4.1.6 FRAME RELAY SERVICES (L.34.1.4)

Qwest's Networx Frame Relay Services leverages our converged Internet Protocol core network to ensure service continuity and a path to next-generation services for Government 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 customer 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 Mbps per second, and three Quality of Service (QoS) levels: Variable Frame Rate-real time (VFRrt), Variable Frame Rate non-real time (VFRnrt), 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 [redacted]. We already provide service to our Government customers and commercial customers throughout the world.

Qwest FRS are proactively monitored 24x7x365, with the additional capability of reporting statistical and alarm information directly to customers via Qwest's customer-facing Web-based reporting service, the Qwest Control Networx Portal.

Our current Government customers such as the [redacted] have already experienced the ease of migration from FRS to enhanced services on our converged network

architecture. Our network design allows FRS customer site connectivity to ATM or Internet Protocol (IP) customer sites. This “any-to-any” approach and worldwide reach allows our Government customers flexibility and reliability now and the confidence that Qwest will continue to address their needs in the future.

4.1.6.1 Qwest's Technical Approach to FRS Delivery (L.34.1.4.1)

The Qwest technical approach to providing a fully compliant FRS is based on our well established, highly reliable and secure fiber optic infrastructure, our commitment to our customers by our Operations and Engineering personnel, and our adherence to proven engineering practices. Qwest has fine-tuned processes to research, evaluate, engineer, deploy, and operate new Frame Relay (FR) features and functionality.

The sections that follow describe our approach to service delivery and how our approach benefits the Government. We also describe how Qwest FRS will facilitate the Federal Enterprise Architecture (FEA) objectives, how Qwest proposes to address problems that may be encountered in providing FRS, and how our synchronization network architecture supports FRS.

4.1.6.1.1 Approach to FRS Delivery (L.34.1.4.1(a))

Qwest’s approach to the delivery of FRS is already proven through successful service delivery to multiple Government 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. Qwest’s FRS approach supports gateway connectivity to the Qwest IP network and supports federal Agency migrations toward a converged services infrastructure.

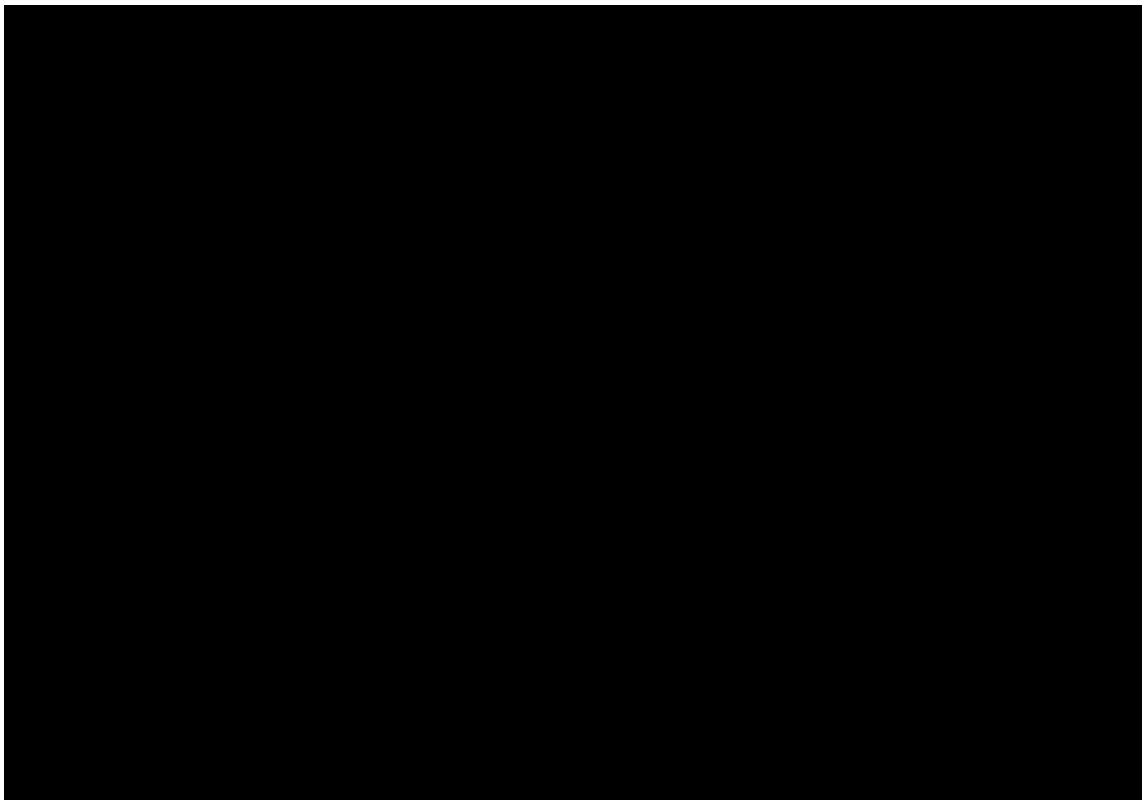
Standards-Based, Global Network

Qwest uses state-of-the-art, standards-based networking technology to meet the Networx FRS requirements. The Qwest ATM and FR network,

illustrated in [redacted] is deployed over the Qwest Nationwide Fiber Optic Network.

FRS provides connection-oriented data transmission at data rates up to DS-3. This allows the Government to purchase bandwidth by specifying the Committed Information Rate (CIR), which is the user's guaranteed minimum transmission rate for a PVC. FRS enables bursting above the CIR up to the capacity of the access circuits.

Qwest supports all technical capabilities required for Networx FRS. Our service approach provides significant flexibility in regard to the provisioning of PVCs, frame size, and the assignment of CIR for both full capacity of the access circuit and oversubscription for PVCs. The service includes ATM/FR ports, PVCs or switched virtual circuits (SVCs), and Internetworking Virtual Circuits (VCs). All of these capabilities meet the



Government's performance parameters for Data Delivery Rate (DDR), latency, availability, and Time to Restore (TTR).

Qwest FRS will connect Government-specified locations at Service Delivery Points (SDPs) via customer's routers, Layer 2 and Layer 3 switches, multiplexing/switching devices, and other Frame Relay Access Devices. The SDP for a Government location is the interface through which the customer receives traffic at speeds from 56 Kbps up to DS-3. In order to enable the service, each site must connect to a Qwest-provided User-to-Network Interface (UNI). The UNI represents the SDP. Details for Qwest's approach to providing the UNIs desired for Networx are provided in Section 4.1.6.3.1.3.

International FRS leverages [redacted] to provide the global reach for the Networx required jurisdictions, and an additional [redacted] jurisdictions from Qwest's Integrated ATM/FR Network platform. Qwest's leading edge ATM/FR Network comprises a single-tiered architecture, based on our installed base of multi-service switches. The integrated broadband network allows Government customers to integrate FR and ATM networks using a single provider on a reliable backbone infrastructure. Qwest will arrange with the serving Local Exchange Carrier/Competitive Local Exchange Carrier to provide access. Qwest's Operations Group works as a team and has a long-standing relationship with our carrier alliances.

Proven Engineering Practices

Qwest built the network to provide high availability to our customers, and Qwest's performance measures and engineering practices are designed to ensure Key Performance Indicator (KPI) fulfillment and manage growth. Our design procedures, network modeling, and circuit route checks provide a high level of network availability. Other aspects of solid FRS delivery are Qwest's network design and engineering for edge aggregation devices and

Points of Presence (POPs). Multiple links are built to ensure diversity and redundancy. Network modeling and utilization reports are tools used regularly in our engineering practice to ensure reliable FRS delivery. Additional information on how Qwest Operations and Engineering support the delivery of FRS can be found in section 4.1.6.4.2, FRS Measures and Engineering Practices.

Commitment to Customers

Qwest has a long history of supporting FRS using highly qualified pre-sales engineering, network planning, provisioning, and operations organizations. Our Network Planning Design and Implementation Engineers adhere to all standards, and they ensure compliance to standards by our network equipment vendors. Qwest has built our network using the precepts of the Telecommunication Management Network Model. Fault-Configuration-Accounting/Administration-Performance-Security testing requirements for all network elements are based on applicable standards. Qwest's principal engineers are frequent contributors to the standards bodies responsible for FR, ATM, and IP. Qwest currently holds patents for FR, ATM, and IP, with others pending for inventions that improve our customers' experience and streamline our operations. Our engineering staff performs detailed compliance tests on all new equipment or software we deploy in our network, contributing to the outstanding reliability and interoperability of our FR network.

Qwest's network operations' repair centers are located in [redacted] Provisioning is performed from Qwest facilities in [redacted] fully test and certify all products, ensuring standards compliance.

4.1.6.1.2 Benefits of FRS Technical Approach (L.34.1.4.1(b))

Qwest's FRS offering provides a broad range of technical and operational advantages and benefits, as summarized below in ***Figure 4.1.6-2***. Our FRS also facilitates the ability of Agencies to fully realize FEA objectives for improved utilization of Government information resources, enhanced cost savings and cost avoidance, and increased cross-Agency and inter-Governmental collaboration, as presented in Figure 4.1.6-2.

Figure 4.1.6-2. Qwest's FRS Features and Benefits

Feature	Benefit	[redacted]
Full internetworking and interoperability between FRS, ATM, and IP services	• Reduced complexity • Greater flexibility for traffic exchange between Agency locations • Ease of migration between services	
Access to multiple Qwest IP services	Combined access to Internet Protocol Service (IPS), MPLS, and Voice Over Internet Protocol (VoIP) facilitates migration toward more efficient converged Agency architectures.	
Multiple International Partners	More than one partner service in each region means more provisioning choices to improve service delivery.	
Qwest's FRS is highly reliable because we use industry-leading, state-of-the-art carrier quality integrated ATM/FR devices	Agencies benefit from high quality services derived from a stable, proven network platform.	
Enhanced Integrated Provisioning and Carrier Management business processes	Fast provisioning of services delivers reliable, consistent, on-time service to customers.	

Qwest's support for FEA objectives for FRS is shown below in ***Figure 4.1.6-3***.

Figure 4.1.6-3. Qwest's FRS Support to FEA Objectives

FEA Objectives	Qwest FRS Solutions
Improve utilization of Government information resources	Qwest FRS facilitates connections to Government information resources for users worldwide, using a scalable, flex ble, standards-based network.
Enhance cost savings and avoidance	Use of converged access to wide area communications resources reduces overall cost.
Increase cross-Agency and inter-Government Collaboration	Interoperability over a converged infrastructure provides leverage to enable intra- and inter-Agency communications more efficiently.

4.1.6.1.3 Solutions to FRS Problems (L.34.1.4.1(c))

Qwest has extensive experience in the evolution and delivery of FRS. Over the last 13 years, we have encountered and resolved a broad range of problems. We have used this experience to evolve our FRS infrastructure and establish the customer support and operational capability necessary to address known problems and react to new issues. ***Figure 4.1.6-4*** summarizes our approach to three key challenges that we often encounter when we deliver FRS to Government Agencies.

Figure 4.1.6-4. Qwest's Approach to Common FRS Delivery Challenges

Problem	[redacted]
Customer needs assistance staging, configuring, and turning up their equipment when service is installed.	[redacted]
Customer needs to modify (Move, Add, Change, Delete) their FR network service at short notice.	[redacted]
Performance degradation due to bursty traffic or over-subscription on an FRS connection.	[redacted]

4.1.6.1.4 Synchronization Network Architecture (L.34.1.4.1 (d))

[redacted]

[redacted]

[redacted]

[redacted]		
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

[redacted]

[redacted]

[redacted]

4.1.6.2 Satisfaction of FRS Performance Requirements (L.34.1.4.2)

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 Qwest's Web-based customer portal,

Qwest-Control Networx. The portal will provide our customers with regularly reported performance statistics that will confirm Networx ATM/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.

Qwest [redacted] all of the Networx program's performance requirements for FRS providers, including those for monitoring and measurement systems, procedures, and evaluation methods.

4.1.6.2.1 FRS Quality of Service (L.34.1.4.2(a))

Qwest's service standard for FRS [redacted] Networx requirements, as shown in ***Figure 4.1.6-7***.

Figure 4.1.6-7. 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	99.99%	≥ 99.99%	
Latency (CONUS)	Routine	120 ms	≤ 120 ms	
Latency (CONUS)	Critical	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	

Qwest meets the end-to-end availability KPI. Qwest's end-to-end FRS availability is guaranteed [redacted]. This is possible because Qwest FRS and ATM services are deployed over a redundant, secure, and scalable fiber-optic network infrastructure that yields high availability rates.

Qwest meets Agencies' expectations in terms of TTR. 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 at the same time triggering auto-generated trouble tickets. These alarm histories and trouble tickets are available to our customers through the Qwest Control Networx Portal and to our operations team for troubleshooting purposes. 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 notify our customers of network issues.

Qwest meets Networx requirements for latency and guarantees that end-to-end network transit delay will meet requirements. This guarantee is based on efficiencies inherent in Qwest's SONET-based multi-service platform and network routing that reduces the chance of delay.

Qwest meets the requirements of both routine and critical service levels for FRS through our ATM and FRS Classes of Service. 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.

4.1.6.2.2 Approach for Monitoring and Measuring FRS KPIs and AQLs (L.34.1.4.2(b))

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. This ensures that 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 the proper attention and focus and also by our network management teams to ensure Service Quality Levels are consistently met.

For all services, Qwest uses the [redacted] trouble ticketing system. [redacted] is a trouble ticketing system that is an industry-leading commercial off-the-shelf 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 point-to-point Service Level Agreement (SLA) metrics listed in Figure 4.1.6-7 are assessed on an end-to-end site or site-pair basis. These data elements are used to ensure that all customer data network SLAs are systematically supported by the network. Additionally, key network infrastructure interfaces (e.g., Aggregation Ports/Network-to-Network Interfaces, ATM Trunk Ports) are monitored for Packet/Frame Loss (including

errors and discards) and availability, ensuring that no customer SLA issues are traceable to key network infrastructure ports.

For FR, Qwest uses [redacted] to obtain PVC Latency, Data Delivery Rate, Availability, PVC Level Bi-Directional Statistics per Class of Service (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 customer portal, Qwest Control Networx Portal. This portal provides customers with regularly reported performance statistics to inform customers that we are meeting their performance requirements.

This information is also shared internally with Qwest's World-wide 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.

[redacted]

[redacted]

The primary benefit of emulating FR and ATM over an IP network is that it provides opportunities for internetworking of Frame, ATM, IP, and Ethernet connected locations over a common transport backbone. In addition, Agencies gain added flexibility regarding access types and access speeds to their network solutions as well as the opportunity to integrate management of previously disparate networks. For example, this internetworking approach allows for phased transformations of legacy networks to more cost-effective next-generation technologies.

In order to maximize flexibility for our current customers, [redacted] Qwest currently offers native FR and ATM services.

Qwest offers IP-enabled FR and ATM services by allowing Agencies to purchase a virtual circuit to any Agency IP VPN network or the public Internet. Qwest's next-generation MPLS core network allows Agencies to assign various levels of QoS to such IP traffic to allow Agency applications priority over other traffic.

4.1.6.2.3 FRS Performance Improvements (L.34.1.4.2(c))

[redacted]

4.1.6.2.4 Additional FRS Performance Metrics (L.34.1.4.2(d))

[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 FRS solution to serve unique Agency needs. Qwest is able to leverage our vast FRS product portfolio, which includes a variety of SED providers and specific FRS solutions. Through a special combination of

vendor solutions and talented engineering capabilities, Qwest will serve an Agency's business needs.

4.1.6.3 Satisfaction of FRS Specifications (L.34.1.4.3)

Section 4.1.6.3.1 describes how Qwest's FR network infrastructure enables a broad range of technical service capabilities and supports all of the technical capabilities, features, and interfaces required for Networx FRS.

Section 4.1.6.3.2 discusses service enhancements. Qwest's homogeneous ATM/FR network represents a major service enhancement that Qwest already delivers to all of our customers. Agencies will benefit from the ability to connect lower- and higher-volume locations cost-effectively through the already-integrated Qwest network. In addition, Qwest offers a disaster recovery feature as an additional service enhancement, which provides a second, distinct, custom-engineered Qwest FR virtual connection to designated Agency sites.

Section 4.1.6.3.3 provides a discussion of Qwest's network and service delivery approach that is already configured to support Agencies' FRS needs, reducing the Agencies' risk.

Section 4.1.6.3.4 provides a discussion of Qwest's long and successful experience in offering FRS to commercial and Government clients. This experience demonstrates that Qwest provides the Government with a low-risk solution.

4.1.6.3.1 Satisfaction of FRS Requirements (L.34.1.4.3(a))

The following three sections describe how Qwest will satisfy the capabilities, features, and interfaces requirements of the Request for Proposal (RFP).

4.1.6.3.1.1 Satisfaction of FRS Capabilities Requirements (L34.1.4.3(a), C.2.3.1.1.4)

Qwest's FR network infrastructure enables a broad range of technical service capabilities and supports all of the technical capabilities required for Networx FRS. ***Figure 4.1.6-8*** summarizes Qwest's technical approach to supporting the FRS capabilities. Qwest fully complies with all mandatory stipulated and narrative features, capabilities, and interface requirements for FRS. The following figure summarizes Qwest's response to the FRS capabilities listed in RFP C.2.3.1.1.4 and is intended to provide the technical description required per L.34.1.4.3(a), and does not limit or caveat Qwest's compliance in any way.

Figure 4.1.6-8. Qwest's Technical Approach to FRS Capabilities

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

Qwest's integration of FR and ATM services provides significant internal operational and cost efficiencies, while enabling internetworking of FR and ATM customer 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 [redacted] 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 56 Kbps 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 user's guaranteed minimum transmission rate for a PVC. [redacted]

4.1.6.3.1.2 Satisfaction of FRS Features Requirements (L34.1.4.3(a), C.2.3.1.2)

In 2003, Qwest interconnected its 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 4.1.6-9*** provides an overview of Qwest's technical approach to providing the required FR features. Qwest fully complies with all mandatory stipulated and narrative features, capabilities, and interface requirements for FRS. The following figure summarizes Qwest's response to the FRS features listed in RFP C.2.3.1.2 is

intended to provide the technical description required per L.34.1.4.3(a), and does not limit or caveat Qwest's compliance in any way.

Figure 4.1.6-9. Qwest's Technical Approach to FRS Features

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

4.1.6.3.1.3 Satisfaction of FRS Interface Requirements (L34.1.4.3(a), C.2.3.1.3)

Qwest's innovative FRS offering has also extended to the customer 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 4.1.6-10***.

Qwest fully complies with all mandatory stipulated and narrative features, capabilities, and interface requirements for FRS. The following figure summarizes Qwest's response to the FRS interfaces listed in RFP C.2.3.1.3 and is intended to provide the technical description required per L.34.1.4.3(a), and does not limit or caveat Qwest's compliance in any way.

Figure 4.1.6-10. Qwest-provided FRS Interfaces at the SDP

UNI Type	Interface Type and Standard	Payload Data Rate or Bandwidth2	Signaling or Protocol Type	[redacted]
1	ITU-TSS V.35	Up to 1.536 Mbps	Frame Relay	
2	ITU-TSS V.35	Fractional T1	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 802.3 cable and connector types	Up to 1.536 Mbps (See note 1)	IEEE 802.3 IP/IPX	
9	All 802.5 cable and connector types	Up to 1.536 Mbps (See note 1)	IEEE 802.5 IP/IPX	
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	

UNI Type	Interface Type and Standard	Payload Data Rate or Bandwidth2	Signaling or Protocol Type	[redacted]
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 connector types	Up to 43.008 Mbps (see note 1)	IEEE 802.x (x=3,5) IPv6/IPX/SNA/IPv4	
46	E3 (non-domestic)	Up to 30.72 Mbps	Frame Relay	
47	E3 (non-domestic)	Up to 30.72 Mbps	IPv4 and IPv6	
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	IEEE 802.3 Cable and Connector Types (non-domestic)	Up to 30.72 Mbps	IEEE 802.x(x=3,5) IPv6/IPX/SNA/IPv4	

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.

4.1.6.3.2 Proposed Enhancements to FRS (L.34.1.4.3(b))

[redacted]

[redacted]

4.1.6.3.3 Network Modifications Required for FRS Delivery (L.34.1.4.3(c))

Qwest's current FR solutions will support all Agency requirements, access speeds, and feature requirements on a global scale. Qwest does not need to generate network or service delivery modifications for Networx FRS. Qwest's services management and solutions are dynamic by design and are customized for Agency needs.

4.1.6.3.4 Experience with FRS Delivery (L.34.1.4.3(d))

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

4.1.6.4 Robust Delivery of FRS (L.34.1.4.4)

For each mandatory service identified in RFP Figure C.2-1 for Transport/IP/Optical Services, Qwest can easily support the Government's projected FR traffic load. Qwest adapts rapidly to meet customer requirements.

End-to-end service delivery is a key feature of Qwest's service. Qwest gives absolute priority to Federal Telecommunications Service Priority (TSP) circuits. TSP circuits are designated by the Government as essential to National Security Emergency Preparedness and must receive priority handling either in installation and/or restoration of a service outage.

4.1.6.4.1 Support for Government FRS Traffic (L.34.1.4.4(a))

Qwest has examined the FRS traffic requirements contained in the Government's traffic model and will fully support these needs. 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. Current backbone utilization averages [redacted] (or, from Section 4.1.6.3.4, approximately [redacted] which implies that all Networx traffic is equivalent to [redacted] of our current network. In addition, Qwest's capacity planning methodology (discussed in Section 4.1.6.4.2) ensures that our network has ample capacity to support evolving customer needs.

4.1.6.4.2 FRS Measures and Engineering Practices (L.34.1.4.4(b))

The speed and size of Agency 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 prepare for growth and provide robustness of the access and backbone networks, ensuring resiliency. Our design procedures, network modeling, and circuit route checks provide a high level of customer service. In addition, Qwest's centralized engineering team applies a consistent capacity management model to all data services.

[redacted]

[redacted]

[redacted]

4.1.6.5 FRS Optimization and Interoperability (L.34.1.4.5)

This section discusses Qwest's approach to optimizing FRS, the approach by Qwest to optimize the network architecture of FRS, the approach to access optimization for FRS, and Qwest's vision for FR service internetworking.

4.1.6.5.1 Optimizing the Engineering of FRS (L.34.1.4.5(a))

[redacted]

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

[redacted]

[redacted]

As traffic increases, Qwest adds more uplinks and backbone links to the network. Qwest engineers evaluate 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.

4.1.6.5.3 Access Optimization for FRS (L.34.1.4.5(c))

Qwest designs, engineers, and deploys multi-service edge switch routers with high-port density to optimize access efficiency and performance based on customer traffic concentration when justified. These multi-service edge devices 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] With these multi-service edge devices, the network has less equipment, fewer layers, and is less complex to operate and manage. Qwest no longer needs to add older IP routers and older L2 switches that were built with limited services and port density, which reduces costs and rack spaces.

4.1.6.5.4 Vision for FRS Internetworking (L.34.1.4.5(d))

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 customer at all stages of their engagement with Qwest, regardless of the technology/service choices the customer makes.

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 customers to use FRS as the access method for IP services.

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