched Data Service	1. ISDN at 64 Kbps 2. ISDN at 128 Kbps 3. ISDN dial backup at 64 Kbps 4. ISDN dial backup at 128 Kbps	[REDACTED]	[REDACTED]

4.1.2.3.2 Proposed Enhancements to NBIP-VPNS (L.34.1.4.3(b))

[REDACTED]

To enable the convergence of Agency applications, such as the use of private real-time applications like VoIP and IP-based videoconferencing, or access to Qwest's VoIP and video conferencing services, [REDACTED]

[REDACTED]

[REDACTED]

Presently, Qwest delivers network-based MPLS VPN services to many of the major Fortune 1000 financial, manufacturing, healthcare, and high technology corporations. Qwest's customers, as well as third-party analyst reports such as Network World Computing, consistently praise our engineering and support services.

4.1.2.4 Robust Delivery of NBIP-VPNS (L.34.1.4.4)

Qwest's has examined the demand set requirements for NBIP-VPNS and has determined that Qwest's proven planning process meets all requirements. Qwest has strict engineering and design rules to ensure connectivity and robustness as well as systems and capacity needed to ensure network performance.

4.1.2.4.1 Support for Government NBIP-VPNS Traffic (L.34.1.4.4(a))

Qwest has examined the NBIP-VPNS traffic requirements of the Government's traffic model. Based on our current backbone utilization and capacity, these bandwidth requirements will not require any significant backbone upgrades. In addition, the total number of ports required does not

represent a number significant to our normal edge router capacity planning. Qwest closely and continuously monitors our edge router capacity and backbone network links and has an aggressive upgrade policy to minimize any effects of congestion on Agency traffic flows.

4.1.2.4.2 NBIP-VPNS Congestion and Flow Control Strategies

(L.34.1.4.4(b))

Qwest uses virtually unlimited backbone bandwidth and aggressive capacity planning to manage congestion in our data and voice services networks. [REDACTED]

[REDACTED] Our network planning examines all failure modes and places 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. The following paragraphs describe the steps Qwest takes at many layers through our network to ensure resiliency in our services, in particular to handle increased traffic loads and equipment anomalies.

Resiliency starts with the fundamental building block of all modern nationwide networks: our fiber and optical transport systems. Qwest started as a network construction company and built to our standards approximately [REDACTED] percent of all of our routes. [REDACTED]

[REDACTED] It is this construction technique that has protected our fiber, even in the face of catastrophic events such as Hurricane Katrina. Our ROW facilities are designed to the highest carrier-quality standards, including:

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

The next step in redundancy and resiliency is our backbone optical transport system. [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED] In fact, none of Qwest's SONET transport customers lost any traffic during the damage caused by Hurricane Katrina. Qwest's POP near the New Orleans Superdome never lost service.

Monthly transport utilization reports are used to monitor congestion and traffic flow. As certain threshold levels are reached, the traffic patterns are reviewed to determine whether a new system is required. As part of the review, the system architecture is analyzed to determine whether there is a better design that could be deployed. The system allows new nodes to be inserted or existing nodes to be removed to route traffic more efficiently. Our goal is to route traffic over the shortest distance with the least number of hubs.

[REDACTED]
[REDACTED]

[REDACTED] This allows for a great deal of flexibility in terms of the services we can provide. As requirements change, Qwest has an established process to quickly convert drop capacity in order to meet the

needs of Agencies. In addition, intermediate locations between current access POPs, such as optical amplifier and regenerator sites, can be converted to provide drops if the traffic patterns indicate it is necessary.

[REDACTED]

[REDACTED]

[REDACTED] Qwest has ample capacity on our existing transport system for the addition of capacity growth in the foreseeable future.

Network resiliency is also built into our data network services. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

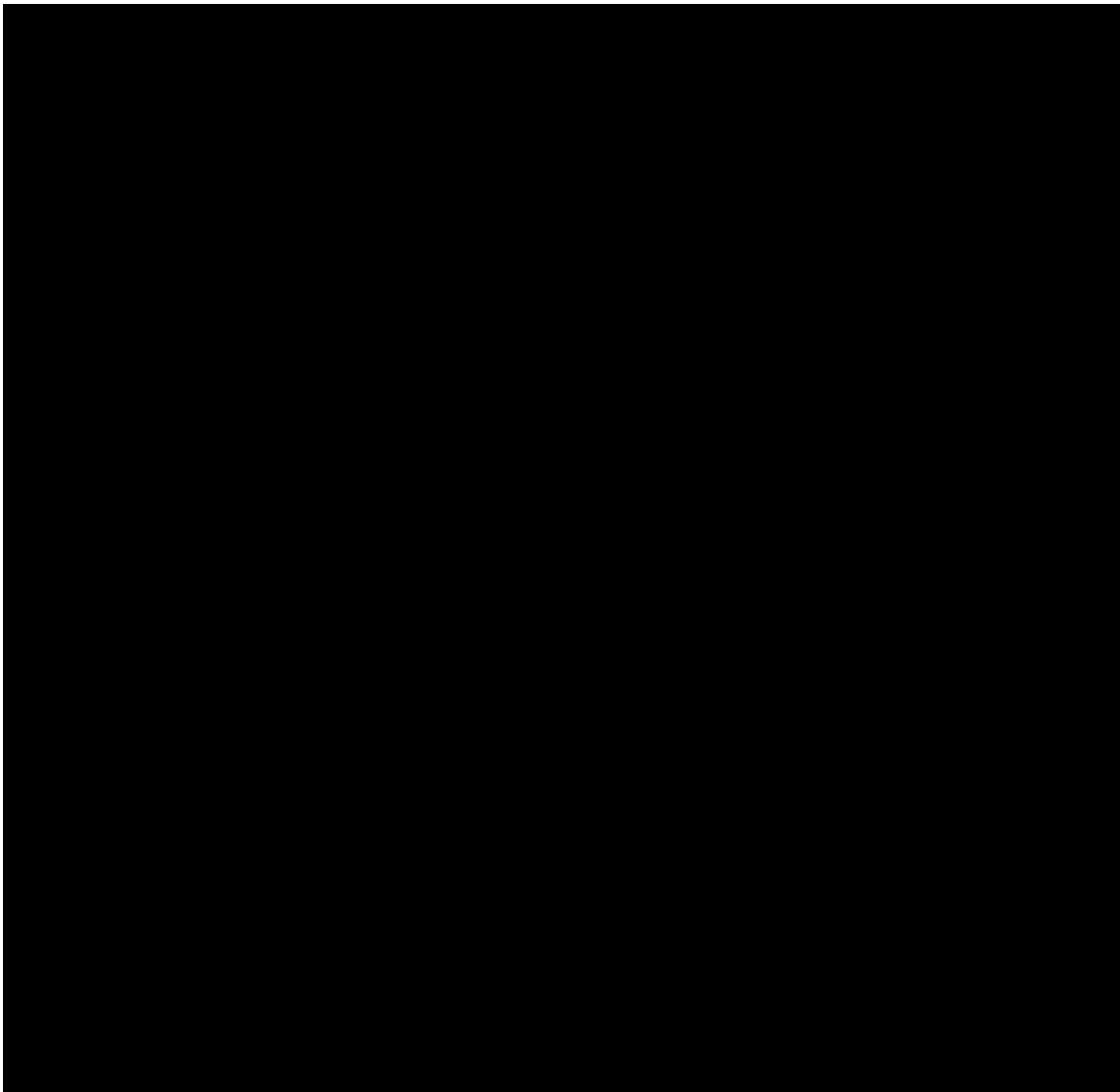
Qwest uses only carrier-class equipment to achieve high network availability. Throughout the equipment lifecycle process, from technology insertion to decommissioning, Qwest employs a rigorous testing and

evaluation program to ensure the equipment we select for our network meets our network availability objectives. Qwest's technology management department evaluates the equipment reliability analysis and sparing strategy and determines which equipment components need to be redundant.

To ensure high availability of our NBIP-VPNS services, Qwest employs

[REDACTED]

[REDACTED] This redundantly configured and inherently reliable equipment is then replicated either locally or in a geographically



diverse location. [REDACTED] shows a diagram of our typical TeraPOP data network architecture. In the event of a loss of a single router or switch (combined with our rigorous capacity planning methodology), an Agency will see continued service and will experience no degradation of service.

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.

[REDACTED]

[REDACTED]

[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.

For last-mile access into a customer facility, Qwest offers a local loop diversity option. [REDACTED]

[REDACTED]

[REDACTED]
[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]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

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 approximately [REDACTED] percent of any remaining backbone trunks.

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]

4.1.2.4.3 NBIP-VPNS Measures and Engineering Practices (L.34.1.4.4(c))

The speed and size of Agencies' telecommunications systems can grow easily and transparently on the Qwest network. Qwest has a history of adapting rapidly to meet customer requirements. [REDACTED]

[REDACTED]

Qwest built our network to provide high availability to our customers. Qwest's performance measures and engineering practices are designed to provide robustness of the access and backbone networks, ensure resiliency, and prepare for growth. Our design procedures, network modeling, and circuit route checks provide a high level of customer service.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Qwest engineers continuously model network capacity using current and forecasted traffic to ensure that Agency traffic is routed efficiently through the network. This assists with properly sizing backbone links.

[REDACTED]

[REDACTED]

Qwest's Network Planning and Engineering organizations use strict engineering rules to create the highly robust private MPLS core, Public [REDACTED] and border router architectures that comprise the Qwest domestic and Asian IP network. These organizations continually monitor network performance and the capacity utilization of core network connections and our peering points to ensure the highest performance for Agencies.

4.1.2.5 NBIP-VPNS Optimization and Interoperability (L.34.1.4.5)

Qwest network engineering and planning have a history of improving the technology and performance of our NBIP-VPNS. [REDACTED]

[REDACTED]

[REDACTED]

4.1.2.5.1 Optimizing the Engineering of NBIP-VPNS (L.34.1.4.5(a))

Qwest closely monitors the KPIs [REDACTED] and constantly optimizes network performance. Qwest's approach to optimizing the engineering of IP-based and optical services begins with the collection and analysis of network performance data, [REDACTED]. This data, along with historical growth rates, is input into network simulation models. The simulation results are compared to AQL targets. [REDACTED]

[REDACTED]

4.1.2.5.2 Methods Applied to Optimize the Network Architecture (L.34.1.4.5(b))

[REDACTED]

[REDACTED]

Architecture Optimization for Services

As Qwest is in the business of providing network services, the architecture and behavior of the network is predominantly based on the type of service being provided. Every product is developed and tested against the current architecture before it is launched. If the existing architecture does not support the product, the network is modified and optimized.

[REDACTED]

Architecture Optimization for Network Growth

The IPS network has been carrying a growing amount of traffic. As the volume of traffic grows, the network architecture is reviewed to ensure that it is still scalable and that it can be improved to continue to provide excellent service to customers.

[REDACTED]

Architecture Optimization for Technological Advances

Over the years, the IPS network has evolved to a strategic network for Qwest, and Qwest has always stayed ahead of the technology. As the equipment vendors have provided improved platforms with more features and functionality, Qwest evaluates them against the current architecture. With the help of this evaluation, Qwest can optimize any part of the network and grow with services and customer requirements. [REDACTED]

[REDACTED]

For Qwest, the architecture is dynamic and needs to be optimized by using any and all the technology and methodology available to meet Agency requirements in a cost-effective manner. We are a facility-based provider with our own fiber, transport, and IPS network, as shown in the previous examples. We leverage technology and architecture at all layers of the network to deliver and build a best-of-class network.

4.1.2.5.3 Access Optimization for NBIP-VPNS (L.34.1.4.5(c))

Qwest's IP network capability has global coverage. With more than [REDACTED] strategically located domestic IP POPs, [REDACTED] international supplier IP POPs, and [REDACTED] network access points equipped with multi-service edge platforms to aggregate and transport Agency traffic to the Qwest IP network, Qwest is able to offer efficient, cost-effective access to IPS. In addition,

through supplier networks, Qwest supports access to an extensive list of countries.

Qwest has designed, engineered, and deployed multi-service edge switch routers with high-port density to provide a full suite of services for diverse customer applications. These multi-service edges are connected directly to the core routers via multiple high-speed uplinks for diversity and redundancy. These intelligent edge routers allow Qwest to create new, differentiated service offerings, continue support for existing services, and optimize the network infrastructure. [REDACTED]

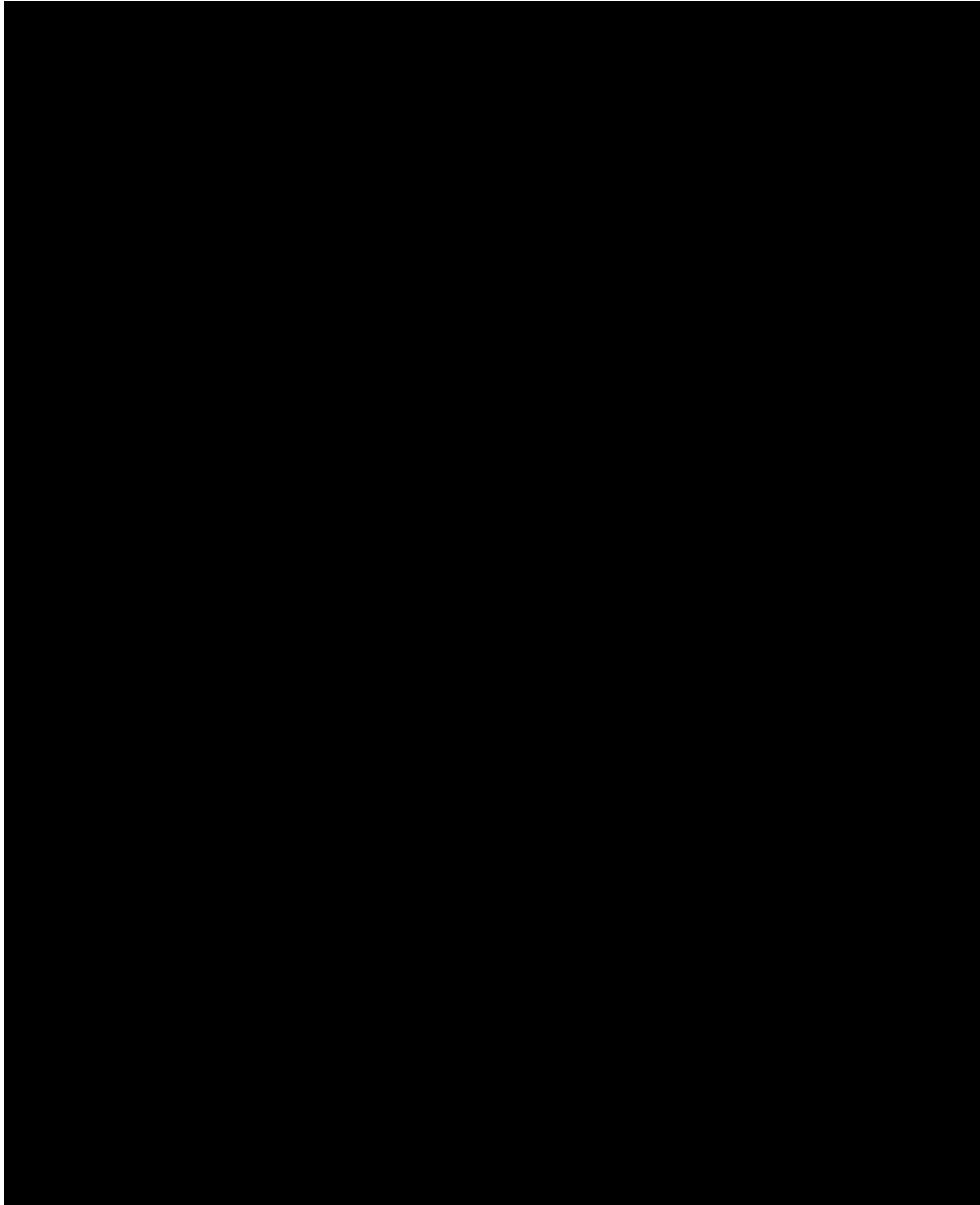
[REDACTED]

With these multi-service edges, the network has less equipment, fewer layers of equipment, and less complexity to operate and manage. Qwest will no longer have to add older IP routers and older Layer 2 switches that were built with limited services and port density, and thus will save in costs and rack spaces. Further reduction in capital and operating expenses can be realized as older equipment at the POPs is being decommissioned and removed after traffic has been migrated over to the new multi-service edges.

4.1.2.5.4 Vision for Service Internetworking (L.34.1.4.5(d))

Qwest is committed to the elimination of single-purpose, stovepipe networks that create planning, operations, and interoperability issues for our customers.

Qwest's service delivery model supports multiple types of customer requirements. Qwest's approach for network architecture evolution guides our investments and provides the overall direction for our technology evolution and services convergence. Qwest's service delivery model also allows us to assess the interoperability impacts of changes in the technical elements in



[REDACTED]

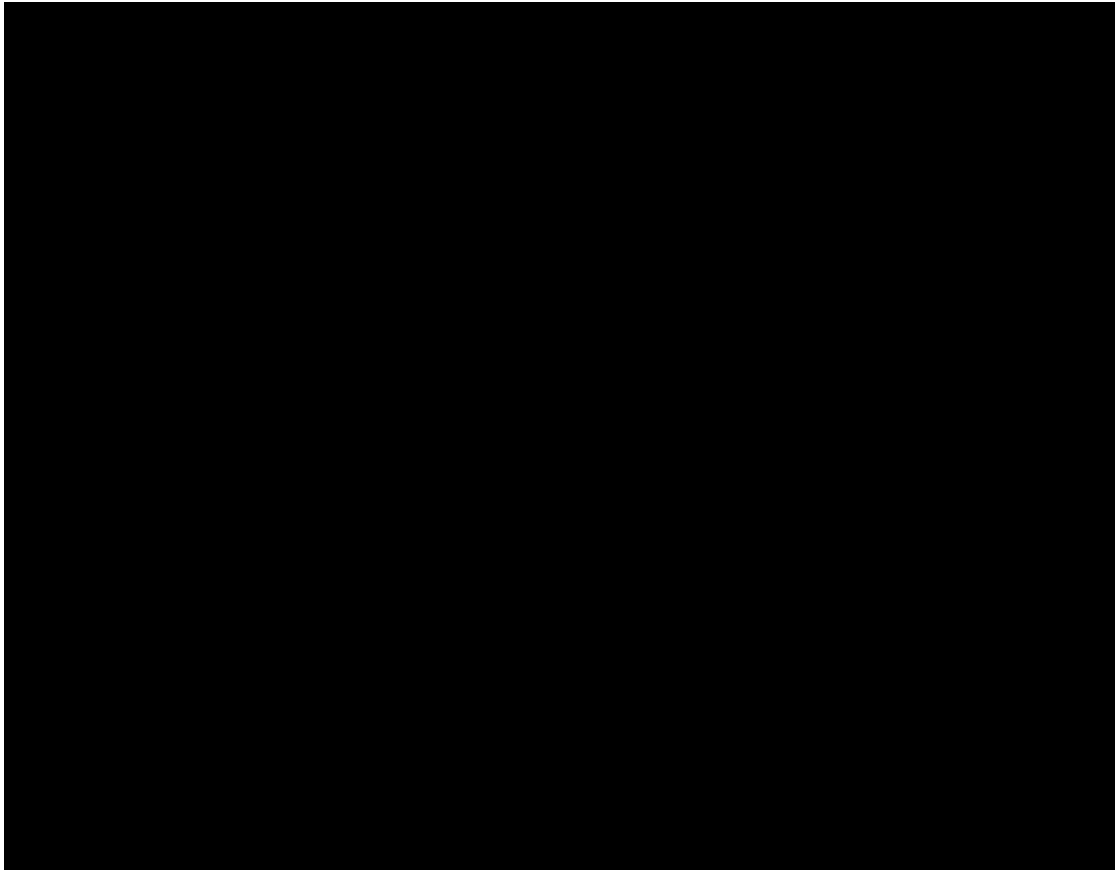
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- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

An integrated service control system is required to enable service convergence that complements network convergence. Together, these capabilities define an adaptable, enabled, and integrated architecture for Qwest's future services that meet changing business needs. [REDACTED]

[REDACTED]



Within the context of Qwest's Network Architecture evolution, the Services Control Architecture provides a structured framework for using the capabilities of the underlying transport and access networks to develop, deploy, customize, and integrate enhanced communication services.



[REDACTED]

[REDACTED]

[REDACTED]