

VOLUME 1, SECTION 4.6: STORAGE SERVICES (SS)



4.6 STORAGE SERVICES [C.2.11.10]

This section of our proposal addresses the Level 3 Team's offering to provide Storage Services (SS) to Government agency customers through the Networx program. Our service meets or exceeds the requirements for SS as defined in Section C.2.11.10 of the Networx RFP.

In support of this offering, Level 3 has partnered with [REDACTED] and will be provide a full-range of Storage Services (SS) to Government agency customers from the [REDACTED] [REDACTED] We selected [REDACTED], based on their reputation for managing complex, large-scale projects in high-transaction environments. We believe [REDACTED] is equipped to deliver these services and will use and refine proven methodologies that maintain control of every detail of the Storage Services program: its processes, technology and performance, as well as the transition itself.

[REDACTED] has provided industry-leading Storage Services by partnering with [REDACTED] since [REDACTED] Today, [REDACTED] is the leading world-wide reseller of [REDACTED] storage products and storage software solutions. [REDACTED] distributes [REDACTED] solutions on both a [REDACTED] All [REDACTED] products undergo strict testing and certification to ensure optimal performance in [REDACTED] enterprise server environments.

As partners, [REDACTED] and [REDACTED] are dedicated to providing the storage platforms and software to meet the requirements of Government agencies as they deploy these services across their enterprise that delivers around-the-clock information availability. [REDACTED] are the main storage workhorses for your most critical business applications. [REDACTED] [REDACTED] products fill out the portfolio with solutions for the distributed data

center. Working together, [REDACTED] servers, [REDACTED], solutions, and services energize and activate each other's exceptional capabilities.

The [REDACTED] offering of [REDACTED] storage related products provide a comprehensive set of and services to many Government agencies utilizing many different types of connectivity already. [REDACTED] has consistently been a leader in driving interoperability and connectivity for all the various components in a storage environment such as storage, host servers, fiber channel host bus adapters, drives, as well as management, availability, and security software. [REDACTED] storage solutions are proven and widely used systems for the type of storage services sought in this initiative.

[REDACTED] has invested significant time and money in several key areas that bring enhanced value and expertise to storage infrastructure deployments. One of the most significant investments made to date is [REDACTED]

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

Level 3 and the [REDACTED] shall provide a full range of storage services and on-going operations and maintenance supporting enterprise computing and storage management initiatives for Government agencies and their select customers.

The [REDACTED] facility was designed and built to Tier III data center standards as defined by the Uptime Institute Industry Standard Tier Classification, and meets or exceeds all Federal government requirements.

[REDACTED]
[REDACTED]

[REDACTED]

[REDACTED]

The [REDACTED] also houses a range of technical service practices that come together supporting specific program requirements. At the [REDACTED], each client's high-speed networks are [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] has additional continental United States data centers supporting full-hosting and managed services. [REDACTED]

[REDACTED] All centers are inter-connected providing back-up and recovery services based on customer requirements.

4.6.1 Technical Description of SS [C.2.11.10.1]

The Level 3 Team's SS offering fulfills the mandatory service requirements for SS contained in Section C.2.11.10.1 of the Networx RFP. A technical description of our offering is provided below, and the remainder of this section demonstrates our capabilities in the following areas:

- Standards
- Connectivity
- Technical Capabilities
- Features
- Interfaces



4.6.1.1 FUNCTIONAL DESCRIPTION [C.2.11.10.1.1]

The Level 3 Team's storage services offering will provide Government agencies with the [REDACTED] types of services specified in Section C.2.11.10.1.1 of the Networx RFP:

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

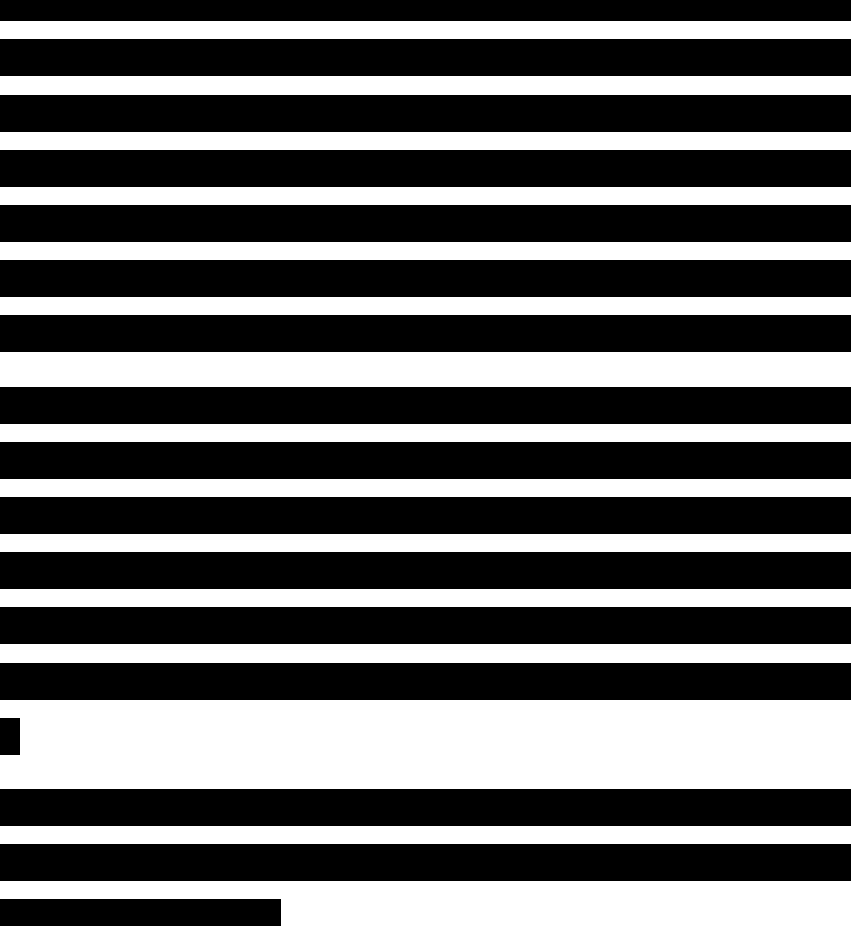
[REDACTED]

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[REDACTED]

4.6.1.2 STANDARDS [C.2.11.10.1.2]

The Level 3 Team will comply with the SS standards specified in Section C.2.11.10.1.2 of the Networx RFP, as applicable to our SS solution.

The Level 3 Team includes industry leaders in true multi-vendor networked storage solutions who are actively involved in the advancement of Open Standards for storage and storage networking. We also adhere to all standards necessary to support protocols, including, but not limited to SCSI, ESCON, Fibre Channel, FICON, NFS, CIFS, FTP, NDMP, and SNMP, as well as all of the standard MIBs including the FiberAlliance MIB that enable storage resource management.

The Level 3 Team's SS has representation within ALL the key industry standard groups, including:

1. FibreAlliance, Founding Member.
2. Storage Networking Industry Association (SNIA)—full voting member.
3. Distributed Management Task Force (DMTF).
4. Fibre Channel Industry Association (FCIA)—Principle Member and resides on the Board.
5. Internet Engineering Task Force (IETF).
6. Institute of Electrical and Electronic Engineers (IEEE).
7. ISO 9000, ISO 9001 manufacturing standards.
8. T10 Technical Committee (SCSI).
9. T11 Technical Committee (Fibre Channel).
10. American National Standards Institute (ANSI) xT11 Committee.
11. I2O Special Interest Group—full member.

12. RDMA (Remote Direct Memory Access)—developing specifications for RDMA over TCP/IP networks, including Ethernet-based networks.

4.6.1.3 CONNECTIVITY [C.2.11.10.1.3]

The Level 3 Team's SS offering is compliant with the mandatory connectivity requirements of Section C.2.11.10.1.3 of the Networx RFP.

Level 3 will provide the interconnectivity to the [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

4.6.1.4 Technical Capabilities [C.2.11.10.1.4]

The Level 3 Team's SS solution complies with the technical capabilities specified in Section C.2.11.10.1.4 of the Networx RFP. Details are provided below.

- 1. Support the interfaces for all tiers of storage devices and services, such as Gigabit Ethernet (GigE), and Fibre Channel, as required by the Agency.**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2. Provide secure data centers to store Agency data.

- a. Provide logical partitioning of storage resources so that storage capacity is dedicated for use by an Agency.**

There are a number of techniques that [REDACTED] can employ to segregate storage resources per Agency, such as [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- b. Support dedicated resources, such as but not limited to storage controllers, Fibre Channel ports, and storage cache for Agency use to the extent needed.**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Access to all restricted areas is controlled by an automated badge access system, configured to detect and report both successful and unsuccessful attempts to access the facility or individual restricted areas.

All Data Center visitors are required to sign a visitor log and be escorted while in the data center. All Data Centers are staffed with [REDACTED] employees, [REDACTED]. All staff is trained on processes dealing with escort responsibilities and the need to challenge unescorted personnel not displaying a valid credential.

Construction-based physical security controls at Data Centers include:

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



[REDACTED]

[REDACTED]

Printed output is protected from unauthorized access at all times while under Level 3 Team control, from the actual printing of data in the printing area, preparation and holding of output for delivery and shipment, and actual delivery and shipment (if under the control of the Level 3 Team).

The hosting facilities owned by [REDACTED] are comprehensive, secure, multifaceted information processing service centers dedicated to providing high-quality outsourcing services to government agencies. The facilities are well equipped to support the processing needs many of our Federal and Public Sector customers, and provide redundant power supplies and state-of-the art security. The data center has [REDACTED]

[REDACTED]

[REDACTED]

3. Storage resources management:

- a. Provide tools for Agency use to manage the storage provided, including but not limited to logical partitioning of allocated storage for Agency needs, applying Agency storage policy management, and providing storage virtualization as needed by the Agency.**

The Level 3 SS solution incorporates the [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]. Customers can choose which applications they need, knowing that they will work together to simplify and automate common tasks with a consistent, information-centric approach.

[illegible]

SAN and NAS storage infrastructure will be managed using the tools described below:

Bar Index	Relative Length (approximate percentage of longest bar)
1	85%
2	95%
3	98%
4	100%
5	99%
6	92%
7	95%
8	88%
9	82%
10	45%

11/11/2019

██████████

114



[REDACTED]

[REDACTED]

[REDACTED]



[Redacted content]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- b. Support the Agency’s investments in storage resources by being compatible with Agency storage management policies, procedures, and tools, as needed by the Agency, including but not limited to storage virtualization across Agency and contractor-provided storage.**

The Level 3 Team’s SS will support this requirement through comprehensive interoperability testing. Our SS technology will be thoroughly tested and pre-qualified, as needed, by the [REDACTED] and [REDACTED] to ensure compatibility with Agency storage management policies, procedures and tools.

The testing facilities and laboratories encompass all aspects of interoperability testing to ensure maximum uptime for all components of our SS offering. The labs contain an extensive mixed host environment including more than a dozen [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] Special labs and testing facilities are also available to cover nationalized environments, operating systems, clustering applications, and many popular application environments. In addition, a unique hardware fault insertion capability is used to test and assure that the hardware and software error recovery capabilities of solutions are the best in the world.

Through [REDACTED] with more than [REDACTED] IT providers such as [REDACTED], our team has access to resources that can work together to resolve integration and operational issues when multi-vendor issues occur.

4. **Perform scheduled Maintenance during off-peak hours. Ensure that contractor maintenance windows are arranged to meet Agency needs.**

The Level 3 Team will perform scheduled maintenance during off-peak hours and will ensure any necessary maintenance windows are scheduled to meet Agency needs.

5. **Backup and Restore (BBKUP&R) services requirements:**
- a. **Backup Agency designated files and databases automatically, including files that are open at the time of the backup.**

The Level 3 Team will comply with the Government's Backup and Restore services requirements. Our SS solution supports data backup and restore to and from most disk systems as well as tape library systems. [REDACTED]

[REDACTED]

- b. **Perform automated data backup at least daily, and, if needed by an Agency, on a more frequent schedule.**

Our SS definitions can be scheduled to perform backups on a daily basis. If needed a single client can reside in multiple groups that perform backups multiple times per day.

- c. **Daily incremental and full weekly backups of data shall be performed, and, if needed by an Agency, on a more frequent schedule**

Our SS scheduling options allow the Level 3 Team to perform the level of backup required by the agency on the schedule required by the agency.

- d. **Stored backup data shall be kept securely in a geographically separate location as needed by an Agency.**

The contractor shall provide storage facilities that meet Agency security requirements.

[REDACTED]

[REDACTED]

- e. Retain a full backup copy of a month's worth of data for at least three months, and for longer if needed by the Agency.**

Our SS solution allows each client to have a retention policy that fits the needs for the agency owning that client.

- f. Restore backup data as needed by the Agency.**

The Level 3 SS solution can perform restore operations from the server to the client or the client can initiate restore directly.

- g. Provide Remote Data Replication (RDR) services, such as for Agency archive purposes, by writing Agency data into storage media and then physically transporting and storing the media in a geographically separate secure location.**

- i. Enable both automated and manually-initiated replication as needed by the Agency.**

[REDACTED]

[REDACTED]

[REDACTED]

- ii. Provide secure storage for the media to meet Agency requirements.**

[REDACTED]

[REDACTED]

- h. Remote Data Mirroring (RDM) services shall be provided, if needed by the Agency, to enable two or more locations,**

such as Agency datacenters and COOP sites, to store and share the same data.

Remote Data Mirroring services are provided by NAS and SAN services, described previously in this response.

6. Network Attached Storage (NAS) services requirements:

a. Provide, operate, and manage storage that is scalable to meet Agency needs.

The Level 3 Team's NAS service is a reliable and flexible offering that will support this requirement. Features include:

[illegible]



[REDACTED]

[REDACTED]

- b. Perform storage upgrades that shall be transparent to the Agency and the Agency shall not experience downtime during upgrades.**

[REDACTED]

- c. Implement rigorous security policies and procedures to protect Agency data to meet Agency security needs.**

The Level 3 Team offers a [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- 7. Storage Area Network (SAN) services requirements:**
- a. Provide, operate, and manage storage that is scalable to meet Agency needs.**

The Level 3 Team’s storage operating environment keeps NAS and SAN current with the latest application, interconnect, and storage software technologies, while maintaining backward compatibility with previous-generation systems for still greater protection. We currently support SAN, DAS, and NAS.

Our SS architecture and FLARE also support metaLUN capability. MetaLUNs are groups of LUNs that enable better use of an enterprise’s storage capacity. Through either striping or concatenation, metaLUNs enable a user to provide a high degree of flexibility and control data layout in the array through limitless storage configuration options. MetaLUNs increase performance capability by allowing a volume to span a large number of drives, and they enable better capacity utilization by expanding capacity anywhere in the array. And since metaLUN capability is non-disruptive, it reduces out-of-disk-space issues and downtime.

The performance and availability of the devices may be changed online. This automates performance tuning of the array in accordance with the control parameters chosen—transparently to application processors and end users. An intuitive GUI allows for easy set up of disk tuning and data placement changes. Level 3's SS ensures business information is optimally placed for best access, allowing the customer to meet business needs and lower IT costs.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- c. Rigorous security policies and procedures shall be implemented to protect Agency data to meet Agency security needs.**

[REDACTED]

[REDACTED] To meet the continuously changing information security threat, team members have developed a strategy of working with best of breed services firms and best of breed products to protect an organization's infrastructure. This strategy also makes it more difficult for an attacker to compromise an infrastructure since there are many more points being monitored and acted upon.

- Level 3 and our partner Unisys have a well defined long-standing history of protecting information across commercial and Government organizations alike.**

8. Information Security

Customers are facing new security challenges that result from increasingly hostile environments and privacy and governance regulations. This has lead to tighter security policies and controls and increased security investments.

Perhaps more so than ever, customers are concerned about the security of their information and infrastructure. Our team is committed to helping to ensure that the right data available at the right place at the right time...securely with secure storage, secure movement and secure management.

- **Product Security Attributes**

Our SS security attributes span all products providing a comprehensive security solution for all product tiers, in both shared and dedicated environments with defined levels of user control. The following describes the security product set that applies to single client and multi-host environments:

- **Security for the Storage Infrastructure**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[Redacted]

[Redacted]

[Redacted]

[Redacted]

- **Security for Storage Management**

[Redacted]

[Redacted]

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[Redacted]

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[Redacted]

4.6.1.5 FEATURES [C.2.11.10.2]

The Networkx RFP does not specify any features for Storage Services.

4.6.1.6 INTERFACES [C.2.11.10.3]

The Level 3 Team SS offering will comply with all applicable User-to-Network (UNIs) at the SDP, as defined in Section C.2.11.10.3.1 of the

[illegible]

4.6.2 Quality of Service and Performance Metrics [L.34.1.5.4 (d), C.2.8.2.4]

The Level 3 Team SS offering is compliant with the performance metrics specified in Section C.2.11.10.4.1 of the Network RFP and shown in Table 4.6-2.

[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]

4.6.2.1 BACKUP AND RESTORE

Level 3's SS will meet the [REDACTED] availability requirement, using our [REDACTED] Restore times meeting the criteria can be met as long as the media being read from can provide data within the given parameters. [REDACTED]

4.6.2.2 NAS

The Level 3 Team proposes the NAS system to meet the specified availability requirements of [REDACTED] for the NAS single server, clustered servers, and mirrored servers.

We are interpreting the NAS single server configuration to equate with a

[illegible]

For SS, availability is the percentage of time the system is able to access or transfer any desired block of data.

Our Team's NAS solutions offer various high availability options. Each individual subsystem is built with redundant hardware components such as power and fans. [REDACTED]

4.6.2.3 SAN

The Level 3 Team will meet the Government's performance requirements for Storage Services systems. We are proposing the [REDACTED] to meet the availability requirement of [REDACTED] Any one of the [REDACTED] systems is capable of meeting the availability requirement of [REDACTED]

Availability and data integrity in the [REDACTED] is optimized with:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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4.6.3 Proposed Service Enhancements [L.34.1.5.4 (e)]

The Level 3 Team does not propose AQLs that exceed the AQLs in the KPIs at this time but would like to reserve the ability to do so with performance improvements that may be attained through the introduction of new technology. Level 3 believes in continuous improvement and will always strive to provide the highest quality, available services.

4.6.4 Experience Delivering Storage Services [L.34.1.5.4 (f)]

Level 3 Team partner, [REDACTED], has supplied systems and services to more than [REDACTED] around the world. [REDACTED] is among the largest providers of IT solutions to [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
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[REDACTED]

[REDACTED]

[REDACTED]

4.6.5 Verification of Individual Services [L.34.1.5.4 (g)]

The Level 3 Team will use [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

4.6.6 Impact on Network Architecture [L.34.1.5.4 (h)]

No new architectural components are required to support this optional service and, thus, there will be no adverse impact to our network design.

4.6.7 NS/EP Functional Requirements [C.5.2.7, L.34.1.5.4 (i)]

Section 2.5.4 of this Technical Volume discusses in detail how the network architecture will satisfy the requirements in RFP Section C.5.2.7 for all of Level 3's proposed services.

4.6.8 National Capital Region Service [L.34.1.5.4 (j)]

Section 2.5.4 of this Technical Volume discusses in detail how the network architecture will satisfy the requirements in RFP Section C.5.2.7 for all of Level 3's proposed services.

Requirements for assured service in the National Capital Region (NCR) do not apply to this service. Management and applications services are not transport or facilities-dependent and therefore, as a service, not directly susceptible to service interruptions affecting the NCR.

4.6.9 Meeting Section 508 Requirements [L.34.1.5.4 (k)]

In accordance with RFP Section C.6.4, relevant provisions of Section 508, Subpart B do not apply to Storage Services.

4.6.10 Infrastructure Enhancements and Emerging Services [L.34.1.5.4 (l)]

A detailed response to this requirement is provided in Section 3.4.11 of this Technical Volume.