4.2.3 Frame Relay Services (FRS) (L.34.1.4.6, M.2.1.2)

Qwest's Frame Relay Services leverages our converged IP core network to ensure service continuity and a path to next generation services for Agencies.

Qwest's Frame Relay Services (FRS) provides connection-oriented data transmission at rates up to Digital Signal Level-3 (DS-3). Qwest's FRS is fully integrated with our Asynchronous Transfer Mode (ATM) platform, providing access to our Multi-Protocol Label Switched (MPLS) core network. These features make the Qwest FRS ideal for seamless integration of Agency sites with a broad range of bandwidth requirements and a wide variety of access architectures.

Qwest's FRS features symmetric or asymmetric Permanent Virtual Circuit (PVC) configurations up to 45 Megabits per second (Mbps), and three Quality of Service (QoS) levels: Variable Frame Rate-real time (VFR-rt), Variable Frame Rate-non real time (VFR-nrt), and Unspecified Frame Rate (UFR). Access is offered over a wide range of bandwidths, from DS-0 through DS-3. Port speeds are available from DS-0 to DS-3, including fractional DS-1 and DS-3.

Qwest's FRS is global in reach, extending directly to Asia and Europe via our multiple international vendors and suppliers. We already provide service to the Government and commercial customers throughout the world.

Qwest's FRS is proactively monitored 24x7x365, with the additional capability of reporting statistical and alarm information directly to Agencies via the Qwest Control Networx Portal.

Our current Government customers, [redacted] have already experienced the ease

of migration from FRS to enhanced services on our converged network architecture. Our network design supports FRS to ATM or Internet Protocol (IP) connectivity for sites that are using access up to OC-12 (ATM) and OC-48 Internet Protocol Service (IPS). This any-to-any approach and worldwide reach provides Agencies with flexibility and reliability now, and the confidence that Qwest will continue to address their needs in the future.

Figure 4.2.3-1 provides an easy reference to correlate narrative requirements to our proposal response.

Figure 4.2.3-1. Table of FRS Narrative Requirements

Req_ID	RFP Section	Proposal Response
30518	C.2.3.1.2.1(7)	4.2.3.3.2

4.2.3.1 Reserved (L.34.1.4.6(a))

4.2.3.2 Reserved (L.34.1.4.6(b))

4.2.3.3 Satisfaction of FRS Requirements (L.34.1.4.6(c))

The following three sub-sections describe how Qwest will satisfy the capabilities, features, and interfaces requirements of the RFP.

4.2.3.3.1 Satisfaction of FRS Capabilities Requirements (L.34.1.4.3(a), C.2.3.1.1.4)

Qwest's Frame Relay network infrastructure enables a broad range of technical service capabilities and supports all of the technical capabilities required for FRS. ***Figure 4.2.3-2*** summarizes Qwest's technical approach to supporting the FRS capabilities. Qwest fully complies with all mandatory stipulated and narrative capabilities requirements for FRS. The text in Figure 4.2.3-2 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 4.2.3-2. Qwest's Technical Approach to FRS Capabilities

ID #	Name of Capability	[redacted]
1	Provisioning over PVCs	[redacted]
2	Max Frame Size	[redacted]
3	Variable Length Frames	[redacted]
4	Provision as a. single pt.-pt VCs b. multiple pt-pt VCs [optional]	[redacted]
5(a)	Access Circuit Capacity	[redacted]
5(b) [Optional]	Multiple PVCs with CIRs	[redacted]
6.	Reserved	

Qwest's integration of FR and ATM services provides significant internal operational and cost efficiencies, while enabling internetworking of FR and ATM connections. Through integration, we also continue our support of both FR and ATM Class of Service (CoS) (for example, VFRrt and CBR) through following the Frame Relay Forum (FRF). FRF-8 implementation guidelines have led us to the selection of an integrated Lucent ATM/FR service suite.

Qwest's FRS consists of a managed, fully interoperable, and scalable suite of services based on a high-performance platform designed to maximize availability and reliability. The services comprise local access, ATM/FR/IP ports, and PVC or SVCs. The service is offered at bandwidths between 56Kbps to DS-1 and DS-3. Qwest's FRS is fully interoperable with other transport services (e.g., ATMS and IPS), providing a total solution for the Agency's current and future requirements.

The Committed Information Rate (CIR) specifies the bandwidth that is the guaranteed minimum transmission rate for a PVC. Qwest FRS enables bursting above the CIR up to the port capacity of the access circuits. Qwest's

FR technology permits subscribers to take advantage of idle connections by oversubscribing their aggregate CIR. An Agency may have a CIR of 64Kbps on a 128Kbps port, allowing data to burst at the port rate. The oversubscription rate is assigned for each port and is dependent on the Agency application and QoS selected.

Qwest meets all of the Networx program's performance requirements for FRS providers, including those for monitoring and measurement systems, procedures, and evaluation methods. Qwest's FRS consists of a managed, fully interoperable, and scalable suite of services based on a high-performance platform designed to maximize availability and reliability. The services comprise local access, ATM/FR/IP ports, and PVCs or SVCs. Qwest's ATM/FR services are fully interoperable.

Qwest FRS will connect Government and Government-specified locations at Service Delivery Points (SDPs) via Agency routers, Layer 2 and Layer 3 switches, multiplexing/switching devices, computers, and other FRS access devices. The SDP for a Government location is the interface through which the Agency receives the traffic. In order to enable the service, each site must connect the service through a Qwest-provided User to Network Interface (UNI). The UNI represents the SDP.

Qwest's approach to the delivery of FRS is already proven in successful service delivery of FRS service to several Agencies. Our FRS offers a variety of benefits, including high reliability, internetworking with ATM and IP-based services, and a broad set of technical capabilities that ensure service continuity for Agencies. Qwest's FRS approach supports gateway connectivity to the Qwest IP network and allows Agencies to migrate toward a converged services infrastructure.

Qwest's highly qualified pre-sales engineering, network planning, provisioning, and operations organizations have supported FRS for 13 years.

Our network planning design and implementation engineers adhere to all standards and ensure that our network equipment vendors comply with standards. Fault, Configuration, Accounting, Performance and Security testing for all network elements is based on applicable standards. Qwest engineers are frequent contributors to the standards bodies responsible for FRS, ATM, and IP. We currently hold multiple patents, with more pending for innovations that improve our customers' experience and streamline our operations. Our engineering staff performs detailed compliance tests on all new equipment or software that is deployed in our network, contributing to the outstanding reliability and interoperability of our FR network.

Qwest complies with all of the Networx program's performance requirements for FRS. Qwest network management systems collect data from FRS nodes, including Local Management Interface interaction with FRS Service Enabling Devices (SEDs). This information is transferred to internal databases, where it is distributed to the Qwest Control Networx Portal. The portal provides Agencies with regularly reported performance statistics that will confirm Networx ATMS/FRS performance requirements. The same system auto-generates trouble tickets to Qwest's integrated alarm notification center, ensuring excellent response time and event notification. Qwest has used this proactive monitoring system successfully for the last 12 years.

[redacted]

Qwest uses state-of-the-art networking technology with a nationwide reach to meet the FRS requirements. The Qwest ATM and FR network, illustrated in [redacted] deployed over Qwest's nationwide fiber optic network.

International FRS uses vendors and suppliers such as Equant, BT/Infonet, [redacted] to provide the global reach [redacted] from Qwest's Integrated ATM/FR network platform. Qwest's leading-edge ATM/FR network is comprised of a single-tiered architecture, based on our installed base of multi-service switches. The integrated broadband network allows Agencies to integrate FRS and ATMS networks using a single provider on a single reliable backbone infrastructure. In areas where Qwest is not the Incumbent Local Exchange Carrier (ILEC), Qwest will arrange with the serving Local Exchange Carrier/Competitive Exchange Carrier (LEC/CLEC) to provide access.

Qwest's FRS network infrastructure enables a broad range of technical service capabilities and supports all of the technical capabilities required for FRS. Our service approach provides significant flexibility in provisioning of PVCs and in the assignment of a CIR for both full capacity of the access

circuit and oversubscription for PVCs. Qwest supports frame sizes up to 4096 bytes.

4.2.3.3.2 Satisfaction of FRS Features Requirements (L.34.1.4.3(a), C.2.3.1.2)

In 2003, Qwest interconnected our FR/ATM and IP/MPLS networks, creating a converged packet network. This converged network design allows our FRS to inherently support Internet gateway and IP Virtual Private Network (VPN) services (also known as IP-enabled FR). ***Figure 4.2.3-4*** provides an overview of Qwest's technical approach to providing the required FR features.

Figure 4.2.3-4. Qwest's Technical Approach to FRS Features

ID #	Name of Feature	[redacted]
1	Class of Service (CoS)	[redacted]
2	Disaster Recovery PVCs	[redacted]
3	Frame-to-Internet Gateway	[redacted]
4	Internetworking Services	[redacted]
5 [Optiona]	IP-Enabled Frame Relay	[redacted]
6 [Optiona]	Multilink Frame Relay	[redacted]
7 [Optiona]	Switched Digital Access to FRS	[redacted]
8 [Optiona]	Voice Over Frame Relay	[redacted]

Qwest's integration of FRS and ATMS provides significant internal operational and cost efficiencies, while enabling internetworking of Agencies FRS and ATMS connections. Through integration, we also continue our support of both FRS and ATMS CoS (for example, VFRrt and CBR) by following the FRS forum implementation guidelines (FRF.8) and selecting an integrated Lucent ATM/FR service suite.

Switched Digital Access to FRS (Req_ID 30518, C.2.3.1.2.1(7))

Qwest is not proposing this optional feature at this time.

4.2.3.3.3 Satisfaction of FRS Interface Requirements (L.34.1.4.3(a), C.2.3.1.3)

Qwest's innovative FRS offering is extended to Agencies through a broad set of UNI support capabilities. In addition to a comprehensive set of conventional access approaches, Qwest supports a broad range of SEDs for our FRS to enable an extensive set of interfaces, bandwidth, and signaling capabilities. Our proposal confirms our compliance with all the interface requirements of C.2.3.1.3.1, as shown in ***Figure 4.2.3-5***.

Figure 4.2.3-5. Qwest-Provided FRS Interfaces at SDP

UNI Type	Interface Type and Standard	Payload Data Rate or Bandwidth2	Signaling or Protocol Type3	[redacted]
1	ITU-TSS V.35	Up to 1.536 Mbps	Frame Relay	
2	ITU-TSS V.35	Fractional T-1	Frame Relay	
3 [Optional]	ITU-TSS V.35	Up to 1.536 Mbps	Asynchronous ASCII	
4 [Optional]	ITU-TSS V.35	Up to 1.536 Mbps	IBM BSC	
5 [Optional]	ITU-TSS V.35	Up to 1.536 Mbps	IBM SNA/SDLC	
6 [Optional]	ITU-TSS V.35	Up to 1.536 Mbps	UNISYS Poll/Select	
7	ITU-TSS V.35	Up to 1.536 Mbps	IPv4 and IPv6 (See note 3)	
8	All 802.5 cable and connector types	Up to 1.536 Mbps (See note 1)	IEEE) 802.5 IP/IPX	
9	All 802.5 cable and connector types	Up to 1.536 Mbps (See note 1)	IEEE 802.5 IP/IPX	

UNI Type	Interface Type and Standard	Payload Data Rate or Bandwidth2	Signaling or Protocol Type3	[redacted]
10	EIA RS-232	Up to 56 Kbps	Asynchronous ASCII	
11	EIA RS-232	Up to 56 Kbps	IBM BSC	
12	EIA RS-232	Up to 56 Kbps	IBM SNA/SDLC	
13	EIA RS-232	Up to 56 Kbps	UNISYS Poll/Select	
14	EIA RS-232	Up to 56 Kbps	IPv4 and IPv6 (See note 3)	
15	EIA RS-422	Up to 1.536 Mbps	Frame Relay	
16	EIA RS-422	Fractional T1	Frame Relay	
17	EIA RS-422	Up to 1.536 Mbps	Asynchronous ASCII	
18	EIA RS-422	Up to 1.536 Mbps	IBM BSC	
19	EIA RS-422	Up to 1.536 Mbps	IBM SNA/SDLC	
20	EIA RS-422	Up to 1.536 Mbps	UNISYS Poll/Select	
21	EIA RS-422	Up to 1.536 Mbps	IPv4 and IPv6 (See note 3)	
22	EIA RS-449	Up to 1.536 Mbps	Frame Relay	
23	EIA RS-449	Fractional T1	Frame Relay	
24 [Optional]	EIA RS-449	Up to 1.536 Mbps	Asynchronous ASCII	
25 [Optional]	EIA RS-449	Up to 1.536 Mbps	IBM BSC	
26 [Optional]	EIA RS-449	Up to 1.536 Mbps	IBM SNA/SDLC	
27 [Optional]	EIA RS-449	Up to 1.536 Mbps	UNISYS Poll/Select	
28	EIA RS-449	Up to 1.536 Mbps	IPv4 and IPv6 (See note 3)	
29	EIA RS-530	Up to 1.536 Mbps	Frame Relay	
30	EIA RS-530	Fractional T1	Frame Relay	
31	EIA RS-530	Up to 1.536 Mbps	Asynchronous ASCII	
32	EIA RS-530	Up to 1.536 Mbps	IBM BSC	
33	EIA RS-530	Up to 1.536 Mbps	IBM SNA/SDLC	
34	EIA RS-530	Up to 1.536 Mbps	UNISYS Poll/Select	
35	EIA RS-530	Up to 1.536 Mbps	IPv4 and IPv6 (See note 3)	
36 [Optional]	ISDN PRI (Multirate)	Up to 1.472 Mbps	Frame Relay	
37 [Optional]	ISDN PRI (Multirate)	Up to 1.472 Mbps	IBM BSC	
38 [Optional]	ISDN PRI (Multirate)	Up to 1.472 Mbps	IBM SNA/SDLC	
39 [Optional]	ISDN PRI (Multirate)	Up to 1.472 Mbps	UNISYS Poll/Select	
40 [Optional]	ISDN PRI (Multirate)	Up to 1.472 Mbps	IPv4 and IPv6 (See note 3)	
41	T3	Up to 43.008 Mbps	Frame Relay	
42	Fractional T3	Up to 43.008 Mbps	Frame Relay	
43	T3	Up to 43.008 Mbps	IPv4 and IPv6 (See note 3)	
44	High Speed Serial Interface (HSSI)	Up to STS-1 (49.536 Mpbs)	Frame Relay	
45	All IEEE 802.3 cable and	Up to 43.008 Mbps (see note 1)	IEEE 802.x (x=3,5) IPv6/IPX/SNA/IPv4	

UNI Type	Interface Type and Standard	Payload Data Rate or Bandwidth2	Signaling or Protocol Type3	[redacted]
	connector types			
46	E3 (nondomestic)	Up to 30.72	Frame Relay	
47	E3 (nondomestic)	Up to 30.72	IPv4 and IPv6 (See note 3)	
48 [Optional]	ISDN BRI (Multirate)	Up to 128 Kbps	Frame Relay	
49 [Optional]	ISDN BRI (Multirate)	Up to 128 Kbps	Asynchronous ASCII	
50 [Optional]	ISDN BRI (Multirate)	Up to 128 Kbps	IBM BSC	
51 [Optional]	ISDN BRI (Multirate)	Up to 128 Kbps	IBM SNA/SDLC	
52 [Optional]	ISDN BRI (Multirate)	Up to 128 Kbps	UNISYS Poll/Select	
53 [Optional]	ISDN BRI (Multirate)	Up to 128 Kbps	IPv4 and IPv6 (See note 3)	
54	All IEEE 802.3 cable and connector types	Up to 30.72 Mbps (see note 1)	IEEE 802.x (x=3,5) IPv6/IPX/SNA/IPv4	
[redacted]				

4.2.3.4 FRS Quality of Service (L.34.1.4.6(d), C.2.3.1.4)

[redacted], as shown in ***Figure 4.2.3-6***.

Figure 4.2.3-6. Qwest Compliance with Government Performance Metrics

Key Performance Indicator	Service Level	Performance Standard (Threshold)	Acceptable Quality Level (AQL)	[redacted]
Grade of Service (GOS) DDR	Routine	99.90%	≥ 99.90%	
GOS (DDR)	Critical [Optional]	99.99%	≥ 99.99%	
Latency (CONUS)	Routine	120 ms	≤ 120 ms	
Latency (CONUS)	Critical [Optional]	90 ms	≤ 90 ms	
AV (PVC)	Routine	99.925%	≥ 99.925%	
Time to Restore	Without Dispatch	4 hours	≤ 4 hours	
Time to Restore	With Dispatch	8 hours	≤ 8 hours	

[redacted] This is possible because Qwest FR and ATM services are deployed over a redundant,

secure, and scalable fiber-optic network infrastructure that yields high availability rates.

[redacted] The geographically dispersed, redundant Qwest Worldwide Data Operations Centers provide proactive monitoring and network maintenance 24x7x365. Our Network Management System records all FRS alarms into our central database continuously while concurrently auto-generating trouble tickets. These alarm histories and trouble tickets are available to the operations team for troubleshooting purposes and to Agencies through the Qwest Control Networx Portal. Our portal can be used by Agencies to query status, performance statistics, equipment configuration, and fault histories. Qwest also uses this operations infrastructure to provide event notification, where we alert our customers to network issues.

[redacted] through efficiencies inherent in Qwest's Synchronous Optical Network (SONET)-based multi-service platform and network-routing [redacted]

[redacted] For critical applications requiring higher levels of availability, performance, or restore criteria, FRS VFRrt provides the desired QoS for applications requiring higher levels of availability, performance, or restore criteria. For applications specified as routine, the FRS UFR will satisfy the data transport requirements. All KPI measurements are applicable from SDP-to-SDP.

[redacted] as shown in ***Figure 4.2.3-7***. Qwest's FRS is highly reliable. [redacted]. As shown in

[redacted] Qwest consistently meets or exceeds the Government's requirements in several areas.

Figure 4.2.3-7. Qwest's FRS Exceeds Several Networx Performance Level Requirements.

Key Performance Indicator	User Type	Government AQL	[redacted]
Data Delivery Rate (DDR)	Routine	99.90%	[redacted]
Latency in Continental United States (CONUS)	Routine	120 ms	[redacted]
PVC Availability	Routine	99.925%	[redacted]

[redacted]

4.2.3.5 Qwest's FRS Meets Service Requirements (L.34.1.4.6(e))

Qwest's FRS [redacted] the requirements of C.2.3.1 and does not propose to offer capabilities, features, or interfaces to exceed the specified requirements.

4.2.3.6 Experience with FRS Delivery (L.34.1.4.6(f))

Qwest's long and successful experience in offering FR services (and ATM services) to commercial customers and Government Agencies provides the Government with a low-risk solution to meeting Networx FRS and ATMS requirements. [redacted] Our FRS customers include those in financial services, medical industries, and public sector clients at the city, state, and federal level. [redacted]

4.2.3.7 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. This combination enables Qwest to leverage our own facilities as an ILEC in 14 states in the western U.S. as well as those of other ILECs and CLECs to provide robust nationwide access solutions that meet our customers' needs.

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

Qwest has the staff and procedures to engineer extremely high-availability access arrangements. Qwest has averaged [redacted] percent for these specially engineered arrangements over the past three years. Measured over the past four years, our operational procedures have also enabled a TTR [redacted] for our Government data networking customers.

Agencies also expect the best possible provisioning intervals to get their service up and running. Qwest has a long and excellent track record in on-time delivery service, with reliable service delivery intervals. As shown in [redacted] Qwest has maintained an excellent, best-in-class service delivery interval for our Government customers. [redacted] represents actual service turn-up from the Agencies' perspective—including all aspects of access, provisioning, demarcation extension, and equipment installation for a major Government department nationwide network.

Our provisioning performance has direct benefits to Agencies, enabling Qwest to define aggressive timelines for service transitions. [redacted]

[redacted]

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.

Dedicated Access Facilities

Qwest uses our own and leased access facilities to connect Agency locations to Qwest network services. In each case, Qwest performs network

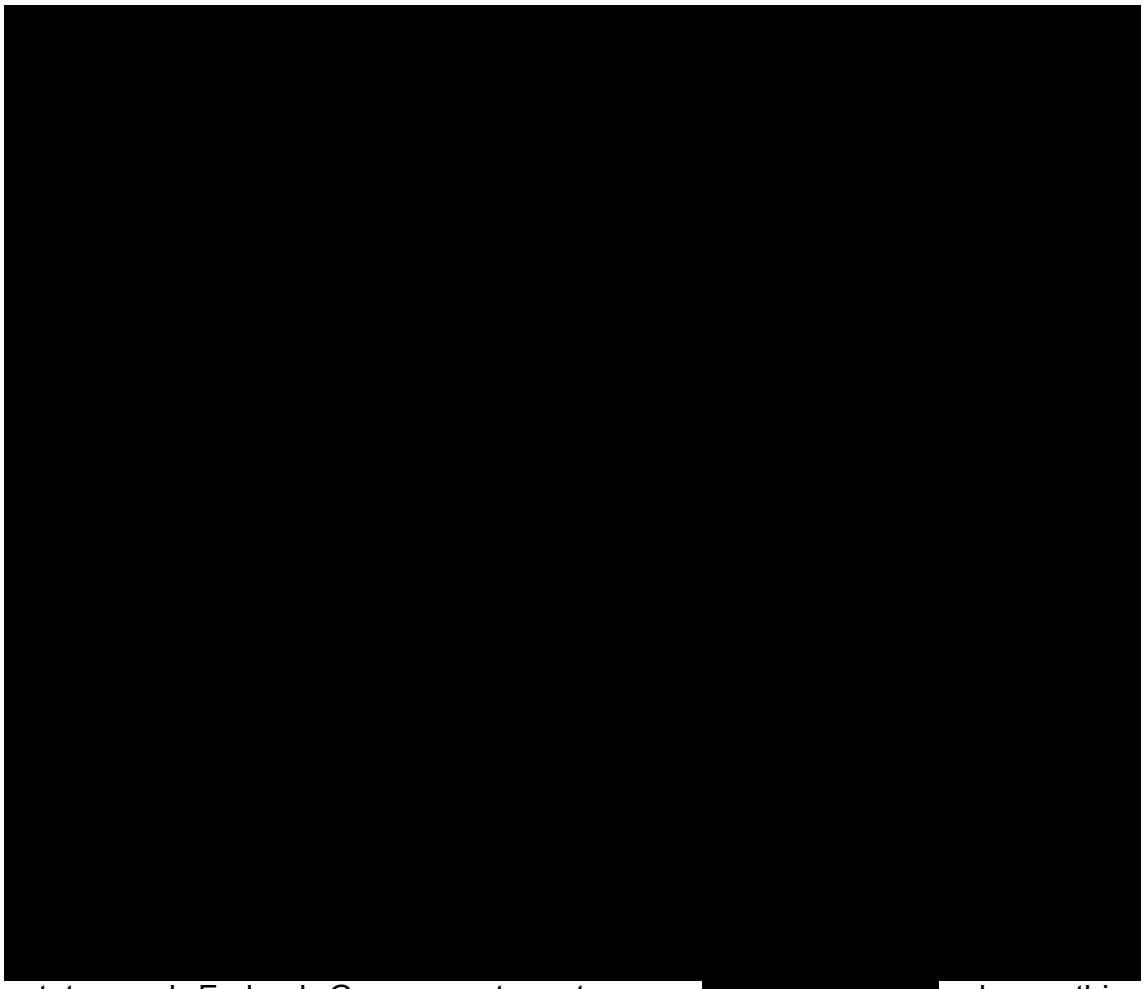
engineering and planning ensuring that the access from our backbone to the Agency's location meets our strict standards for high-quality, reliable services.

To support FRS, Qwest will provide both dedicated access and FRS access. Dedicated Access has the following characteristics:

- Protected and Unprotected DS-0, FT-1, T-1, DS3
- Qwest covers every LATA in every state with dedicated access
- Qwest requires all ILECs and CLECs to have diverse entrance facilities into our backbone POPs and meet Qwest operational requirements
- All off-net backhaul providers are also required to provide protected SONET services, meet Qwest POPs with route-diverse entrance facilities, and meet Qwest operational requirements
- Qwest requires that all access arrangements run error-free for up to 72 hours before acceptance

All Qwest backbone services monitor the availability and condition of our access providers. Qwest transport services, such as FRS, automatically generate trouble tickets when access link errors are detected. These trouble tickets are worked by our Network Operations Centers (NOCs). Qwest's [redacted] application provides an historical analysis capability to assist in identification of chronic access problems. We proactively manage our access providers to redesign or re-engineer circuits with chronic problems.

In addition to leased access from ILECs and CLECs, Qwest has created robust connections to each of the ILEC's regional FRS infrastructures using Network-to-Network Interfaces (NNI). This means that current ILEC FRS customers can gain almost immediate access to virtually all of Qwest's backbone services without having new access installed. Sharing access improves costs and increases our capability to share information with local,



state, and Federal Government customers. [redacted] shows this virtually complete nationwide capability.

Qwest interconnects with each NNI carrier in a minimum of two geographically diverse locations. We collect and review usage data (actual traffic utilization and Equivalent Bandwidth (EQBW) utilization) across such NNIs weekly. In addition to the diverse NNIs, Qwest provisions hot stand-by NNIs per region or LATA that are available for backup in the event of failure of any of the primary NNIs.

[redacted] EQBW is the amount of

bandwidth reserved for each ATM or FRS Permanent Virtual Circuit (PVC) based on its QoS class and the associated traffic descriptors (e.g., sustained cell rate, maximum burst size, and peak cell rate). A new primary NNI per region or LATA will be ordered [redacted]

More information about Qwest's access arrangements, including wireline access arrangements and broadband access arrangements for FRS, may be found in Section 3.2, *Approach to Ensure Service Quality and Reliability*.

4.2.3.8 Approach for Monitoring and Measuring FRS KPIs and AQLs (L.34.1.4.6(h))

Qwest monitors and measures the KPIs and AQLs using automated processes that pull data from the root source, summarize it, and display it using Web tools. These Web tools display actual results and provide a color-coded visual indicating whether performance goals have been achieved. Our approach is to completely automate the Web display of results from data collection to ensure the focus is on responding to performance issues rather than on performance report generation. The automated reporting process eliminates any question of manipulating the performance data.

For network KPIs, we use Statistical Analysis System to display the Network Reliability Scorecard. This includes the KPIs, objectives, and clear graphical representation of objectives 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 at the executive level to ensure proper attention and focus, as well as by our network management teams to ensure that Service Quality Levels are consistently met.

For all services, Qwest uses the [redacted] trouble ticketing system. [redacted] is an industry-leading commercial-off-the-shelf trouble ticketing application that we have customized to make more effective for our needs. From this system, we collect many useful metrics that we use internally to evaluate and improve our processes, including TTR. The calculation for TTR uses the same business rules as the Government requires for its services.

For FRS, all of the end-to-end SLA metrics listed in Figure 4.2.3-5 are assessed on an end-to-end site or site-pair basis. These data elements are used to ensure that all Agency data network SLAs are systematically supported by the network. Additionally, key network infrastructure interfaces (e.g., Aggregation Ports/Network to Network Interfaces, Trunk Ports) are monitored for Packet/Frame Loss (including errors and discards) and availability, ensuring that no SLA issues are traceable to key network infrastructure ports.

For FR, Qwest [redacted] to obtain PVC Latency, Data Delivery Rate, Availability, PVC Level Bi-Directional Statistics per CoS (Transmit/Receive Bytes/Frames, Transmit Discards), and Port Level Statistics (Average and Average Peak Transmit/Receive Utilization and Discard Rates, Transmit Error Rate).

Qwest network management systems collect data directly from the routers via Simple Network Management Protocol. This information is transferred to internal databases, where it is distributed to Qwest's Web-based Agency portal, the Qwest Control Networx Portal. This portal provides Agencies with regularly reported performance statistics to confirm we are meeting their performance requirements.

This information is also shared internally with Qwest's Worldwide Data Operations Center, which continuously monitors the performance of the network. FRS network utilization is monitored by the Qwest infrastructure

group, which is responsible for reporting statistics to the Data Network Planning and Design group.

4.2.3.9 FRS Support of Time Sensitive Traffic (L.34.1.4.6(i))

QoS options are a method whereby network providers offer varying levels of service for an Agency's traffic. The QoS level is indicated in the header of the frame so the FRS switch knows the priority of the frame when it arrives at the network. There are three QoS options for FRS:

1. Variable Frame Rate - real time (VFR-rt) – VFR-rt is intended for real-time applications where each end connection maintains a timing relationship. VFR-rt features a high delivery rate with a low threshold for delay and delay variation, while allowing application and network bursts. The types of applications supported are packetized voice or video, near real-time video, systems network architecture, and time-sensitive data.
2. Variable Frame Rate - non-real time (VFR-nrt) – VFR-nrt is designed for applications that can tolerate delay variation and have bursting traffic characteristics. A timing relationship is not required on each end of a connection. VFR-nrt can be used to support mission-critical data such as WAN connectivity, internetworking, Web hosting, e-commerce, store and forward non-real time video and audio, and client-server (terminal-host) data.
3. Unspecified Frame Rate – UFR is a best-effort service providing no service guarantees which supports connections that have no performance requirements. UFR allows transport of information only if bandwidth is available. If network congestion occurs, the UFR cells are the first to be discarded. UFR supports non-mission critical data such as LAN emulation, remote access, fax, e-mail, Internet/intranet access, and file transfers.

For both ATMS and FRS, the Qwest network supports a virtual guarantee of cell or packet delivery using CBR, VBR-rt, and VFR-rt. IP packet delivery for Voice over Internet Protocol (VoIP) or video conferencing (for example, H.323) is correspondingly high (less than 0.05 percent loss). Since the traffic contract is obeyed end-to-end, no other traffic on the network can interfere with the minimum data rate in the virtual circuit's traffic contract parameters. Combined with Qwest's capacity planning, even failures of core ATM switches or backbone circuits will not reduce the network capacity to a point where it impacts Agencies' minimum traffic contract parameters.

4.2.3.10 FRS Support for Integrated Access (L.34.1.4.6(j))

Qwest's network architecture and data services approach directly enables a complete menu of integrated access options to virtually all of Qwest's services.

Qwest is the incumbent local services provider in 14 states through owned assets and provides access services in all major metropolitan areas and U.S. Territories. Qwest also has a significant infrastructure deployed throughout the U.S. that enables customized access services to meet stringent Agency requirements, such high availability (using physical access diversity).

[redacted]

Each of these access methods is engineered to deliver the data quality necessary to support the integration of voice, video, and data on the same access circuit. As important as simply providing access bandwidth, these methods are matched to the Qwest network architecture, with the data service network enabling technologies of ATM, FRS, and MPLS/IP VPNs,

each with class of service and quality of service mechanisms to enable real multimedia performance for Agencies.

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

FRS is a mature service, currently supported by our converged core network. While no major service enhancements are currently being contemplated to the FRS switching infrastructure, enhancements are being made to support growth and emerging services on the converged core. Qwest's current focus on the FRS switching infrastructure is specific to maintenance of quality and capacity planning activity.

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

Qwest has a clear approach and has made significant progress in deploying a network that enables true convergence. Centered on our private MPLS-based core, Qwest has already converged our IP-based services (private port iQ MPLS VPNs, public port iQ for Internet services and our VoIP transport for Public Switched Telephone Network (PSTN) traffic) over this network.

Qwest is committed to the elimination of stove-piped networks that create planning, operations, and interoperability issues for our customers. [redacted] shows Qwest's approach to ensure that services have a uniform view of network and support infrastructure.

Multiple overlay networks are no longer established to deliver new services. Value is shifted to network-based services, where Qwest becomes a solutions provider. Applications-based services are delivered independent of the network infrastructure. Excellent service quality is maintained during network convergence through the following practices:

- Consistent and rigorous technology management methodology that includes evaluation, selection, and certification of network elements
- Accommodation of legacy services as the network evolves
- Network simplification through de-layering and introduction of multi-service access devices
- Coincident convergence of back-office systems, including introduction of a next generation network management layer

As shown in [redacted] the use of a converged MPLS core significantly eases the problems normally associated with backbone traffic engineering. Without a converged backbone, each services network (for

example, one for Internet, one for private IP services, and one for voice) needs to be traffic-engineered independently. The normal state of affairs is that one network has too much capacity and another has performance limitations that require a backbone or router upgrade. The issue is that a carrier gets into a situation where the upgrade for one services network requires a large upgrade that is not cost effective. For example, the desired upgrade from OC-48c to OC-192c backbone circuits may require a complete nationwide upgrade that the carrier cannot afford, forcing them to settle for suboptimal performance regarding SLA fulfillment.

[redacted]

[redacted]

[redacted]

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

Section 3.3.5 describes our IP-to-PSTN inoperability strategy.

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

When Agencies select the Internet gateway or IP-enabled FR options, IP addressing is an essential element to the solution. [redacted]

[redacted]

4.2.3.15 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 Open Systems Interconnection 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 FRS:

- **Enhanced Priority Treatment** (C.5.2.1(1)) – FRS supporting NS/EP missions are provided preferential treatment over other traffic
- **Secure Networks** (C.5.2.1(2)) – FRS 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)) – FRS 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, FRS 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)) – FRS will provide access to an egress from international carriers
- **Interoperability** (C.5.2.1(6)) – FRS 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 FRS 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)) – FRS 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)) – FRS delivered on Qwest's redundant backbone is robust enough 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 FRS
- **Broadband Service** (C.5.2.1(11)) – FRS 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 will be able to manage the capacity of FRS to support variable bandwidth requirements
- **Affordability** (C.5.2.1(13)) – As a mature product, FRS inherently 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)) – FRS performs 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.

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

[redacted]

To further prevent attacks to our SS7 network, Qwest is compliant with Network Reliability and Interoperability Council SS7 recommendations relating to network reliability and survivability where technically possible. Qwest is compliant with industry-availability standards.

Protection of Satellite Command Link

[redacted] Satellite

uplink commands are encrypted and authenticated to ensure legitimate control of the satellite and its operation and to protect them from interception and compromise.

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

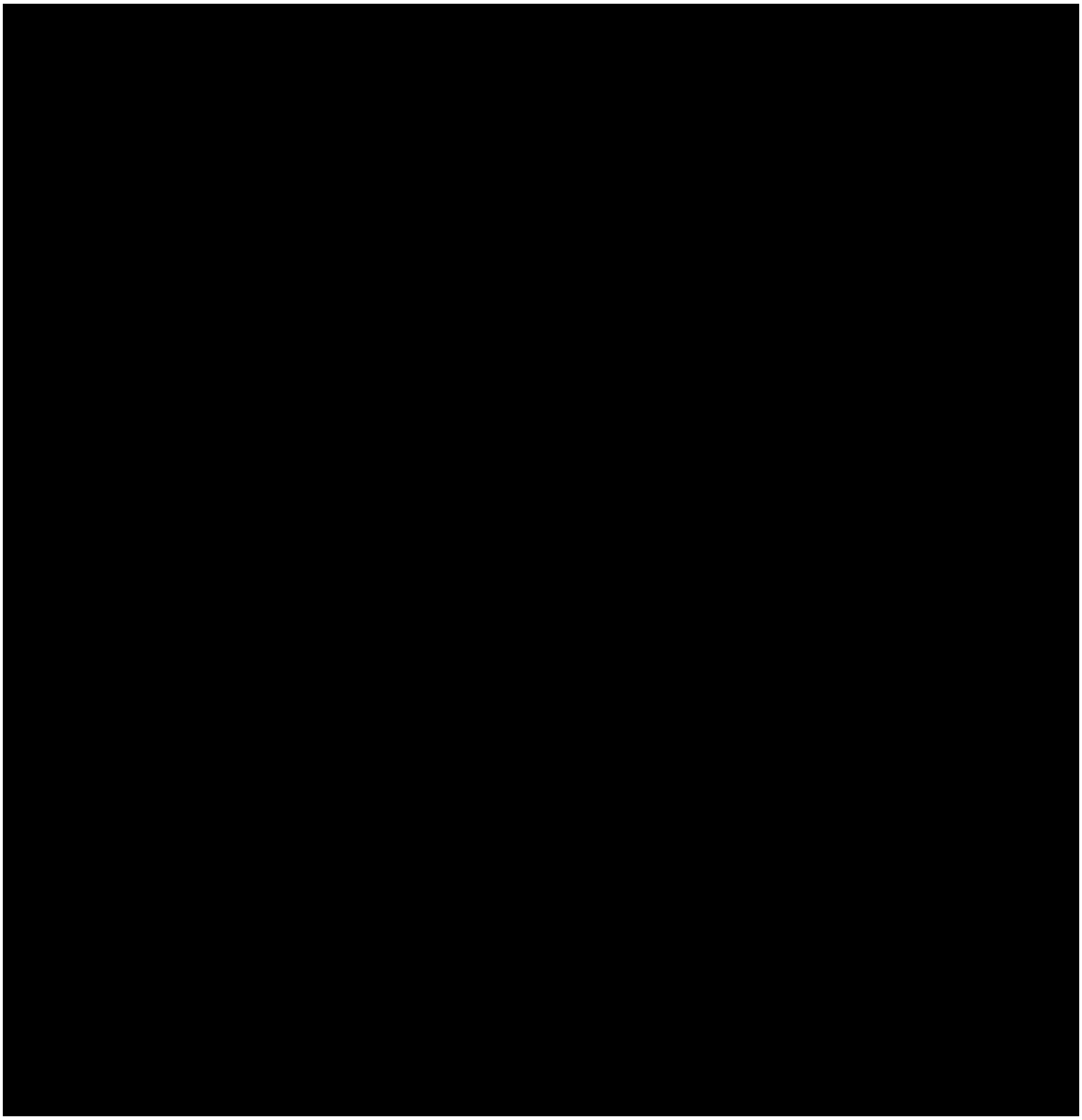
As discussed in Section 3.2, *Approach to Ensure Service Quality and Reliability*, Qwest provides network services in the NCR with a robust network architecture designed and engineered to ensure service continuity in the event of significant facility failures or catastrophic impact. Qwest will continue 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.

Qwest has an active, compliant NS/EP plan. [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] shows the logical configuration of the major transport facilities as well as the services provided at each POP.



[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, who 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. For simplicity, Figure 4.2.3-17 shows the [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.

To ensure 50 to100 millisecond range service restoration in the event of a catastrophic backbone circuit or router failure, Qwest's IP-based MPLS fast-forwarding core design uses fast re-route, which provides pre-provisioned multi-path healing for all Qwest IP services.

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).

4.2.3.18 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 FRS. Qwest has fully described our approach to satisfying Section 508 requirements for applicable, offered services in Section 3.5.4 of this Technical Volume.

4.2.3.19 FRS Impact on Network Architecture (L.34.1.4.6(s))

[redacted]

As traffic increases, Qwest adds more uplinks and backbone links to the network. Qwest evaluates when higher bandwidth links are needed to replace multiple lower bandwidth links. When the network architecture is optimized, the network becomes much easier to manage and results in improved AQLs for customers.

4.2.3.20 Optimizing the Engineering of FRS (L.34.1.4.6(t))

[redacted]

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

Qwest's state-of-the-art IP-centric network architecture makes it possible for Agencies to easily build an integrated network that includes various access and network technologies, with options to overlay managed services, security services, and VoIP service on top of their enterprise network. Internal systems, processes, and workflows have been built from the ground up, resulting in a seamless service experience for the Agency at all stages of their engagement with Qwest, regardless of the technology/service choices they make.

Control plane internetworking between FRS and IP-based services is not required. FR is a legacy technology and there are no standard bodies working on—nor vendors implementing internetworking between—FR control protocols and IP/MPLS control protocols. Qwest, like the rest of the industry, is supporting the integration of FR and IP services with FR and IP network interconnects and IP/MPLS-based multi-service platforms that allow Agencies to use FRS as the access method for IP services.

Converged services are available on Qwest's optimized infrastructure today. [redacted]

Qwest labs fully test and certify all new products to ensure standards compliance. Our engineering staff conducts detailed compliance testing of all new equipment or software deployed in our network to assure the reliability and interoperability of our FRS network.

4.2.3.22 Support for Government FRS Traffic (L.34.1.4.6(v))

Qwest has examined the FRS traffic requirements contained in the Government's traffic model and will fully support these traffic loads. Specifically, Qwest understands that the Government traffic model forecasts demand for more than 13,878 FRS circuits ranging from DS-0 to DS-3 access speeds. While this is a significant requirement, projected Networx needs amount to only a small portion of our current capacity. [redacted] In addition, Qwest's capacity planning methodology ensures that our network has ample capacity to support evolving Agency needs.