

5.9 STORAGE SERVICES

Qwest's Network SS provides a secure and highly available environment for Agency applications, which allows Agencies to free up valuable resources.

Qwest's Storage Services are layered on top of our Collocated and Dedicated Hosting Services to provide Agencies with worry-free, end-to-end storage solutions. With Qwest Storage Service, Agencies can use Qwest tape and disk storage resources to handle their most demanding storage requirements.

5.9.1 Technical Approach to Storage Services Delivery (L.34.1.5.1)

By using a proven Statement on Auditing Standards (SAS) 70 certified process, Qwest is able to readily provide Agencies their customized Storage Services. The Storage Services are offered in Qwest CyberCenters. Qwest CyberCenters are specially designed to provide state-of-the-art hosting for mission-critical applications and services. Qwest CyberCenters have the following characteristics which provide a secure, scalable and reliable foundation for success, as reflected in **Figure 5.9.1-1**.

Figure 5.9.1-1 Key Characteristics of Qwest's CyberCenters

Feature	Description
Staffing	<ul style="list-style-type: none"> • 24x7x365 on-site trained system and network engineering staff backed up by the centralized operations staff. • Qwest has developed a problem management process to identify and track problems with customer hosted system(s). This process includes a call management system and a multi-level technical support system. <ul style="list-style-type: none"> • All Agency requests (including, but not limited to, hardware installation, software installation, software modifications, and script-writing outside the scope of Standard Operating Environment Management) shall be provided on a "remote hands" basis.

Feature	Description
Heating, Ventilation, and Air Conditioning (HVAC)	<p>[REDACTED] Redundant HVAC to maintain an appropriately air-conditioned environment (between 55 degrees and 85 degrees Fahrenheit) and proper relative humidity level (between 20% and 65%) for the customer equipment. [REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>
Power	<ul style="list-style-type: none"> • N+1 redundancy on generators and UPS • Multiple power feeds to raised floor • Power for Collocation is provisioned and installed in standard circuits of 120V/20A. Alternate circuits, on optional diverse PDUs.
Network	<ul style="list-style-type: none"> • [REDACTED]

5.9.1.1 Approach to Storage Services Delivery (L34.1.5.1(a))

With customer needs driving our delivery methods, Qwest has refined our service delivery processes over the last 12 years. The result is fast, reliable delivery and installation of services such as Storage Services. Our SAS 70 certification ensures that hosting delivery and implementation processes are well documented, customer-specific, focused, and routinely updated to ensure timeliness and accuracy.

Qwest’s Storage Service Delivery Process: Qwest initiates the delivery process by assigning a dedicated Sales Engineer (SE) to respond to Agency requests for Storage Services. The Qwest SE will meet and work with the Agency’s IT and telecommunications engineers to identify the detailed technical requirements of the Storage Services deliverable. With Storage Services requirements accepted by an Agency, the SE will develop a detailed delivery and implementation plan, including a design document, a site plan, and an implementation schedule. Qwest will present this plan with the included data and information in the format requested by the Agency for

validation. Plan scope and coverage can vary depending upon the Agency's needs and the complexity of the deliverable.

Qwest will assign a Customer Service Manager (CSM) that ensures a quality hosting experience for each customer by focusing on daily operations, implementation and support tasks, and strategic initiatives according to Agency's requirements. The CSM coordinates all support activities and collaboratively schedules additional resources for implementation projects, change management, and on-going support activities. Additional CSM's responsibilities include:

Implementation

- Follow managed services implementation methodology
- Prepare implementation discovery reports, project plans and revisions
- Prepare implementation acceptance signoff checklists
- Prepare the technical operations manual
- Ensure the availability of all resources for a timely and accurate implementation
- Serve as a focal point for project status, communications, and all other relevant information
- Leverage all required Qwest resources and groups to the utmost to ensure timely and accurate delivery

Emergent issues, issue resolution, escalation/crisis

- Manage the escalation process
- For high priority issues, provide hourly status updates on remediation efforts to client until issues are resolved
- Document all technical and operational issues and resolution

Ongoing

- Act as Single Point of Contact for Agency communications
- Direct all support activities
- Work through all relevant Qwest organizations to resolve and document any open issues
- Provide Agency with status updates for all activities performed on the infrastructure impacting the Agency
- Control changes to Agency environment and direct implementation of changes (in accordance with agreed-upon Change Management Procedures)
- Ensure that all documentation is kept current
- Prepare and deliver regular status reports to Agency (weekly, monthly)
- Participate in Agency conference calls (daily, weekly, monthly, as needed)
- Review monthly Qwest-based ticket and Portal information that is available and on a best effort basis identify disturbing trends in the monthly status report
- Work with Agency and appropriate Qwest resources to coordinate contractual changes as needed
- Coordinate activities with Agency Third Parties

Response Time Commitments

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- For critical customer issues, the CSM will update the client designated contact hourly with updates for issues that are owned by Qwest

- Work requested through the Change Control Process will be executed as follows:
 - Normal business hour execution will require [REDACTED]
 - Outside of normal business hours execution may require a scheduled window at [REDACTED] of the desired execution date.

This individual uses documented requirement set, including design and site plan as a baseline for all engineering and configuration management activities.

5.9.1.2 Benefits of Storage Services Technical Approach (L.34.1.5.1(b))

Figure 5.9.1-2 shows the benefits of Qwest’s Storage Services solution and **Figure 5.9.1-3** illustrates how Qwest’s Storage Services solution meets the Federal Enterprise Architecture (FEA) objectives.

Figure 5.9.1-2 Benefits of Qwest’s Storage Services Solution

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

Figure 5.9.1-3 Qwest’s Storage Services Solutions Meets the FEA Objectives

Core FEA Objective	[REDACTED]
Improve use of Government information resources to focus on core Agency mission and service delivery to citizens by using the FEA	[REDACTED]
Enhance cost savings and avoidance	[REDACTED]

Core FEA Objective	[REDACTED]
Increase cross-Agency and inter-Government collaboration	[REDACTED]

5.9.1.3 Solutions to Storage Services Problems (L.34.1.5.1(c))

Potential problems associated with meeting Storage service requirements (**Figure 5.9.1-4**) and deliverables include server hardware and maintenance, lead times on needed materials, overall installation complexity, or planning for and working from un-validated requirements. With substantial experience and success in on-time deliveries of numerous Government and commercial Storage installations, Qwest is adept at recognizing developing problems such as those cited above and implementing measures to minimize impact on delivery schedules or costs.

Figure 5.9.1-4 Potential Issues and Proposed Resolution for Storage Services

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

5.9.2 Satisfaction of Storage Services Performance Requirements (L.34.1.5.2)

Through the use of the Qwest CyberCenters, we are able to provide a highly reliable and secure facility for our storage systems. Qwest will meet the metrics defined by building an infrastructure that meets the Institute of Electrical and Electronics Engineers (IEEE) standards relative to storage and storage networking. Our storage engineering experts follow developments in the storage industry and apply industry best practices to continually improve

the production infrastructure. As an example, Qwest uses stringent test processes in the laboratory to ensure that upgrades to the production environment are thoroughly tested and then certified for use in production. The purpose of this is that the full benefit of firmware, driver, or other technology upgrades are achieved without risk to a failure in the production environment due to lack of testing and development. Lastly, Qwest has long-standing relationships with its vendors, which benefits customers through extremely quick response to problems, typically less than four hours.

5.9.2.1 Storage Services Quality of Service (L.34.1.5.2(a))

Figure 5.9.2-1 shows the AQLs that Qwest meets and that are listed as performance metrics.

Figure 5.9.2-1 Qwest’s Storage Service Solution Meets the Networx QOS Goals

Key Performance Indicators (KPI)	Service Level	Performance Standard (Threshold)	Acceptable Quality Level	[REDACTED]
Backup and Restore				
Av(SS/ BBKUP&R)	Routine	99.9%	≥ 99.9%	[REDACTED]
Grade of Service (Restore Time)	Routine	30 min	≤ 30 Min	[REDACTED]
Network Attached Storage				
Av (SS/NAS) (Single Server)	Routine	99.9%	≥ 99.9%	[REDACTED]
Av (SS/NAS) (Clustered Servers)	Routine	99.99%	≥ 99.99%	[REDACTED]
Av (SS/NAS) (Mirrored Servers)	Routine	99.999%	≥ 99.999%	[REDACTED]
EN (Total Scheduled Downtime)	Routine	8 hours/month	≤ 8 hours per month	[REDACTED]
	Critical	8 hours/year	≤ 8 hours per year	[REDACTED]
Storage Area Network (SAN)				
Av(SS/SAN) (Single Connectivity)	Routine	99.95%	≥ 99.95%	[REDACTED]
Av(SS/SAN) (Dual connectivity)	Routine	99.999%	≥ 99.999%	[REDACTED]
Time to Restore (TTR)	Without Dispatch	4 hours	≤ 4 Hours	[REDACTED]
	With Dispatch	8 hours	≤ 8 Hours	[REDACTED]

The KPI and the relevant information are as follows:

Backup and Restore – Av (SS/BBKUP&R): The 99.9 percent availability objective is achieved today by Qwest without modifications.

Backup and Restore – Grade of Service (Restore Time): Qwest's use of high-performance tape drives and [REDACTED] software allows us to meet the KPI of 100GB/hour restore.

NAS – Av (SS/NAS) (Single Server): The 99.9 percent availability objective is currently achieved by Qwest with our existing redundant Internet Protocol (IP) network architecture and without modifications to our Network Appliance or [REDACTED]

NAS – Av (SS/NAS) (Clustered Servers): The 99.99 percent availability objective is currently achieved by Qwest with our existing redundant IP network architecture and without modifications to our Network Appliance or [REDACTED]

NAS – Av (SS/NAS) (Mirrored Servers): The 99.999 percent availability objective is currently achieved by Qwest with our existing redundant IP network architecture and without modifications to our Network Appliance or [REDACTED]

NAS – EN (Total Scheduled Downtime - Routine): The 8 hours per month objective is achieved by Qwest using existing maintenance methods.

NAS – EN (Total Scheduled Downtime - Critical): The 8 hours per year objective is achieved by Qwest using existing maintenance methods.

SAN – (SS/SAN – Single Connectivity): The 99.95 percent availability objective is currently achieved by Qwest with [REDACTED] in use today without modifications to our [REDACTED]

SAN – (SS/SAN – Dual Connectivity): The 99.999 percent availability objective is currently achieved by Qwest with [REDACTED] in use

today without modifications to our [REDACTED]
[REDACTED]

SAN – Time to Restore (Without Dispatch): Qwest measures TTR the same way as defined in C.3.3.1.2.4. Qwest trouble management processes and dedicated trouble management staff will allow Qwest to meet this 4 hour objective.

SAN – Time to Restore (With Dispatch): Qwest measures TTR the same way as defined in C.3.3.1.2.4. Qwest trouble management processes and dedicated trouble management staff will allow Qwest to meet this 8 hour objective.

5.9.2.2 Approach for Monitoring and Measuring Storage Services (L.34.1.5.2(b))

Qwest will ensure that all tools, systems (ticketing, ordering, change management), and portals supporting Government requirements are maintained at, or above, industry standards. Qwest uses multiple tools to monitor Storage Services systems, including [REDACTED]
[REDACTED]

[REDACTED] These systems are monitored by Qwest personnel in our CyberCenter facility in [REDACTED] and locally within the Data Center. With staff on-site 24x7x365, and emergency contracts with subcontractors, Qwest is able to provide Agencies with the stated service levels.

Qwest uses data from these systems in several ways:

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

5.9.2.3 Verification of Storage Services (L.34.1.5.2(c))

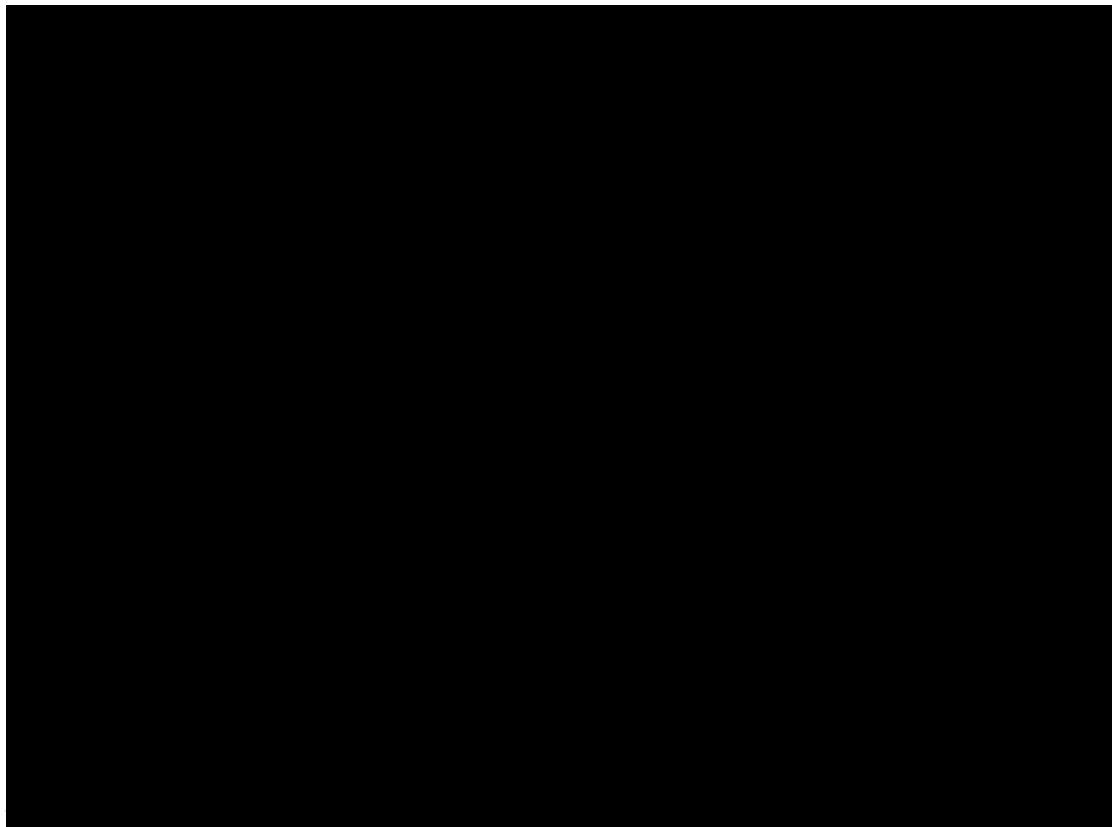
Performance can be verified through our Qwest Control Network Portal, which is connected to all of our monitoring systems. Vendor-specific tools and our experience in their use allow us to properly report relevant SAN, NAS, and tape back-up performance statistics. [REDACTED]

[REDACTED]

[REDACTED]

5.9.2.4 Storage Services Performance Level Improvements (L.34.1.5.2(d))

Qwest proposes to meet all KPIs and AQLs for SS. 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 SS solution to serve unique Agency needs. Qwest is able to leverage our vast SS product portfolio which includes a variety of SED providers and specific SS solutions. Through a special combination of vendor solutions and talented engineering capabilities, Qwest will serve Agencies' business needs.

5.9.2.5 Additional Storage Services Performance Metrics (L.34.1.5.2(e))
[REDACTED]

5.9.3 Satisfaction of Storage Services Specifications (L.34.1.5.3)

Remote Tape Backup, SAN, and NAS are services that use the Qwest CyberCenter facility disk and tape infrastructure to remotely store critical customer business data. Customers connect to the CyberCenter facility to store their data by utilizing any of our network connectivity options. Agency data remains safe within the CyberCenter facility and is available on demand to restore primary data at the customer site. Qwest fully complies with all mandatory stipulated and narrative features, capabilities, and interface requirements for SS. The text in the following sections and table is intended to provide the technical description required per L.34.1.5.3(a) and does not limit or caveat Qwest's compliance in any way.

5.9.3.1 Satisfaction of Storage Services Requirements (L.34.1.5.3(a))

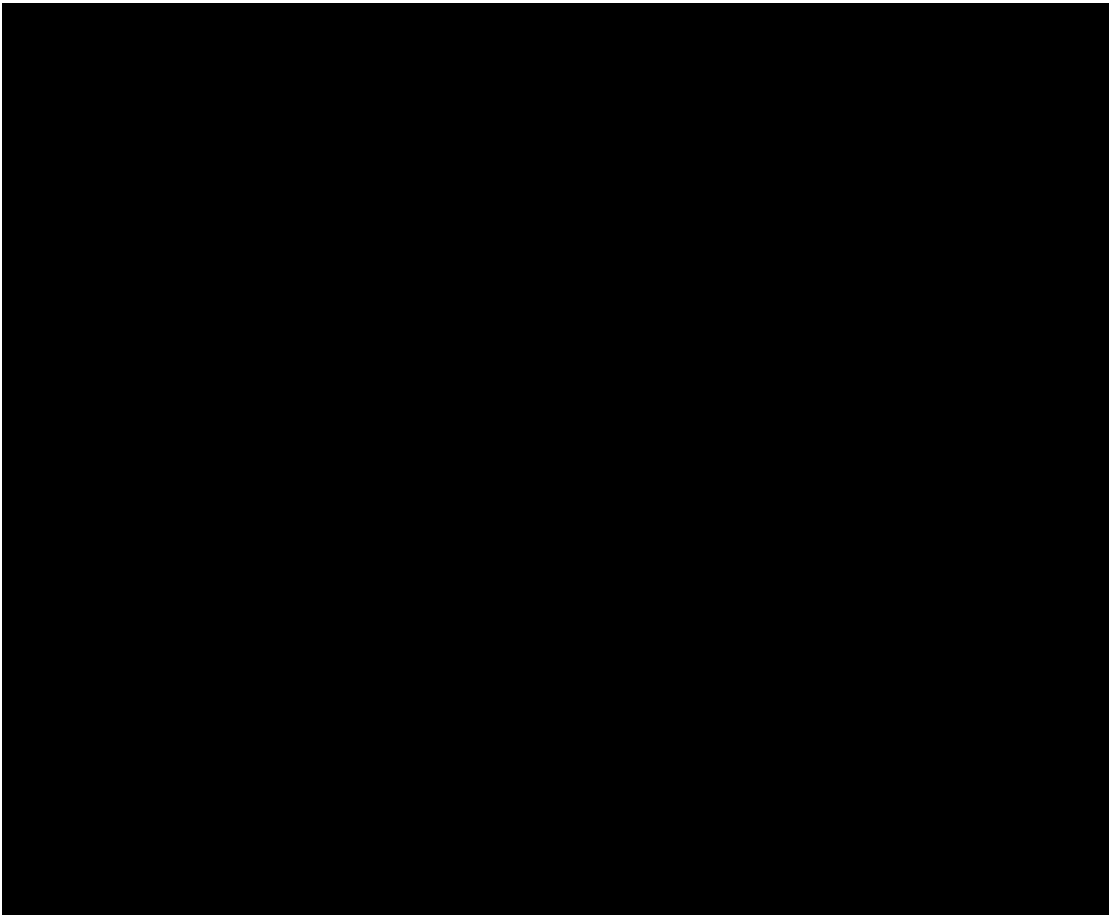
Qwest Storage and Back-up Services are a fully managed, flexible portfolio of state-of-the-art products and services, including Utility Storage (Basic, High and Critical), Managed Dedicated Storage, Point-in-Time Copy, Managed Tape Back-up, Non-Disruptive Back-up, archiving, and restore. The ability to provide these services in conjunction with hosting delivers on our vision of being a comprehensive solution provider.

5.9.3.1.1 Satisfaction of Storage Service Capabilities Requirements (L34.1.5.3(a), C2.11.10.1.4)

As shown in [REDACTED] Qwest uses a combination of storage hardware providers to support our SAN services. These disk platforms include [REDACTED]

[REDACTED] Connecting the disks to Agency servers are [REDACTED] switches with 2GB connections. Qwest has an IP-based back-up solution using dedicated Network Interface Cards (NICs) on the customer systems that connect into the Qwest Tape Area Network (TAN). Qwest uses [REDACTED] to manage back-ups across the Qwest TAN.

Qwest storage and back-up services consist of the following:



**5.9.3.1.2 Satisfaction of Storage Service Features Requirements
(L.34.1.5.3(a), C.2.11.10.2)**

There are no Network Storage Services feature requirements.

**5.9.3.1.3 Satisfaction of Storage Service Interface Requirements
(L.34.1.5.3(a), C.2.11.10.3)**

Figure 5.9.3-2 shows the Qwest Storage Service solution interfaces.

Figure 5.9.3-2 Qwest’s Storage Service Solution Interfaces

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

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

5.9.3.2 Proposed Enhancements for Storage Services (L.34.1.5.3(b))

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]
[REDACTED]

**5.9.3.3 Network Modifications Required for Storage Services Delivery
(L.34.1.5.3(c))**

There is no network modification necessary to make our services interoperate with client systems. Qwest has built its offerings on IEEE standards.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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