

Virginia Information Technologies Agency



COMMONWEALTH OF VIRGINIA
VIRGINIA INFORMATION TECHNOLOGIES AGENCY (VITA)
SUPPLY CHAIN MANAGEMENT DIVISION
11751 MEADOWVILLE LANE
CHESTER, VIRGINIA 23836

REQUEST FOR INFORMATION (RFI) 2017-14
FOR:
SERVER, DATA CENTER, AND SECURITY SERVICES

Issue Date: September 29, 2016
Due Date/Time: October 21, 2016 @ 3:00 pm Eastern
Response Delivery Method: E-mail attachment to Single Point of Contact
Single Point of Contact (SPOC): Greg Searce, VITA Supply Chain Management (SCM)
Telephone: (804) 416-6166
E-mail Address: gregory.searce@vita.virginia.gov

NOTE: This public body does not discriminate against faith-based organizations in accordance with the Code of Virginia, §2.2-4343.1 or against a Supplier because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment.

VITA is committed to increasing procurement opportunities for small, women-owned, and minority-owned (SWaM) businesses, strengthening the Commonwealth's overall economic growth through the development of its IT suppliers.

TABLE OF CONTENTS

1. Introduction	3
A. IT Infrastructure Services Program (ITISP) Overview.....	3
B. RFI Purpose.....	3
2. Submission Logistics and Contact Information	5
3. Overview of RFI Documents	5
4. Respondent Contact Information.....	6
5. Questions	7
A. Server/Storage Services	7
B. Financial/Server Storage	41
C. Managed Security.....	43
D. Financial/Managed Security	44
6. Feedback Regarding RFI Documents	46

1. INTRODUCTION

The intent of this Request for Information (RFI) is solely to gather information; it is not a formal procurement. Responding to the RFI is not a pre-requisite to submitting a proposal for any subsequent procurement. Respondents should not provide any confidential or proprietary information.

Ownership of all data, materials, and documentation originated and prepared for VITA pursuant to the RFI shall rest exclusively with VITA. All information provided to VITA as part of this RFI will not be publicly disclosed, but shall be subject to public inspection in accordance with the §2.2-4342 of the *Virginia Public Procurement Act and the Virginia Freedom of Information Act*.

A. IT Infrastructure Services Program (ITISP) Overview

This procurement event is a component in VITA's overall strategy to implement a new IT Infrastructure Services Program (ITISP). This program will position VITA to fulfill its vision to "deliver agile technology services at the speed of business" by better balancing the needs of the individual agencies and the enterprise in a multisupplier ecosystem. The ITISP is intended to accomplish the following:

- **Maintain and improve service quality.**
 - Develop the capability to address evolving agency needs and create opportunities to improve service performance without degrading service reliability, security, and quality.
- **Ensure cost competitiveness – both now and in the future.**
 - Structure service offerings so they can be more easily compared to market services at market rates; offer a menu of service options to customers.
- **Create a platform view of service delivery that is highly visible and accountable.**
 - Provide for Enterprise and Agency visibility of consumption, cost, performance, and the responsiveness of suppliers. Establish a governance structure and forums to promote stakeholder engagement and improve the balance of agencies and enterprise needs.

Procurement of new services that will transition the Commonwealth from a single supplier model to an integrated multisupplier model is occurring over three waves. VITA has begun implementing Wave 1 of this transition by awarding a contract for Messaging services in July 2016 and a contract for IBM Mainframe services in September 2016. Wave 2 of this transition begins with this Request for Proposal ("RFP") soliciting proposals for the services of a multisourcing service integrator (MSI). That procurement was released on September 29, 2016 under RFP# 2017-03. The Wave 2 procurements are also intended to include services for Server, Storage, Data Center LAN, Data Center Facilities, and Managed Security Services (abbreviated as "Server, DC, and Security").

Respondents to this RFI are encouraged to review the publicly available RFP# 2017-03 documents for additional context. Note also that there will be a Pre-Proposal Web Conference for the MSI RFP, scheduled for Tuesday, October 4th at 2 pm. Information to register for the conference is indicated in the RFP Instructions for RFP# 2017-03.w

B. RFI Purpose

VITA has decided to accelerate its MSI implementation, such that the contract for RFP# 2017-03 is awarded while the other Wave 2 procurements are still underway. The initial focus on the MSI RFP allows additional time at the front-end of the timeline to gather further market research for Server, DC, and Security via this RFI. This RFI will allow VITA to improve the quality of the resultant RFP or RFPs to be released around the end of 2016.

Currently, VITA's Wave 2 internal RFP teams are structured around two separate potential RFPs: 1.) Server, Storage and Data Center Services and 2.) Managed Security Services. However, VITA is interested in identifying the most efficient demarcation or bundling of these services between RFPs. For example, perhaps it would be more efficient to separate the Data Center facilities from the other Server services; or perhaps it would be better to include some or all of the Security services with the Server RFP. VITA anticipates resolving these decisions, and other questions as detailed in the Section 5 (Questions) below, in part by considering feedback obtained from marketplace participants via this RFI.

The Commonwealth has the following goals for the procurements:

Server, Storage, and Data Center Services

- Assume all existing Services for Server, Storage, Data Center LAN, and Centralized Data Center facility currently provided to the Commonwealth via the Comprehensive Infrastructure Agreement (CIA) with Northrop Grumman.
- Transition to the next generation of delivery for Server, Storage, and Data Center services to VITA and Customers, taking advantage of the ever-changing technology landscape while decreasing costs to VITA and Customers.
- Provide compute, storage, and Data Center LAN services that are flexible, rapidly provisioned, cost effective, transparent, and elastic to meet VITA and Customer needs while preserving enterprise requirements such as security and compliance management.

Managed Security Services

- Replace the existing security services included within the Comprehensive Infrastructure Agreement (CIA) with Northrop Grumman.
- Support VITA's Commonwealth Security and Risk Management (CSR)M) directorate by acting as its operational "hands and feet":
 - Advising on risks and standards development
 - Assessing vulnerabilities and compliance (suppliers and agencies)
 - Provide security monitoring and integration tools across the environment
 - Respond to and address security risks and incidents
 - Provide tools and technologies to protect the environment from compromise
 - Provide security services that are adjustable to meet compliance needs of the Customer and adaptable to advancements in both security and technology industries
 - Establish, implement and maintain a secure enterprise information technology environment ensuring the confidentiality, integrity and availability of critical Commonwealth information and systems

- Provide VITA and its Customers with access to their data and metadata, in real-time

2. SUBMISSION LOGISTICS AND CONTACT INFORMATION

Issue Date:	September 29, 2016
Due Date / Time:	October 21, 2016 at 3:00 pm EST
Response Delivery Method:	E-mail attachment or CD sent to Single Point of Contact. Note: e-mail must be received by the due date and time; CD must be post-marked by the due date, but can be received later. E-mail attachments must be limited to 10 MB.
Single Point of Contact (SPOC):	Greg Searce
Telephone:	(804) 416-6166
E-mail Address:	gregory.searce@vita.virginia.gov
Mailing Address:	11751 Meadowville Lane, Chester, VA 23836
Pricing:	No pricing information should be submitted
Document Format:	Return this document, having populated Section 4 (Respondent Contact Information), Section 5 (Questions) below, and Section 6 (Feedback Regarding RFI Documents)
RFI Questions and Answers:	Suppliers may submit questions regarding this RFI at any time via e-mail to the SPOC.

3. OVERVIEW OF RFI DOCUMENTS

Within this RFI, VITA has chosen to release the following documents, which are drafts of some key documents anticipated for release in a final RFP or RFPs.

- Exhibit 2.1-a: Server, Storage, Data Center LAN Services
- Exhibit 2.1-b: Data Center Facilities Services
- Exhibit 2.1-c: Managed Security Services
- Exhibit 2.2: Cross-Functional Services
- Exhibit 3.1-a: Server, Storage, Data Center LAN, and Data Center Facilities SLA Matrix
- Exhibit 3.1-b: Managed Security SLA Matrix

- Exhibit 3.2-a: Server, Storage, Data Center LAN, and Data Center Facilities SLA Descriptions
- Exhibit 3.2-b: Managed Security SLA Descriptions
- Exhibit 4: Pricing and Financial Provisions
- Exhibit 4.1-a: Server, Storage, Data Center LAN, and Data Center Facilities Pricing and Volumes Matrix
- Exhibit 4.1-b: Managed Security Pricing and Volumes Matrix
- Exhibit 4.2-a: Server, Storage, Data Center LAN, and Data Center Facilities RU Definitions
- Exhibit 4.2-b: Managed Security RU Definitions
- Exhibit 4.4: Form of Invoice

4. RESPONDENT CONTACT INFORMATION

Please provide your contact information in the box below.

Contact Information	Enter your response here, enlarging the box as needed
Company Name	NetApp, Inc.
Company Mailing Address	Worldwide Headquarters 495 East Java Drive Sunnyvale, CA 94089 NetApp U.S. Public Sector, Inc. 1921 Gallows Rd, Suite 600 Vienna, VA 20105
Company Website Address	www.netapp.com
Name of Contact Person	Jamie Payne
Contact Person E-mail Address	jamie.payne@netapp.com
Contact Person Telephone #	Mobile: 434-531.3618

5. QUESTIONS

Please use the table to respond to the Commonwealth’s questions.

As the storage and data management leader in Public Sector* and the world-wide Public Cloud and now the largest independent provider to companies around the world helping them build Private and Hybrid Cloud architectures**, NetApp is pleased to respond to the Virginia VITA RFI. NetApp will be responding only to those Server/Storage questions that we have industry thought leadership and technical and practical experience. NetApp feels this will allow VITA to focus on where we have the most to offer in helping build the most efficient and price competitive Private and Hybrid Cloud solution for the citizens of Virginia.

*Market Connections’ Federal Storage Market Appraisal FY2013

** IDC, Worldwide Quarterly Enterprise Storage Systems Tracker - 2016Q2, September 16, 2016

Ref#	Category	Question	Supplier Response
A. Server/Storage Services			
Q1.	Server/Storage	The Commonwealth has upwards of 10 non-centralized Data Centers in Agency-operated buildings, primarily in the metro Richmond area. What are examples of Suppliers’ best practices in managing the Servers, Storage, Firewalls, and Data Center LANs in non-centralized (Agency) facilities?	See below.
		<p>NetApp has many enterprise customers operating non-centralized data centers and can offer best practices to ensure VITA’s data is protected. Best practices begin by selecting a storage provider who provides the foundation of a data management layer that makes it possible for VITA to deliver consistent services across all environments regardless of location. It includes:</p> <ul style="list-style-type: none"> • Data management efficiencies • Security technologies • Replication and backup technologies • Backup technology • Data access protocols <p>This multi-faceted data management layer will provide VITA’s IT the flexibility to choose the right set of resources to meet the needs of their applications and the freedom to change them whenever they want. NetApp has developed this data management layer referred to as Data Fabric and is the means to manage different data centers across a heterogeneous multi-cloud environment.</p> <p>The Data Fabric enabled by NetApp is a collection of integrated technologies and services that deliver high-value data management solutions to VITA which are much greater than the sum of their parts. Platforms (physical and software-defined)</p>	

Ref#	Category	Question	Supplier Response										
		<p>establish the data store endpoints in various environments. The multi-cloud capabilities of the data fabric provide organizations with a choice of environments for running their applications.</p> <p>The Data Fabric enabled by NetApp can be applied to address real data management problems that VITA is faced with today across the enterprise. It enables VITA to safely span data centers and clouds while retaining ownership and control of your data.</p> <p>There are many aspects to making a true “Data Fabric” approach work properly and the following list highlights available technologies that should be leveraged as a best practice to manage data across a large, non-centralized environment like VITA’s:</p> <p>Integrated Cloud Data Management</p> <p>VITA should have the ability to have the same data access and control in the cloud and at all of its data centers with the ability to move data and applications from on-premises to the cloud, between regions, and across cloud providers. An integrated set of data management tools from a common storage operating system that is available in all locations (cloud or not) should be used. Having this kind of approach will allow VITA to choose the data location(s) that best fit the business requirements.</p> <p>Data Management Efficiencies</p> <p>VITA can reduce data storage and management costs using data management software and its leading set of optimization and data-reduction technologies. You can manage your data resources—flash, disk, and cloud—with greater efficiency:</p> <ul style="list-style-type: none"> • Improve storage utilization • Eliminate planned and unplanned downtime • Save on storage costs <p>NetApp data management efficiencies.</p> <table border="1" data-bbox="426 1076 1667 1463"> <thead> <tr> <th data-bbox="426 1076 705 1133">Technology</th> <th data-bbox="705 1076 1667 1133">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="426 1133 705 1224">Snapshot copies</td> <td data-bbox="705 1133 1667 1224">Provides near-instantaneous point-in-time copies that protect data with no performance impact, using minimal storage space.</td> </tr> <tr> <td data-bbox="426 1224 705 1282">Deduplication</td> <td data-bbox="705 1224 1667 1282">Automatically removes duplicate data blocks.</td> </tr> <tr> <td data-bbox="426 1282 705 1341">Data compression</td> <td data-bbox="705 1282 1667 1341">Offers inline or post processing compression.</td> </tr> <tr> <td data-bbox="426 1341 705 1463">Thin provisioning</td> <td data-bbox="705 1341 1667 1463">Allocates space for LUNs and volumes on demand, instead of reserving them up front, resulting in physical capacity being consumed only when needed to store unique new data.</td> </tr> </tbody> </table>	Technology	Description	Snapshot copies	Provides near-instantaneous point-in-time copies that protect data with no performance impact, using minimal storage space.	Deduplication	Automatically removes duplicate data blocks.	Data compression	Offers inline or post processing compression.	Thin provisioning	Allocates space for LUNs and volumes on demand, instead of reserving them up front, resulting in physical capacity being consumed only when needed to store unique new data.	
Technology	Description												
Snapshot copies	Provides near-instantaneous point-in-time copies that protect data with no performance impact, using minimal storage space.												
Deduplication	Automatically removes duplicate data blocks.												
Data compression	Offers inline or post processing compression.												
Thin provisioning	Allocates space for LUNs and volumes on demand, instead of reserving them up front, resulting in physical capacity being consumed only when needed to store unique new data.												

Ref#	Category	Question	Supplier Response
		<p>Cloning</p> <p>Security Technologies</p> <p>A defense-in-depth strategy relies on layers of defenses to protect systems and data. Such a strategy requires that all components across the hybrid cloud environment support a consistent security architecture and policy.</p> <p>Example security mechanisms include:</p> <ul style="list-style-type: none"> • Secure data at rest. AES 256-bit software encryption capabilities to secure data at rest on public cloud storage and implement hardware-based security with self-encrypting drives when possible. • Secure data in flight and at rest. Encrypt all data prior to transmitting it over the wire to the target cloud storage. • Control encryption keys. All encryption capabilities enable users to have end-to-end control of their security policies. Users manage their encryption keys with their own KMIP-compliant key management servers. • Control data access. Role-based access controls (RBAC) are used for managing a set of actions that a user or administrator may perform in a given environment. • Provide multitenancy. Enable multiple tenants to share the resources of a cluster with its storage virtual machine capabilities. Cluster administrators set the resource limits and QoS levels for each tenant. Tenants have administrative control of their slice of the system, while remaining isolated from others. <p>Replication Technologies</p> <p>Replication technologies are used to protect against data loss of any kind. Replication helps to satisfy strict recovery point objective (RPO) and recovery time objective (RTO) requirements while controlling costs and improving operational processes. For example, NetApp’s SnapMirror is a single replication solution that can be used across the Data Fabric.</p> <p>SnapMirror is ideal for moving data across regions and clouds because it is a resilient IP-based protocol that is optimized for data transfer over WANs. A new SnapMirror session performs a baseline copy in which all data in a volume is replicated to the destination. Incremental updates are performed continuously, leveraging Snapshot copies to minimize data transfer, sending only the blocks that have changed. Storage efficiencies remain intact, where data that has been compressed or deduplicated on the source stays that way over the wire and at the destination.</p> <p>Backup and Restore</p> <p>Data Fabric allows many options for managing backup and restore operations. Organizations have the choice of using:</p>	<p>Allows instant replication of data files, LUNs, and volumes as transparent, virtual copies without requiring additional storage at the time of creation.</p>

Ref#	Category	Question	Supplier Response										
		<ul style="list-style-type: none"> Backup appliance to back up data to any cloud. Beyond its deployment flexibility, these products should offer ingest rates of more than 9TB per hour, encryption with customer-controlled keys, and local caching to minimize RTO of recent data. For additional cost efficiency, the products should support tiering across multiple object store types (an example is AWS S3 and Glacier). Disk-to-Disk (D2D) backup to back up snapshot copies from any primary storage endpoint with a unified replication data transport. D2D enables data stored on multiple systems to be backed up to a central, secondary system quickly and efficiently as read-only snapshot copies. For example, NetApp offers technology that can be used to easily and efficiently back up data from each remote office to the data center. An all flash array can easily backup high performance data to a hybrid array with this technology. Replication and D2D are lightweight replication engines to easily and effectively copy data between systems in the Data Fabric. Integrated backup and restore functionality to manage native backup and restore operations based on snapshots compatible with S3 and Swift object stores. This native backup integration eliminates the need for and cost of third-party backup software. Data management systems should support Network Data Management Protocol (NDMP), providing an open standard for network-based backup of network-attached storage (NAS). NDMP minimizes coding needed for different applications by providing standard commands for backing up and restoring file servers. For NetApp customers, NDMP increases the speed and efficiency of NAS data protection, because data can bypass backup servers and be written directly to tape storage. <p>Data Access Protocols</p> <p>An extensive data fabric must provide data access in ways that meet the needs of today’s applications. The protocols supporting data access may vary depending on the platform.</p> <p>NetApp data access protocols by system.</p> <table border="1" data-bbox="426 1052 1667 1333"> <thead> <tr> <th data-bbox="426 1052 873 1105">System</th> <th data-bbox="879 1052 1667 1105">Data Access Protocols</th> </tr> </thead> <tbody> <tr> <td data-bbox="426 1110 873 1164">Unified Data Management</td> <td data-bbox="879 1110 1667 1164">NFS, CIFS, iSCSI, FC, FCoE</td> </tr> <tr> <td data-bbox="426 1169 873 1222">Object Based Storage</td> <td data-bbox="879 1169 1667 1222">S3, CDMI, NFS gateway services, Swift</td> </tr> <tr> <td data-bbox="426 1227 873 1281">Backup Appliance</td> <td data-bbox="879 1227 1667 1281">NFS, CIFS, SMBv3</td> </tr> <tr> <td data-bbox="426 1286 873 1339">High Performance/Specialized</td> <td data-bbox="879 1286 1667 1339">iSCSI, FC</td> </tr> </tbody> </table>	System	Data Access Protocols	Unified Data Management	NFS, CIFS, iSCSI, FC, FCoE	Object Based Storage	S3, CDMI, NFS gateway services, Swift	Backup Appliance	NFS, CIFS, SMBv3	High Performance/Specialized	iSCSI, FC	
System	Data Access Protocols												
Unified Data Management	NFS, CIFS, iSCSI, FC, FCoE												
Object Based Storage	S3, CDMI, NFS gateway services, Swift												
Backup Appliance	NFS, CIFS, SMBv3												
High Performance/Specialized	iSCSI, FC												

Ref#	Category	Question	Supplier Response
Q2.	Server/Storage	What does the Supplier recommend for the length of the contract for Server, Storage, and Data Center Services? Please describe benefits and trade-offs.	<p>It is recommended the length of this contract be 10 years broken down to a base of 5 years with 5 - 1 year options.</p> <p>Regardless of the contract terms for any of the storage portion there are several criteria that should be taken into consideration:</p> <ol style="list-style-type: none"> 1. Maturity and stability of the equipment manufacturers. VITA must ensure that the technology will be supported for the length of the contract and can be supported by the manufacturer. VITA should be cautious with smaller, niche type manufactures and their ability to continue to operate in the future and be innovative over the contract term. 2. Nondisruptive operations (NDO) are fundamental to any scale-out architecture. NDO is achieved as the storage infrastructure remains up and serving data throughout the execution of hardware and software maintenance operations as well as during other IT lifecycle operations such as performing technology refreshes. The goal of NDO is to eliminate downtime— whether it is preventable, planned, or unplanned— and to allow changes to VITA’s systems to occur at any time. 3. The storage solution provider must be flexible and provide integration to leading edge technologies and have a solid software defined storage strategy that offers maximum flexibility over platform choice, deployment models and licensing, without compromising data management capabilities.

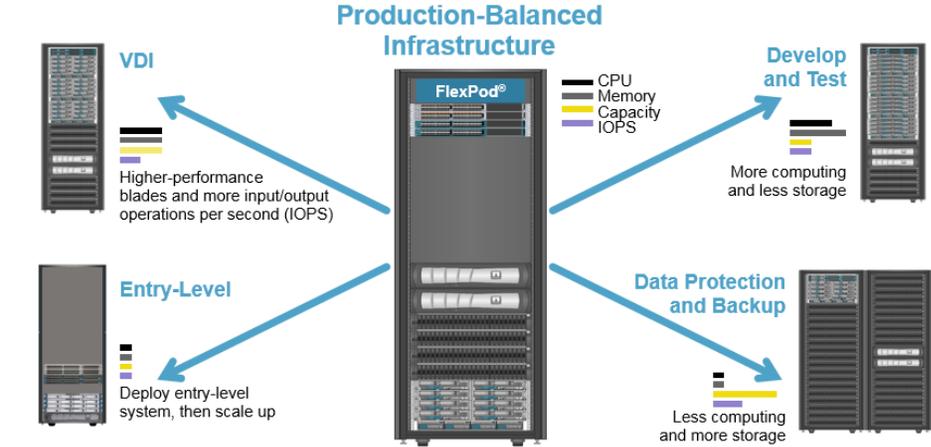
Ref#	Category	Question	Supplier Response
Q3.	Data Center	What do you recommend for the length of the contract for the Data Center Facility for this type of environment?	The longer the contract the greater savings VITA will be able to achieve over the length of the contract. We recommend a minimum of a 10-year contract with the facility.
Q4.	Server/Storage	What does the Supplier recommend for technology refresh rate for the different types of Devices in VITA’s environment? Is there an impact on the length of the services contract?	<p>A storage refresh rate of 3-5 year is recommended which is common in the storage industry. In years 5-7 maintenance costs increase and need to be evaluated against the purchase cost of a new system. This has no impact on the length of the contract but may incur some additional costs in the refresh year for the services associated with an upgrade.</p> <p>If VITA is moving towards a consumption model, paying for storage by terabyte, then the refresh cycle is moot as it will be the contractor’s responsibility to maintain systems that meet your desired service levels such as bronze, silver, and gold.</p>
Q5.	Server/Storage	The Commonwealth is interested in a separate hardware charge in the Server RUs to account for the initial capital outlay for physical servers. Is there a better way to represent the cost differences and hardware refresh cycle in the Server RU structure?	See below.
		<p>From a storage perspective, NetApp has a long history of providing customers a choice in how they acquire NetApp's leading-edge technology. To address the growing demand for cloud-based pricing, once such program NetApp offers enables customers to pay for actual use of infrastructure. This program is a simple, agile, cost-effective program that provides the flexibility of an on-premises storage solution with a consumption-based billing model to easily scale storage to keep pace with growing data volumes. This program is financially backed by NetApp, available for resale through partners, and includes all the data storage benefits that VITA has come to expect from NetApp. If approved for this program, it will allow VITA to:</p> <ul style="list-style-type: none"> • Scale to meet changing business demands in a timely fashion • Insert newer technology with limited budget while avoiding complex procurement processes • Reduce asset base in order to improve return on assets 	

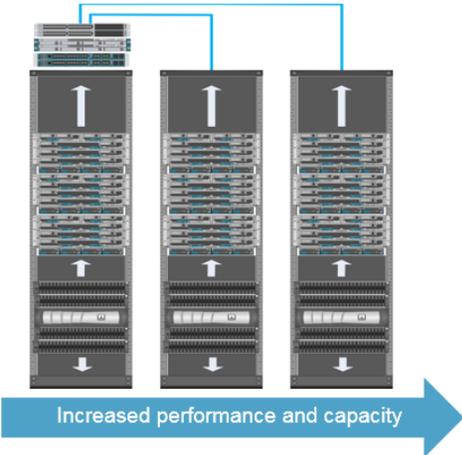
Ref#	Category	Question	Supplier Response
		<p>Usage-Based Consumption Program</p> <p>The referenced program is an on-premises consumption program for infrastructure owned by NetApp. VITA will use and pay for resources on a monthly basis, consistent with selected service levels to meet specific business requirements:</p> <ul style="list-style-type: none"> • Pay for actual usage • Match expense to consumption • Eliminate upfront investment • Simplify procurement • Buy based on desired business outcomes versus complicated configurations <p>Based on the selected service levels, NetApp and/or its partner, defines, installs, and implements the configuration at the customer location that best meets service-level objectives. NetApp then monitors, measures, and provides reports that document actual usage.</p>	
Q6.	Server/Storage	<p>The Commonwealth is proposing tiering of services for Server and Storage in an attempt to align costs with availability and performance. Based on your experience, do these tiers of service have any challenges in developing a solution? Do you have experience with these service tiering model? Do you have any recommendations or enhancements for the Commonwealth to consider?</p>	See below.
			<p>NetApp has experience with service tiering models and uses tiers in various utility and OnDemand consumption based models currently available to customers. VITA is proceeding in the correct direction by aligning costs with availability and performance. If VITA wants to leverage their existing infrastructure for your consumption model it is extremely important to obtain a clear picture of your heterogeneous environment to fully understand the performance of existing systems, which applications are aligned to which types of disks and what performance issues exist.</p> <p>This recommendation to VITA is to analyze existing application workloads for realistic measurements to be the baseline for moving forward. Most customers will ask “How do I know what service levels the applications need?” Frankly, most people don’t know, or they throw money at the problem, which works while you have the money. Most organizations are struggling with the explosion of data and the associated costs. Few companies can afford to spend the labor to profile and characterize each application’s performance needs.</p>

Ref#	Category	Question	Supplier Response
		<p>While every customer environment is different, the first step to the journey of becoming a storage service provider for the business is to define a service metric. If we examine what applications consume and what storage systems deliver, the answer becomes obvious. One such storage resource management tool, NetApp’s OnCommand Insight, is a highly recommended, agentless tool that can be utilized to examine your heterogeneous infrastructure.</p> <p>OnCommand Insight provides a view of performance metrics across the domain, including application performance, datastore performance, virtual machine performance, and storage infrastructure performance. It analyzes tier assignments and enables load-balancing of an organization’s entire application portfolio across all of the endpoints of the Data Fabric. It also improves application performance and boosts efficiency levels of existing storage resources so that IT administrators manage storage as an end-to-end service and to integrate storage into the entire IT service delivery chain.</p> <p>A measurement that will assist VITA in defining/aligning its service level tiers is IOPS per Terabyte, or Input-Output Operations Per Second Per Terabyte that is an IO Density metric. IO Density is simply how many Input-Output Operations per second applications are asking from a given capacity of storage. Every application tends to have an IO density that it needs to be responsive to its users. With an IO Density report, we identify the storage service levels that applications need, and we can move volumes to those service levels to save cost and improve performance.</p> <p>Just like a car needs a throttle, every storage system needs an IO throttle to limit the cost to serve applications. Without a QoS limit, storage systems will deliver unpredictable performance to applications and unpredictable cost to the business. Until networks implemented QoS limits, they were unpredictable and expensive. The following table is a reference of how service levels can be defined based upon an IO density report.</p>	

Ref#	Category	Question	Supplier Response																												
		<table border="1" data-bbox="495 207 1948 675"> <thead> <tr> <th colspan="4" data-bbox="495 207 1948 277">Application-Aligned Storage Service Levels</th> </tr> <tr> <th data-bbox="495 282 821 345">Service Level</th> <th data-bbox="827 282 1199 345">Bronze 1.0</th> <th data-bbox="1205 282 1577 345">Silver 1.0</th> <th data-bbox="1583 282 1948 345">Gold 1.0</th> </tr> <tr> <th data-bbox="495 350 821 414">Workload Type</th> <td data-bbox="827 350 1199 414">Email, web, file shares, backup</td> <td data-bbox="1205 350 1577 414">Database & virtualized applications</td> <td data-bbox="1583 350 1948 414">Latency-sensitive applications</td> </tr> <tr> <th data-bbox="495 418 821 482">Target IOPS/TB provisioned*</th> <td data-bbox="827 418 1199 482">128</td> <td data-bbox="1205 418 1577 482">1,536</td> <td data-bbox="1583 418 1948 482">6,144</td> </tr> <tr> <th data-bbox="495 487 821 550">QoS Limit in IOPS/TB</th> <td data-bbox="827 487 1199 550">512</td> <td data-bbox="1205 487 1577 550">3,072</td> <td data-bbox="1583 487 1948 550">12,288</td> </tr> <tr> <th data-bbox="495 555 821 618">Target Latency (ms)</th> <td data-bbox="827 555 1199 618">17</td> <td data-bbox="1205 555 1577 618">2</td> <td data-bbox="1583 555 1948 618">1</td> </tr> <tr> <th colspan="4" data-bbox="495 623 1948 675">Flash-Accelerated, SAN and NAS, High Availability and Durability, Non-Disruptive Movement Between Service Levels</th> </tr> </thead> </table> <p data-bbox="506 704 1276 727">* Minimum 30% Random Read; 32K Block, Recovery Point Objective not less than 4 hours</p> <p data-bbox="422 777 1871 841">The Target IOPS/TB row is an expectation for the minimum performance of the service level, achievable even in a fail-over situation, within a set of conditions, such as a read: write ratio.</p> <p data-bbox="422 885 1843 948">The QoS limit in IOPS/TB is the maximum speed of each service level. The values are expressed so that they can easily be divided by 1024 to derive IOPS per GB as some organizations prefer.</p>	Application-Aligned Storage Service Levels				Service Level	Bronze 1.0	Silver 1.0	Gold 1.0	Workload Type	Email, web, file shares, backup	Database & virtualized applications	Latency-sensitive applications	Target IOPS/TB provisioned*	128	1,536	6,144	QoS Limit in IOPS/TB	512	3,072	12,288	Target Latency (ms)	17	2	1	Flash-Accelerated, SAN and NAS, High Availability and Durability, Non-Disruptive Movement Between Service Levels				
Application-Aligned Storage Service Levels																															
Service Level	Bronze 1.0	Silver 1.0	Gold 1.0																												
Workload Type	Email, web, file shares, backup	Database & virtualized applications	Latency-sensitive applications																												
Target IOPS/TB provisioned*	128	1,536	6,144																												
QoS Limit in IOPS/TB	512	3,072	12,288																												
Target Latency (ms)	17	2	1																												
Flash-Accelerated, SAN and NAS, High Availability and Durability, Non-Disruptive Movement Between Service Levels																															
Q7.	Server/Storage	The Commonwealth currently spreads costs across a very simple RU model. Do you have an enhanced RU model that could offer a larger variety of services while minimizing the RUs and their complexity?	See below.																												
		As highlighted previously, there are \$/TB consumption models that offers monthly payments based upon capacity and software usage. While this model may not entirely apply here, there are additional options using a converged infrastructure solution that offers predictable and flexible solutions that can easily scale in a prescribed manner.																													

Ref#	Category	Question	Supplier Response
		<p>Operational efficiencies result from choosing a standard deployment chunk for infrastructure and using it in a repeated fashion to scale out to meet the needs of the business.</p> <p>Many organizations perform the following steps when servicing a new application or requirement:</p> <ol style="list-style-type: none"> 1. Collect detailed requirements. 2. Architect and size: Work with the vendors to architect and size the system. Depending on the number of applications and the number of vendors involved, the sizing and architecting phase can take many weeks and often months. 3. Data Center planning: Work with the data center team to negotiate power, floor space, and cooling requirements for the new system. 4. Procure equipment: This phase involves many weeks of obtaining quotes, ordering, and receiving the new gear. The time it takes to deal with a large organization, plus additional shipping times, can easily total six weeks. 5. Detailed design: This phase involves working out the exact configuration for compute configuration, network connectivity, storage layout, security, and isolation. 6. Deploy: Configure the equipment for use. 7. Test: Create and run a test plan to make sure that the equipment is correctly installed and meets the original requirements. <p>NetApp has a converged infrastructure referred to as a FlexPod. The following solution components are critical building blocks in the FlexPod architecture:</p> <ul style="list-style-type: none"> • Cisco Unified Computing System™ and Cisco Nexus® family of switches • NetApp FAS/All-Flash FAS storage and OnCommand Software Management Suite <p>FlexPod configurations are delivered as a complete data center in a one-rack cabinet, ready to be deployed. You can accelerate transformation from traditional silos to a virtualized, shared environment with standardized and scalable building blocks that leverage a next-generation data center solution from Cisco, NetApp, and leading OS and hypervisor partners.</p> <p>FlexPod is not a fixed configuration. It provides an excellent starting point as shared infrastructure for organizations that want to run mixed workloads. This flexible configuration allows administrators to “pick their own starting point.” If the focus is virtual desktop infrastructure, or VDI, the infrastructure requirements might be different from those for a develop and test environment.</p>	

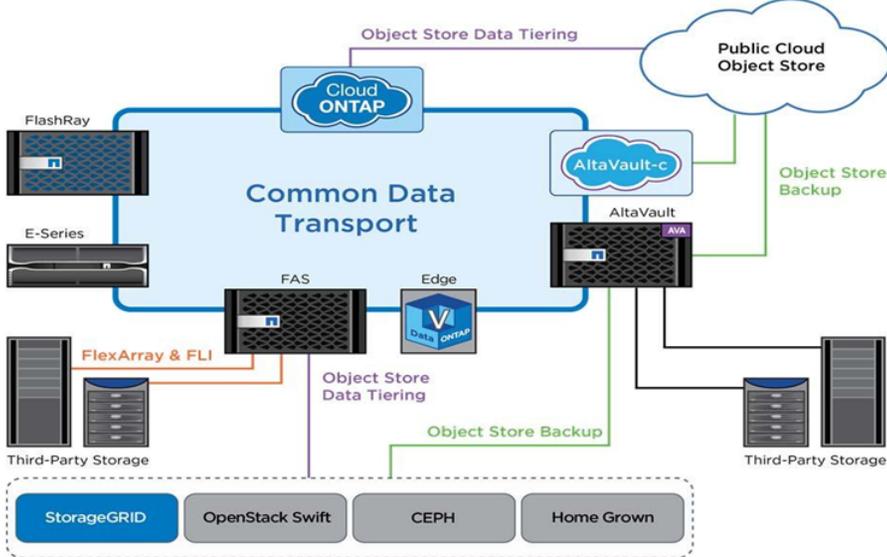
Ref#	Category	Question	Supplier Response
		<p style="text-align: center;">Optimize for Any Workload</p> <p style="text-align: center;">Production-Balanced Infrastructure</p>  <p>The diagram illustrates a central FlexPod infrastructure unit. Four arrows point from it to different server racks representing various workloads:</p> <ul style="list-style-type: none"> VDI: Higher-performance blades and more input/output operations per second (IOPS). The bar chart shows high IOPS and CPU usage. Develop and Test: More computing and less storage. The bar chart shows high CPU and Memory usage, and low Capacity usage. Entry-Level: Deploy entry-level system, then scale up. The bar chart shows low CPU, Memory, and Capacity usage. Data Protection and Backup: Less computing and more storage. The bar chart shows low CPU and Memory usage, and high Capacity usage. <p style="text-align: center;">Legend: CPU Memory Capacity IOPS</p>	<p>By using FlexPod, many of these phases are compressed or removed altogether. For example, the architecture, design, deployment, and test phases are all substantially compressed. Many organizations don't know what future demands will be placed on IT. By using (preprovisioned) FlexPod as a pool of infrastructure, the compute, network, and storage resources are on the floor already. Therefore, it is a very rapid process to meet the business needs and preprovisioning to provide agility demanded by the business.</p>

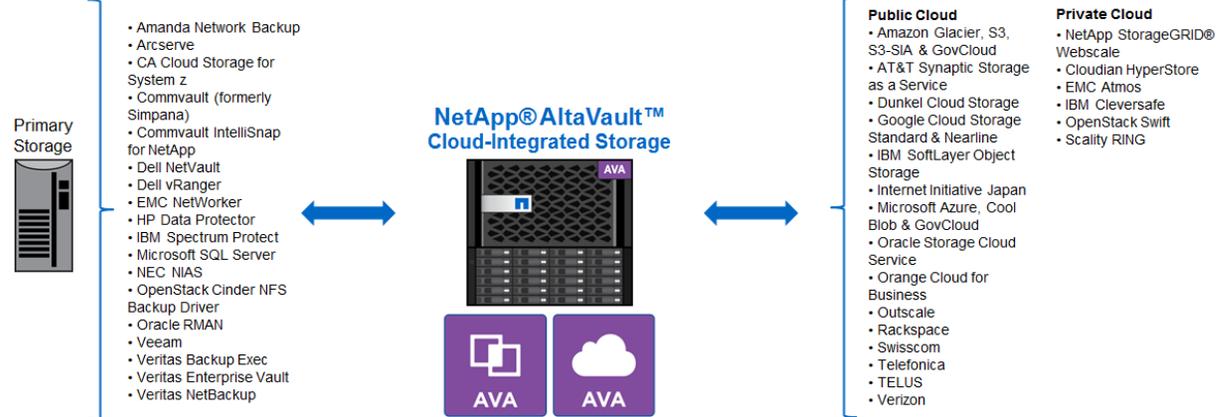
Ref#	Category	Question	Supplier Response
		<p>Scale Out with FlexPod Repeatable, Consistent Deployments</p> <p>Scale out with standard and proven configurations</p> <ul style="list-style-type: none"> • Predictable and highly efficient • Manage pools of resources, not individual systems • Easily scale vertically or horizontally  <p>FlexPod is the leading Converged Infrastructure through a partnership with Cisco. FlexPod®, a fully tested, cost-effective data center platform, supports both virtualized and non-virtualized resources. FlexPod offer over 100 validated architectures and have over 7,000 customers running FlexPod. It can be easily implemented and managed within existing infrastructures while scaling nondisruptively to meet future cloud computing objectives.</p>	
Q8.	Server/Storage	The Commonwealth is including Bronze thru Platinum service levels for Server as examples of service categories. What would be required to implement this model in the Commonwealth?	See below.
		<p>As highlighted in Question 6, it is extremely important to examine your existing infrastructure and the application workloads and the types of disks that the volumes reside on. The I/O Density metric referenced is one method to assist in defining service levels. Based upon experience in assisting customers with this type of metric, NetApp has developed a Storage Service Design Workshop to enable IT decision makers to build a service provider business model for data services. The workshop was developed with NetApp Cloud Service Provider partners, and is now also being delivered for enterprise IT leaders. It compresses months of service business design into one day of actionable outcomes. The result is lower cost with higher performance and agility.</p> <p>Unlike the tiered hardware methodology of the past, the NetApp Storage Service Design Workshop designs software-defined virtualized storage service levels abstracted from the hardware. It aligns the storage service to the wide range</p>	

Ref#	Category	Question	Supplier Response
		<p>of cost and price required by applications. It simultaneously leverages the latest flash technologies for high performance, while also leveraging very dense disk capacity for very low cost.</p> <p>The Service Design Workshop uses a combination of IO density analysis, design tools, and patented software to define service levels, service metrics, IO budgets, cost, price, and margin per service level. The result is a price per GB per service level to provide the range of price and performance that the business requires. It often identifies substantial reductions in cost with performance and agility improvements. It defines the patented Adaptive QoS policy so that the IT organization can implement and manage service levels without additional labor. It optionally defines data protection services levels or Object Service levels.</p> <p>IT leaders use the outcomes of the workshop as the foundation for their storage strategy, and the blueprint for implementing internal, hybrid, or external cloud.</p> <p>This workshop addresses the following customer challenges:</p> <ul style="list-style-type: none"> • Business dissatisfaction with storage services • Lack of defined storage services with a service metric • Unpredictable storage cost, performance, and agility • Over-provisioned storage • Lifecycle management issues • Stranded storage • Storage performance issues • Lack of defined data protection service levels <p>The following are the outcomes of the workshop:</p> <ul style="list-style-type: none"> • A set of storage service levels aligned to actual application demand • Service metrics that can be measured, monitored and reported • Cluster plans with IO Budgeting of thin provisioned IOPS to deliver SLAs with higher utilization and fewer performance issues • Customized financial analysis with fully burdened cost, price, and margin • Adaptive QoS Policy definitions for operating the cluster according to the service design • Data Protection Service levels according to data criticality 	

Ref#	Category	Question	Supplier Response
Q9.	Server/Storage	Do you see a better way to bundle or spilt the services we are requesting, in order to more effectively integrate with other towers (including MSI), and obtain more flexibility in the Commonwealth’s IT environment while maintaining appropriate Governance and security?	See below.
		<p>To obtain greater flexibility while maintaining governance and security VITA should consider using bundling services with an architecture designed using a converged infrastructure. With a converged infrastructure solution, you can:</p> <ul style="list-style-type: none"> • Reduce risk with a validated, simplified data center solution that offers built-in secure multi-tenancy capabilities, business continuity, and disaster recovery features, plus a support alliance model to enable a safe and proven path from virtualization to the cloud. • Increase business agility with flexible IT that can scale up within each layer of the components, or scale out without architectural change to fit a variety of use cases and environments (VDI, SAP®, Oracle®, Microsoft® Exchange 2010, SQL Server®, and SharePoint®). Anticipate and respond to business demands. Deploy new services fast. Simplified, automated tasks increase productivity and slash time to service for IT customers. • Improve data center efficiencies to lower TCO with fewer operational processes and less energy consumption, optimized resources, and reduced time to deployment for applications. With Flash memory approaching disk pricing, you can deliver high-performance, cost-effective solutions. • Performance. Deploy high-speed, all-flash architectures to deliver application performance that drives business outcomes. <p>Integrated and standardized components let you scale up or out to meet the demands of your enterprise applications. You can plan the power, floor space, usable capacity, performance, and cost of each FlexPod deployment with accuracy.</p> <p>Converged infrastructure configurations are delivered as a complete data center in a one-rack cabinet, ready to be deployed. You can accelerate transformation from traditional silos to a virtualized, shared environment with standardized and scalable building blocks that leverage a next-generation data center solution from Cisco, NetApp, and leading OS and hypervisor partners.</p> <p>NetApp’s converged infrastructure solution combines NetApp storage and Cisco switches and servers into a solution named FlexPod. FlexPod®, a fully tested, cost-effective data center platform, supports both virtualized and nonvirtualized resources. It can be easily implemented and managed within existing infrastructures while scaling nondisruptively to meet future cloud computing objectives. We offer over 100 validated architectures and have over 7.000 customers running FlexPod</p>	

Ref#	Category	Question	Supplier Response
		<p>With over 100 FlexPod validated architectures, FlexPod continues to expand business-critical workload support, adding to the already broad validations to date, and provides assurance of application support through extensive lab validation.</p> <p>FlexPod supports the broadest range of virtualized or bare-metal options, including VMware vSphere, Windows Hyper-V, Citrix XenServer, Oracle OVM and RedHat Enterprise Virtualization. Validated workloads include applications from 4 of the 5 largest software companies, VMware, Microsoft, SAP, Oracle, as well as from Citrix and others. Secure separation and multi-tenancy is a popular use case, recently delivered through a design using Cisco Secure Enclaves.</p> <p>Most recent publications include: “FlexPod Datacenter with VMware vSphere 5.5 and Cisco UCS Director”, “FlexPod Datacenter with VMware vSphere 5.5 U1, Cisco UCS Director, Cisco Nexus 9000, Cisco ACI”, “FlexPod Datacenter with Microsoft SQL Server 2014 High Availability” and “FlexPod Datacenter for SAP HANA with Cisco Nexus 9000 Switches”.</p> <p>FlexPod is a meet-in-the-channel solution, with trained resellers delivering FlexPod solutions. Our reseller partners have NetApp channel certification and Cisco UCT, DCA, and ATP certifications. We now have more than 1,100 joint partners across the globe who can deliver FlexPod, including 13 out of 14 of the world’s largest system integrators.</p> <p>Our network also includes 125 FlexPod Premium partners. This elite group of resellers has the highest level of training and certification and has made a significant investment in a FlexPod services practice.</p>	
Q10.	Server/Storage	<p>Are their new Storage offerings, like Object Based Storage or predictive storage, that the Commonwealth should include in storage or enhanced services? How do you offer and charge for virtual storage?</p>	<p>See below.</p>
		<p>Yes, there are many new storage offerings that should be included in VITA environment to enhance services such as object based storage and both virtual and physical cloud backup appliances.</p> <p>Object-based storage solutions should provide intelligent policy-driven global data management. Object-based storage solutions simplify the task of managing petabytes of unstructured data and billions of objects globally, by providing a high available, durable distributed storage architecture, and sophisticated data management features. Object-based storage should be available as an appliance and software defined storage solution.</p> <p>StorageGRID enables ubiquitous data access by providing a global object namespace formed by a distributed “grid” of storage nodes, upon which multiple storage tenants can be created and multiple protocols (S3 API, Swift API, CDMI, SMB, NFS) can be used to service both cloud and enterprise unstructured data applications.</p>	

Ref#	Category	Question	Supplier Response
		<p>Object-based storage should offer software-defined object storage which may be mixed and matched into a single cluster. Depending on how it is used, object-based storage becomes an integrated component of the data fabric, a standalone object fabric, or both. It is an integrated part of the Data Fabric that serves as a target for storage array object store data tiering, SolidFire backups and AltaVault backups.</p> <p>The following is an example of where Object based storage and the cloud backup appliance (AltaVault) reside within the NetApp data fabric.</p>  <p>Backing Up to Cloud</p> <p>A cloud backup appliance backs up data to any cloud and supports a wide variety of backup software. It is a modern day replacement for tape that provides the economic and geolocation advantages of cloud implementations. NetApp's cloud backup appliance is named AltaVault. The following diagram shows the backup software and clouds that AltaVault integrates with.</p>	



AltaVault integrates with existing storage and software to securely send data to any cloud.

Object Store Integration

The data fabric supports multiple use cases for object stores, including a target for AltaVault backups, direct volume backup/restore, and object store data tiering. For these use cases, the cloud backup appliance manages the data stored in the repository. The implementation and configuration of the repository itself are flexible. For on-premises deployments, the software that implements the object protocol can be object based storage or open-source solutions such as OpenStack Swift and CEPH. The back-end physical storage for the repository can be a NetApp storage array or any third-party storage server.

Software-defined scalable storage

Software-defined scalable storage software architecture should be offered and can be deployed on your choice of commodity servers, and disk media (HDD or SSD). NetApp’s ONTAP Select is a software-defined solution that offers robust enterprise storage services that are deployed on VITA’s choice of commodity hardware and hypervisor. It combines the best of the cloud for agility and for granular capacity scaling with the flexibility, resilience, and locality of on-premises storage. ONTAP Select can help VITA:

- Deploy NetApp ONTAP in various ways
- Increase productivity without increasing cost
- Provide enterprise data protection and efficiency
- Enable a one-box branch office data center

In today’s IT environment, customers need the flexibility and efficiency that a cloud environment provides. For fast deployment of IT resources or for applications with varying usage needs, the cloud provides a level of flexibility unmatched by any on-premises solution. This allows VITA to use what they need when they need it. This has become a go-to deployment model for applications that are either spun up or spun down on demand to applications to new applications that do not yet

Ref#	Category	Question	Supplier Response
			<p>have a clear steady state operation. However, when it comes to data, it is not this straightforward. Because data is difficult to pick up and move to a new location, there needs to be a simple, controlled solution that enables IT professionals to manage their data with the same functionality that their own private environments offer.</p> <p>Another example of software-defined storage is NetApp ONTAP Cloud. ONTAP Cloud is a software-only storage appliance built on the world’s #1 branded storage operating system, NetApp ONTAP. ONTAP Cloud provides a flexible data storage solution that fits different customer storage requirements from small-capacity, low-performance applications to medium-scale applications with higher performance needs. You can build virtual storage directly in Amazon infrastructure resources using ONTAP Cloud. ONTAP Cloud is deployed and managed from OnCommand Cloud Manager as an Amazon Elastic Compute Cloud (EC2) compute instance that manages Amazon EBS storage and in Microsoft Azure.</p> <p>Simple Point-and-Click Deployment</p> <p>When VITA needs a new storage environment in the cloud, with OnCommand Cloud Manager, you point and click to bring up a new instance of ONTAP Cloud. Choose the amount of storage capacity and performance, and within minutes you will have an operational ONTAP storage environment.</p> <p>Choose How to Consume Your Storage from Multiple Procurement Models</p> <p>VITA can use ONTAP Cloud either on an hourly, metered model or on a six-month subscription basis:</p> <ul style="list-style-type: none"> • Hourly/metered. Resources are procured straight from the Amazon Marketplace and billed to your Amazon account. • Subscription. You purchase the subscription from NetApp, and a key is used in Cloud Manager for each instance you deploy. <p>In each case, Cloud Manager is used to deploy the instance. Both payment models include a NetApp Software Support Plan.</p> <p>ONTAP Cloud provides a data storage solution that fits many different workload requirements from small to large capacity environments with smaller performance needs. It is deployed and managed from OnCommand Cloud Manager as a virtual machine on Amazon EC2 compute and manages Amazon EBS storage. This allows VITA to build an enterprise storage solution directly on Amazon resources.</p> <p>Building your cloud storage environment on ONTAP Cloud provides VITA enterprise-class features for your cloud storage. With ONTAP you can:</p> <ul style="list-style-type: none"> • Get non-disruptive storage operation with multi-region high-availability. • Minimize your cloud storage resources with efficiency features such as data deduplication, compression and zero capacity snapshot copies which can all act on your primary data. • Provision both NAS and SAN storage for your application environment with CIFS, NFS, and iSCSI support.

Ref#	Category	Question	Supplier Response
		<ul style="list-style-type: none"> • Provide near-instantaneous point-in-time backups of your data with zero-impact NetApp Snapshot™ copies. • With the ONTAP SnapManager® tools suite, you get application consistency with those Snapshot copies. • ONTAP provides #1 storage replication SnapMirror® technology, which brings your hybrid cloud together by tying your on-premises FAS storage to your ONTAP Cloud environment. 	
Q11.	Server/Storage	The Commonwealth is interested in ensuring it provides optimal storage performance and availability for VITA and VITA's Customers. How do you propose to provide and measure this performance?	See Below
		<p>The use of a reporting and management tool or tools is common and provides consistent insight across your data center and your clouds so you can monitor and manage a multi-tiered and multivendor storage, compute, and switching infrastructure. You can manage the IT infrastructure as an end-to-end service by integrating the entire IT service delivery chain. This is important to determine non-storage related bottlenecks that may or may not be affecting various service levels.</p> <p>An enterprise storage resource management (SRM) tool should be agentless and help you optimize your current infrastructure, allowing you to right-size operations to meet service level objectives.</p> <p>SRMs identify workloads that are suitable candidates for re-tiering and potential migrations to the cloud. Once services or applications have been migrated to the cloud, the SRM can provide validation that workloads continue to perform as expected and meet business demands. It provides visibility into the on-premises and off-premises assets so VITA can monitor and manage across compute and storage resources, regardless of geographic location and manufacturer. It maps the relationship between application, platform, infrastructure, and storage siloes and monitors the capacity and performance metrics along service levels and cost.</p> <p>With a SRM tool, VITA can manage and monitor infrastructure across a hybrid cloud environment, focusing on three key areas:</p> <ul style="list-style-type: none"> • Improving operations through simplified troubleshooting and analysis • Monitoring and promoting service quality to optimize resources and reduce capex and opex • Managing and analyzing costs, and creating showback and chargeback reporting <p>The SRM establishes the baseline service level performance. This helps VITA compare actual service-level agreements (SLAs) vs. expected SLAs. It also allows IT administrators to right size the environment and to make informed decisions on which workloads are good candidates for hosting in an off-premises and/or cloud data center.</p> <p>The SRM also delivers consistent insight across your data center so you can monitor and manage your multivendor storage, compute, and switching infrastructure. SRM can help you optimize your current infrastructure, allowing you to right-size</p>	

Ref#	Category	Question	Supplier Response
		<p>operations to meet business demands. It simplifies the process of determining what and when to buy. With an enterprise SRM, you can manage the IT infrastructure as an end-to-end service by integrating the resources into the company’s entire IT service delivery chain.</p> <p>Implementation of an enterprise SRM will allow VITA to quickly identify misused, misaligned, or underused assets for more efficient use of your infrastructure. When integrated into your daily operations, it reduces service delivery time and yields significant operational improvements. Administrators focus less time on reactive troubleshooting and routine tasks and more time on business-critical projects.</p> <p>This tools ability to understand a host’s path to storage, combined with device performance information, results in unparalleled visibility into the cost efficiency of delivering infrastructure service to an application.</p> <p>The SRM should provide a global view of your storage infrastructure so you can track your storage utilization in multiple locations simultaneously. It provides trending information that shows you how much storage capacity you have at each tier, the number of used and available switch ports, Fibre Channel bandwidth, top applications, and how much time you have until your data centers are full. With this information, you will also accurately predict how much capacity you are likely to need in the next period. As a result, you can make more informed and timely business decisions based on real-time data, vastly simplifying capacity management. You buy what you need, when you need it.</p> <p>Detailed business-level reporting gives you full cost awareness. You can immediately see how much storage, compute, or switching resources each business unit or application uses in each storage tier over a given period of time. Comprehensive information allows you to work with business units to make more intelligent decisions about how storage is being used. You will quickly identify datasets that are misplaced and reduce the amount of expensive tier 1 storage you need. You can assign a value to each tier of storage to simplify the process of charging business units for resources used.</p> <p>Quality of Service QoS (Quality of Service) can help VITA manage risks around meeting performance objectives. You can use Storage QoS through the data management application or the CLI to limit the throughput to workloads and to monitor workload performance. To address performance problems, you can limit workloads proactively or reactively.</p> <p>Automation Automation tools integrated into the SRM tool and data management tools should be able to provide a framework for implementing Service Level Objectives (SLO). Using the SLO, storage service providers can optimize utilization, performance modelling, trend analysis, and asset planning.</p>	

Ref#	Category	Question	Supplier Response
Q12.	Server/Storage	<p>The Commonwealth has traditional x86 virtual servers, but it is also interested in the capabilities of a private cloud. Could they be combined or left separate? Please describe how this could be accomplished most effectively.</p>	<p>See below.</p>
		<p>VITA has a variety of cloud deployment models to choose from: private cloud in the data center, public cloud offerings from service providers, and hybrid cloud that combines multiple clouds. VITA may select a combination of deployment models to define the topology and span of your data fabric.</p> <p>Data requirements differ between each cloud model, and everyone’s cloud is different—so how can data be integrated in the cloud to VITA’s specifications?</p> <p>Private clouds may reside in VITA’s own data center or be hosted in remote facilities. Products integrate data management capabilities across all commercial or open-source hypervisor and cloud orchestration frameworks. Many products can tightly integrate data management capabilities with these ecosystems. The storage solution choices range from purpose-built to software-defined storage.</p> <p>A flexible data fabric enables customers to respond and innovate more quickly because data is free to be accessed where it is needed most. Customers can realize the full potential of their hybrid cloud and make the best decisions for their business. Over time, the VITA’s data fabric will expand to cover more environments. With each new weave, the data fabric becomes more textured, more expansive, and more capable.</p> <p>To fulfill this vision, one must define the data fabric technology for hybrid cloud. Products, services, and partnerships help customers seamlessly manage their data across their diverse IT resources, spanning flash, disk, and cloud. IT has the flexibility to choose the right set of resources to meet the needs of their applications and the freedom to change them whenever they want.</p> <p>A true data fabric delivers on five major design principles:</p> <ul style="list-style-type: none"> • Control. Securely retain control and governance of data regardless of its location: on premises, near the cloud, or in the cloud. • Choice. Choose cloud, application ecosystem, delivery methods, storage systems, and deployment models, with freedom to change. • Integration. Enable the components in every layer of the architectural stack to operate as one while extracting the full value of each component. • Access. Easily get data to where applications need it, when they need it, in a way they can use it. • Consistency. Manage data across multiple environments using common tools and processes regardless of where it resides. 	

Ref#	Category	Question	Supplier Response
		<p>When a data fabric delivers on these principles, it enables customers to increase efficiency, improve IT responsiveness, and ultimately accelerate innovation.</p> <p>In a hybrid cloud environment automation and orchestration are essential elements. Workflow Automation eliminates slow, error-prone manual processes for storage management. It enables storage administrators to provision storage for fast turnkey deployments of applications including VMware®, Oracle®, Microsoft®, SAP®, Citrix, and others. It can be used to construct, customize, test, publish, and activate a broad range of storage workflows, including:</p> <ul style="list-style-type: none"> • Provisioning, migrating, or decommissioning storage for databases or file systems • Setting up a new virtualization environment, including a storage switch or datastore • Setting up storage for an application as part of an end-to-end orchestration process • Setting up converged infrastructure software or virtual desktops • Performing storage cloning • Conducting centralized replication software activation <p>Improve productivity in your organization by automating repeatable manual storage-management processes. Use automation to construct, customize, publish, and activate a broad range of storage workflows.</p> <p>You can:</p> <ul style="list-style-type: none"> • Provision, clone, migrate, or decommission storage for databases or file systems. • Set up a new virtualization environment, including a storage switch or datastore. • Set up virtual or cloud storage for an application as part of an end-to-end orchestration process. • Set up converged infrasture for virtual desktops. • Perform storage cloning. • Conduct a centralized replication software activation. • Enable self-service, storage as a service (PDF), and more with faster delivery of new standard and custom storage services. • Deploy Software Defined Storage (SDS) (PDF) for your Software Defined Data Center (SDDC) (PDF). • Automation enables one-click automation and deployment of applications, including VMware® (PDF), Oracle®, Microsoft®, SAP®, Citrix, and others. Reduce the cost of your storage management while enabling the use of best practices. <p>Cloud storage management tools are also necessary in a hybrid cloud environment. It can simplify the installation and resource assignment of all your cloud storage instances and is the deployment environment. These tools also ease the day-to-</p>	

Ref#	Category	Question	Supplier Response
		<p>day requirements of your cloud and private cloud environments, including configuring, provisioning, and monitoring your active virtual and hardware storage nodes.</p> <p>Cloud storage management tools integrate with your cloud environment, allowing you to insert credentials so that it gathers the required resources to meet your storage requirements. With visibility into the actual resources consumed by each instance, VITA can monitor and provides valuable cost feedback to your administrator on the cost of resources over time. This information is then used to help you decide how to best move workloads to the most cost-efficient environment.</p> <p>Key features should include:</p> <ul style="list-style-type: none"> • Simplifies configuration and deployment of software-defined storage • Offers central point of control for all cloud instances • Provides cloud resource cost monitoring • Eases license and entitlement management • Facilitates hybrid environments that include software-defined and private cloud storage 	
Q13. b	Server/Storage	How does Database as a Service make sense for an Enterprise like the Commonwealth? Do you have any recommendations for how to charge for enhanced Database services (i.e., Development DBA)?	See below.
		<p>Database as a Service (DBaaS) can be a powerful offering approach to the storage and management of structured data. DBaaS is one of a growing number of other cloud-based services. Whether it is in a Private Cloud, Public Cloud, or a Hybrid Cloud model there are some potentially very costly and potentially disastrous challenges if it does not have the proper underlying technologies.</p> <p>Benefits:</p> <p>DBaaS delivers database functionality similar to what is found in relational database management systems (RDBMSes) such as SQL Server, MySQL and Oracle. Being cloud-based that it is not a proprietary infrastructure or proprietary cloud, DBaaS provides a flexible, scalable, on-demand platform that's oriented toward self-service and easy management, particularly in terms of provisioning a business' own environment. DBaaS products typically provide enough monitoring capabilities to track performance and usage and to alert users to potential issues. The products can also generate at least some degree of data analytics.</p> <p>Challenges:</p> <p>Disadvantages to the DBaaS model include a lack of control over network performance issues, such as unacceptable latency and application failures. Some DBaaS products don't support capabilities of the typical RDBMS, such as data compression and table partitions. Hardware proprietary hardware lock-ins and proprietary clouds that make it virtually impossible to have application and data mobility and execute an effective contractually required exit strategy.</p>	

Ref#	Category	Question	Supplier Response
		<p>A stove pipe-solution of any kind will work against a long term price and cost competitiveness and leave assets sitting idle and not generating usage or revenue. Before committing to DBaaS, it's essential to assess specific requirements and ensure they are satisfactorily addressed.</p> <p>Economic challenges are very significant! For every production database there are about seven (7) other copies being used for data protection, disaster recovery, and application development. Without underlying technologies, it quickly becomes more cost effective to work outside of the VITA program.</p> <p>Suggestions:</p> <p>These are the suggested underlying technologies whether in a Private Cloud, Public Cloud, a Hybrid Cloud: These are the suggested underlying technologies whether in a Private Cloud, Public Cloud, a Hybrid Cloud:</p> <ul style="list-style-type: none"> • DBaaS should be hosted on non-proprietary hardware infrastructure and compatible with industry standard cloud service providers. • Space-less snapshots (a Storage Networking Industry Association term) for point-in-time-copies that are safe, secure, have no performance impact and don't incur additional and potentially large fees until absolutely necessary. • Space-less clones (a Storage Networking Industry Association term) for point-in-time-clones that are safe, secure, have no performance impact and don't incur additional and potentially large fees until absolutely necessary. • Snapshot and clone management tools to simplify backup, restore, and clone lifecycle management with application-integrated workflows. • Be integrated with other storage efficiency tools such as but not limited to thin provisioning, deduplication, and flexible volumes. 	
Q14.	Server/Storage	The Commonwealth wants to provide cost effective solutions to VITA and the Agencies. What do you describe as the key cost and value drivers that would help the Commonwealth offer services that are not cost prohibitive to deliver? Do you see any requirements in the description of services in this RFI that would cost more to meet than the business value they provide?	
Q15.	Security	The Commonwealth is interested in an Enterprise Key Management System for compliance and security. How do you propose the Commonwealth request Key Management services?	

Ref#	Category	Question	Supplier Response
Q16.	MSI	Identity and Access Management (IAM) services and the systems supporting those functions are currently split between multiple providers. How do you propose bringing these services together to provide a single integrated service?	
Q17.	MSI	The Commonwealth has defined the cross-functional requirements in Exhibit 2.2. Do you have any comments in the structure and handoffs identified in this document? Do you have any prior experience working with MSIs? Do you have any recommendations regarding the approach for how the MSI should interact with the other suppliers?	
Q18.	MSI	Do you see any benefits or challenges in requiring the Data Center facility provider to also be responsible for providing common operating monitoring groups in the same solution (e.g., CMOC, ITOC, SOC, NOC)?	
Q19.	MSI	The Commonwealth currently has a single traditional DR solution that requires the entire backup Data Center to be failed over. There is a desire to move to a more flexible solution that allows single Agencies or even applications to be failed over individually. This process requires design, development, operations, testing, and coordination. What role should VITA's MSI should play in this effort in relation with the Server Services provider?	
Q20.	Data Center	The Commonwealth is interested in Multi-site High Availability and Disaster Recovery Services. At a high-level, what do you recommend on the number and locations of centralized Data Centers the Commonwealth should utilize for that purpose? Any tradeoffs?	See below.
		<p>The number of locations and centralized data centers can virtually be unlimited with the right data management and data protection technologies deployed. In the central data center and the remote locations where low latency response times are critical and autonomy in other locations is desired there is still the need for a multi-site data protection, high availability, and disaster recovery approach. With a comprehensive plan the Commonwealth can architect a VITA data fabric that is secure, resilient, uses the latest technologies cost effectively, and provides options and alternatives to adapt to risks and challenges as they change over time.</p> <p>The Commonwealth may employ a hierarchal, distributed, or hybrid approach to a multi-site data protection, high availability, and disaster recovery plan. Today the market is certainly including cloud-like approaches for better economies, resiliencies, and responsiveness.</p>	

Ref#	Category	Question	Supplier Response
		<p>A hierarchical approach could be the VITA central data center providing the data protection, high availability, and disaster recovery to the 10 non-centralized. The VITA central data center could use a trusted service provider to offer cloud based data protection, high availability, and disaster recovery services. This however causes challenges if the central site is impacted thereby cutting off the remote sites from essential services.</p> <p>A distributed approach could be every-one doing their own data protection, high availability, and disaster recovery with a trusted service provider to offer cloud based data protection, high availability, and disaster recovery services. This however also introduces challenges with Governance, service levels, and cost controls.</p> <p>A hybrid approach is more practical starting at the 10 non-central sites having a private cloud based upon a common converged infrastructure with common administrative and operational solutions as the VITA central site. Just as one of many scenarios could be:</p> <ul style="list-style-type: none"> • Data protection – backups having the latest copy stored locally for quick recovery and current and previous backups being sent encrypted and compressed to be held by the trusted service provider. Should there be a need to recover the data then the VITA central data center or the remote site could retrieve the data securely and efficiently. If necessary, the VITA central site could retrieve on behalf of a remote site. • High availability – with a common converged infrastructure high availability is built into those designs for all sites. • Disaster recovery - with a common converged infrastructure in the event of a catastrophic failure at a remote site, the VITA central site could regain the data and begin providing the essential services. In the event of a catastrophic failure at the VITA central data center the trusted service provider could assume all processing. <p>Again this is only a quick example to a fairly complex issue that will change over time and new risks and challenges occur.</p>	
Q21.	Migration	Suppliers will be required to provide an implantation plan to specify how they will take over responsibility for the existing environment. The Commonwealth is also interested in recommendations with regard to how the Commonwealth could migrate or transform to new Service offerings. What do you recommend for this migration plan?	
Q22.	Enhanced Services	The Commonwealth is interested in receiving proposals to include new enhanced services, (e.g., Cloud, Analytics, Managed File Transfer) Can you recommend any other such enhanced services the Commonwealth should also consider including at the moment? How would you recommend these services be delivered?	See below.

Ref#	Category	Question	Supplier Response
		<p>VITA has many options and integrations available based on technology available today and needs to follow industry trends to adapt to the ever changing environment. The ability to remain flexible and leading-edge is critical when selecting a vendor especially if the term of this contract is 5-10 years.</p> <p>We recommend enhanced services that are part of the data fabric highlighted previously and fully integrated to a holistic solution that can extend additional services, including:</p> <ul style="list-style-type: none"> • Protecting investments in existing third-party storage arrays • Bringing data fabric capabilities to commodity, DAS systems • Leveraging open-source software-defined storage offerings • Backing up to public or private cloud object stores • Integrating with object stores <p>Increasingly, IT organizations do not have specialists dedicated to managing the server, networking, or storage infrastructures. Instead, IT generalists manage the entire infrastructure. Traditional approaches of monitoring application servers, networking, and storage infrastructure, typically with different vendor-provided tools, no longer fit the new data center paradigm. To address this challenge and to enable organizations to choose from a broad range of application ecosystems and cloud service providers, VITA should look at vendors who have developed a technology stack. The lowest layer of this technology stack includes APIs that enable automation and management integration with both third-party products and custom-built tools and workflows.</p> <p>As a result of these ecosystem integrations:</p> <ul style="list-style-type: none"> • Enterprises do not need to be specialized on any specific storage vendor. They only need to understand their ecosystem products. • Enterprises eliminate the need for homegrown tools by using tools and frameworks. • Enterprises can protect applications (including databases, SharePoint, and Exchange) without needing understanding of the data protection mechanisms of those applications. • Enterprises can tie their legacy systems into the modern infrastructure without changing processes. <p>Ecosystem Integration Layer</p> <p>Storage vendors should make significant investments to integrate innovative data management capabilities with the virtualization and cloud management tools. Vendors should contribute to OpenStack to support customers that choose to leverage its open-source management ecosystem.</p>	

Ref#	Category	Question	Supplier Response
		<p>The following highlights examples of industry leading technologies and the level of integration that NetApp has available to customers such as VITA that should be considered requirements in a future RFP:</p> <p>VMware</p> <p>The NetApp strategy for ecosystem integration with VMware is to enable self-service through VM granular data management that VITA storage administrators can safely expose to VM and application owners. NetApp added functionality such as rapid VM cloning to the native VMware vSphere user interface (UI). Today, deep integration with VMware means that the data management functionality of the Data Fabric can be seamlessly leveraged through vSphere native management APIs and UIs. These native integrations include:</p> <ul style="list-style-type: none"> • SnapMirror integration with VMware Site Recovery Manager for automation of DR testing and DR failover/failback scenarios • VAAI array integration with VMware vStorage APIs to enable offloading of cloning and other storage-intensive operations • VVols integration enables service-level aware provisioning and management of virtual disks and VMs and virtual disk granular data management integration between vSphere and the Data Fabric • vRealize Operations (vROps) Management Pack extends vROps with metrics and analytical views specific to NetApp for ONTAP storage systems • Qualification of NPS solutions to run attached to VMware public cloud platform, vCloud Air <p>Microsoft Windows Server and Azure Cloud Integrations</p> <p>Microsoft technologies for the private cloud are based on Microsoft Hyper-V and System Center Virtual Machine Manager (VMM). For the public cloud, the technologies are based on the Microsoft Azure cloud platform. Microsoft offers Azure Site Recovery (ASR) for hybrid cloud disaster recovery to connect multiple private and public clouds into a single IT infrastructure. ASR enables virtual machines to move between Hyper-V servers within a single site and between multiple sites in secondary private cloud data centers as well as Azure cloud data centers.</p> <p>Organizations that require replication between their private and Azure public clouds for Azure site recovery can replicate their Data Fabric SAN to NPS. NetApp integrations with Microsoft are enabled by the combination of protocol-level capabilities and industry-standards-based storage management integration with Microsoft System Center.</p> <p>The Microsoft System Center administrator has increased agility in the management domain.</p> <ul style="list-style-type: none"> • Automate workflows using System Center Virtual Machine Manager and System Center Orchestrator for workflow automation 	

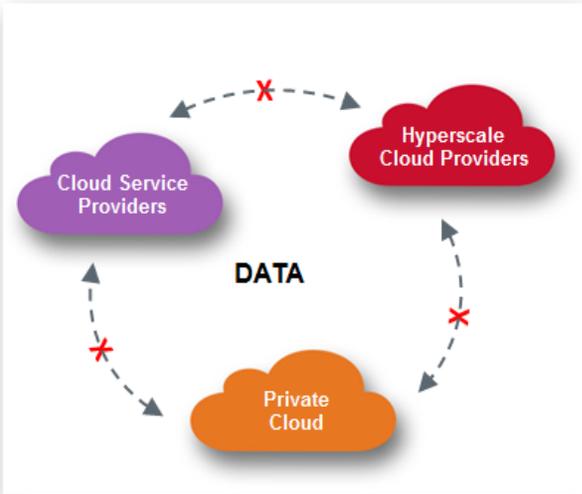
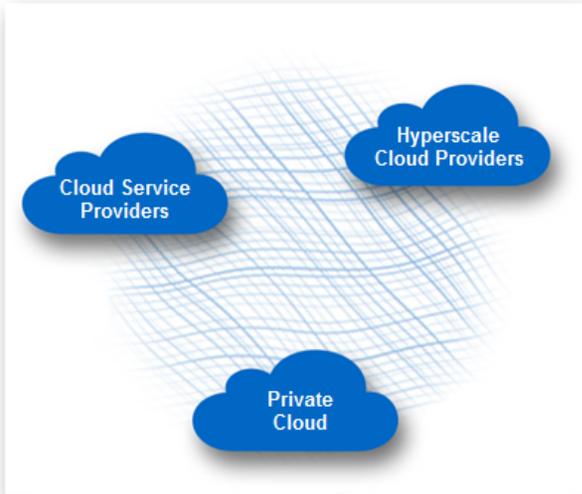
Ref#	Category	Question	Supplier Response
		<ul style="list-style-type: none"> • Monitor server and storage availability and capacity for Microsoft Windows Server Hyper-V VMs • Isolate problems using System Center Operations Manager alerts and health explorer views • Enable high availability and load balancing of management servers with OpsMgr Management Server Resource Pool • Leverage Windows Azure Pack (WAP) to provide service provider capabilities on top of ONTAP in a private cloud architecture <p>OpenStack</p> <p>NetApp contributes to OpenStack, supporting customers in their choice to leverage an open-source management ecosystem. OpenStack is the leading open-source cloud platform, and NetApp integrates OpenStack into our Data Fabric to make deployment of cloud services simpler, faster, and more scalable. NetApp OpenStack block storage (Cinder) integrations include:</p> <ul style="list-style-type: none"> • Storage provisioning and data management. Specific NetApp drivers for ONTAP, SolidFire and E-/EF-Series systems enable NetApp storage provisioning and data management capabilities. • Storage service catalog capabilities. NetApp Cinder drivers allow IT to create a catalog of storage capabilities that meet diverse application and tenant needs for efficiency, performance, availability, and protection. • Enhanced persistent instance creation with copy offload. The NetApp Cinder drivers for ONTAP make use of NetApp cloning technology to quickly and efficiently create multiple virtual machines from Glance images. <p>NetApp is driving the addition of a shared file system service known as Manila, with shared file systems underpinning much of the total storage shipped worldwide.</p> <p>Containers</p> <p>With the availability and scale of cloud platforms, application architectures are evolving to capitalize on their advantages. This often means the adoption of a service-oriented architecture or a more modern microservices architecture. Both encapsulate the functionality of a portion of the application into a component which can be independently developed, deployed, scaled, and even replaced nondisruptively. Such components are known as containers.</p> <p>Docker abstracts container instantiation, decoupling them from the underlying operating system, helping facilitate the movement to distributed, container-based microservices. This application architecture presents new challenges for accessing persistent data from many different locations simultaneously.</p> <p>To address these challenges, NetApp provides a Docker volume plugin that allows the management and attachment of persistent storage devices to containers across multiple hosts. This removes the burden of data management from the application and simplifies microservice components while providing enterprise-class storage performance, efficiency, and</p>	

Ref#	Category	Question	Supplier Response
		<p>flexibility. Today, the plugin supports NFS and iSCSI protocols for ONTAP systems, with support for additional platforms coming in the future.</p> <p>Cloud Manager</p> <p>OnCommand Cloud Manager simplifies the creation and management of ONTAP Cloud instances in the cloud. OnCommand Cloud Manager is the primary portal for establishing ONTAP Cloud endpoints in public clouds and managing cloud resources in the data fabric. It has simplified wizards for common workflows such as creation, resource provisioning, and replication. Hybrid clouds may be constructed by simply dragging and dropping FAS systems to ONTAP Cloud systems and establishing a SnapMirror session for data replication. In addition, OnCommand Cloud Manager exports a RESTful API set so that higher level tools can automate operations.</p> <p>Application Integration</p> <p>The NetApp SnapDrive, SnapManager, SnapCenter, and Snap Creator family of products empowers self-service data management by DBAs and SharePoint and Exchange application owners. VITA can benefit from the data management capabilities of ONTAP and the replication capabilities of the data transport to automate critical enterprise application lifecycle tasks, including:</p> <ul style="list-style-type: none"> • Simplifying storage layout, planning, backup, and restore operations • Reducing application server data recovery times from hours to minutes leveraging NetApp Snapshot, SnapMirror, and SnapVault technologies • Providing clone lifecycle management to accelerate deployment of new releases and new applications <p>In addition to traditional on-premises deployment models, these application integrations support NPS and ONTAP Cloud deployment models as well as hybrid cloud solutions where the application data is transported by SnapMirror or SnapVault across sites, clouds, and deployment types. Fully integrated solutions include:</p> <ul style="list-style-type: none"> • Microsoft SQL Server • Microsoft SharePoint • Microsoft Exchange • Oracle databases • SAP systems <p>Snap Creator and SnapCenter extend these capabilities to be leveraged for additional commercial and custom databases and applications.</p>	

Ref#	Category	Question	Supplier Response
		<p>Backup Management Integration</p> <p>Backup and recovery is a key use case for data transport. Many enterprises have dedicated teams and infrastructures for their enterprise backup architectures, and NetApp understands how important it is to fit in with VITA's chosen enterprise backup management architecture.</p> <p>NetApp has partnered with most major enterprise backup management software vendors to provide integrated management of the Data Fabric:</p> <ul style="list-style-type: none"> • CommVault® software is fully integrated with NetApp Snapshot technology for primary, vault, and mirror data. It also includes deduplication-aware replication and tiering across storage and cloud repositories. Commvault software is also supported in NPS deployment configurations. NetApp also resells Commvault IntelliSnap for NetApp software which offers a more affordable way to deploy Commvault software with NetApp storage. • Veritas NetBackup integration with Replication Director enables a similar value proposition for NetBackup users. • Veeam is an easy-to-use and affordable backup and Availability solution, providing fast, flexible and reliable recovery of virtualized applications and data. 	
Q23.	Enhanced Services	As the technology landscape changes in the Commonwealth's environment, could you describe other enhanced services that VITA and VITA Customers should consider in the future?	
Q24.	Enhanced Services	What would you propose as a good business case for virtualizing the desktop (offering VDI)?	
Q25.	Data Center LAN	What do you recommend as the best demarcation point between the Data Center LAN and the Network or WAN? The Commonwealth wants to make the cleanest scope separation for a future WAN Network RFP.	
Q26.	Data Center LAN	In the current RFI, the Commonwealth has bundled Data Center LAN services (e.g., switching, routing, load balancing and firewall) with Server and Storage services. Do you find any challenges, issues, or concerns with this approach and why? Any recommendations?	
Q27.	Data Center LAN	The Commonwealth did not bundle Data Center LAN services (e.g., switching, routing, load balancing and firewall) with the Data Center Facility services (e.g., HVAC, power, raised floor). Do you believe this is the correct approach? Do you have any recommendations?	

Ref#	Category	Question	Supplier Response
Q28.	Data Center LAN	The Commonwealth is considering decoupling the Data Center Facility services from the Server, Storage, and Data Center LAN services. What do you think of this approach? What do you think are the advantages, disadvantages and tradeoffs of splitting the facility services out versus coupling these services with Server, Storage, Data Center LAN?	
Q29.	Data Center LAN	Supplier is expected to provide centralized Data Center LAN services. Should LANs in non-centralized Data Centers be part of the scope for Data Center LAN services or bid as part of Network/WAN in a future procurement? What would be the pros/cons and tradeoffs?	
Q30.	Data Center LAN	If the solution includes new Data Centers, who should provision and manage the network connections between the Data Center locations? Should it be the Network Provider, the Data Center Provider or the Server, Storage, Data Center LAN Provider?	
Q31.	Data Center	How does the Supplier propose to migrate Server, Storage, Data Center LAN services out of the CESC datacenter by June 2019 or earlier? Describe how the Supplier would seamlessly migrate out of CESC like-for-like, transform to new services, or a combination of the two? What are the recommended approaches?	
Q32.	Cloud Services	The Commonwealth is interested in a solution that integrates traditional hosting services with new private, community, and public cloud offerings. How do you propose integrating these services?	See Below
		<p>VITA has a variety of cloud deployment models to choose from: private cloud in the data center, public cloud offerings from service providers, and hybrid cloud that combines multiple clouds. VITA may select a combination of deployment models to define the topology and span of your data fabric.</p> <p>Data requirements differ between each cloud model, and everyone's cloud is different—so how will your storage infrastructure be managed in the cloud to VITA's specifications?</p> <p>Multi-cloud endpoints not only provide VITA with a choice of environments, but also enables you to avoid cloud vendor lock-in, protect assets in the event a particular cloud is compromised, and consistently and seamlessly manage assets regardless of geographical location. Solutions must support a wide array of virtualized environments and clouds today and will continue to expand to more clouds. NetApp has over 275 NetApp Service Provider Partners around the globe that offer dedicated support.</p> <p>Private Cloud</p> <p>Private clouds may reside in VITA's own data center or be hosted in remote facilities. Products must integrate data management capabilities across all commercial or open-source hypervisor and cloud orchestration frameworks. Products must</p>	

Ref#	Category	Question	Supplier Response
		<p>tightly integrate data management capabilities with these ecosystems. The storage solution choices range from purpose-built to software-defined storage.</p> <p>Public Cloud</p> <p>Public clouds are resources made available by service providers who offer their own data centers and infrastructure for public use. Although the largest cloud providers operate at a scale at which they can design proprietary architectures, service providers typically choose from the same options used by enterprises architecting private clouds. Doing so enables the service providers to focus less on infrastructure and more on their core business of service innovation.</p> <p>Service providers utilizing NetApp infrastructure give VITA the ability to expand your data fabrics to the cloud by offering replication and D2D services. This allows the service provider’s customer base to efficiently onboard data into the cloud for use with the service provider’s services, paving the way for hybrid cloud architectures.</p> <p>In addition, SDS should be used to quickly create endpoint in AWS, bringing the value of ONTAP data management to cloud storage.</p> <p>Hybrid Cloud</p> <p>Hybrid cloud leverages both on-premises and public cloud resources so that VITA can build the cloud on your terms: multi-cloud and multidirectional, integrating any combination of resources that are on premises, near the cloud and in the cloud. For example, a hybrid cloud deployment may consist of a storage arrays in the corporate data center and virtualized storage in AWS, connected using a common transport to replicate data from one location to the other. This simple architecture establishes a data fabric that enables application data to be served and managed the same way for all locations.</p> <p>A hybrid cloud may also connect colocation managed and/or dedicated services with cloud resources. For example, organizations may deploy a private storage array cluster in a colocation facility and use a network exchange to achieve lower latency when connecting to public cloud compute. IT departments retain control of their data, from its physical location to retention policies and service-level objectives (SLOs), and gain the benefit of data mobility across environments through the connectivity that the data fabric provides.</p>	

Ref#	Category	Question	Supplier Response
		<p style="text-align: center;">Isolated Resources</p>  <p style="text-align: center;">The Data Fabric</p>  <p>Data Fabric connectivity through hybrid cloud architectures – <i>Data Fabric connects everything, across diverse platforms and incompatible data silos with no down time.</i></p>	
Q33.	Cloud Services	What would be the best practice with regard to Suppliers owning the cloud contracts and potentially transferring that contract to the Commonwealth? Should the Commonwealth own that contract outright? Are there any other alternatives to be considered?	
Q34.	Cloud Services	When the Commonwealth buys cloud services offerings how do you propose to identify where the data and services are located?	See below.
		<p>Identifying the location for the data and the subsequent services based upon citizen expectations, participating agency wishes, application and other technical requirements, and legal requirements such as HIPPA, CJIS, etc. Now with more citizens accessing services through their smart phones than their home PC this impacts application performance in many ways. Legal requirements also mandate certain solutions today that will change over the length of this contract, especially in areas concerning cyber security. The only thing that the Commonwealth should plan for is that change is constant.</p> <p>NetApp has helped many governments and leading corporations implement a customized data fabric that helps to safely, securely, and efficiently place data close to the resources and customers that need it the most, even if it is in two or more places at once. NetApp’s data fabric vision and associated products expand your cloud choices by connecting to many clouds</p>	

Ref#	Category	Question	Supplier Response
		<p>at one time whether they are private, public or hybrid and switch between those clouds at any time and change is dictated. NetApp can assist the Commonwealth in achieving the following benefits:</p> <ul style="list-style-type: none"> • Get cloud on the Commonwealth’s terms. Use your own private cloud and multiple, industry-leading clouds while maintaining complete control over your data no matter where it is or who you are allowing to access it. • Switch at any time. With a data fabric approach, the Commonwealth can put its data “in” multiple clouds, “next to” multiple clouds, and “in” your own private cloud. Once you make your first cloud connection you can add or switch to any or all of them—in minutes. • Own and control the Commonwealth’s data. You can meet your data compliance and sovereignty requirements because you know where your data is safely, securely, and efficiently located at all times. The data no matter where it is can be managed as a whole through one pain of glass to insure compliancy. 	
B. Financial/Server Storage			
Q35.	Pricing Structure	<p>The Commonwealth is interested in creating the best possible pricing structure for the Services. In light of that fact, Supplier is invited to both comment on the structure described in Exhibit 4.1 and 4.2, and to propose an alternate pricing structure if they believe that it will better serve the interests of both parties.</p> <p>The Commonwealth will contemplate any proposed pricing structure along five dimensions:</p> <ol style="list-style-type: none"> 1. Predictable: To the greatest extent possible, customers should be able to forecast charges ahead of time; changes in pricing that occur over time should not be a surprise. 2. Manageable: The pricing should not be so complex that it is needlessly difficult to administer. If quantities of work or equipment in the environment must be measured, then those quantities should be as easy and transparent as possible to measure. 3. Fair: The service pricing must be a reasonable proxy for a services provider’s underlying costs and should adequately recover those costs. Additionally, to the extent possible, the party that causes any incremental cost should bear that cost. 	

Ref#	Category	Question	Supplier Response
		<p>4. Incentives: All pricing structures will incentivize certain behaviors and discourage others. The goals of the sourcing program must be kept in mind when considering the behaviors that might be driven by a pricing structure. For example, a goal to encourage server consolidation might include reduced cost at a centralized data center.</p> <p>5. Flexible: As consumption moves up and down, the charges should also adjust. Technology is an evolving industry, and the ability to turn down an old service to turn up a new service is one of the benefits of an efficient IT sourcing agreement. Such adjustments may include minor volume changes month to month, significant scope additions, reductions, or terminations, and ability of large service providers to re-deploy investments.</p>	
Q36.	Inventory and Volume Collection	<p>The Commonwealth is interested in introducing new Resource Units that do not exist in the current contract; in order to fairly compensate Supplier for service delivered, and support the other goals described in question 36, Supplier is asked to describe their experience and approach to collecting and verifying volumes both before and after contract signing, and the approaches they use to adjusting financials in the event that the initial count is incorrect. For example, today database support is provided by the Supplier, but is not separately billable. The Commonwealth sees an advantage to separating out database support and making it a separate chargeable unit, how would the service provider collect and verify the volumes to support this chargeable unit?</p>	
Q37.	Asset Ownership	<p>The Commonwealth consumes certain services today which are underpinned by a set of assets (servers, firewalls, etc.). The Commonwealth (or their designee) has the right to acquire these assets. The Commonwealth has a desire to consume services; rather than own assets, and envisions Supplier acquiring these assets and using them to provide services back to the commonwealth. Please describe experiences acquiring assets from an incumbent, and also</p>	

Ref#	Category	Question	Supplier Response
		describe your recommend financial treatment of their cost recovery for these assets.	
C. Managed Security			
Q38.	Security	The Commonwealth's Managed Security description of services includes all the required scope bundled for a single experienced Security Supplier. Do you see any challenges or issues with this bundled model?	
Q39.	Security	Do have any concerns or recommendations regarding how to scale Managed Security Services to organizations of the size and complexity of the Commonwealth?	
Q40.	Security	Can you provide examples of comparable environments where you offer security services similar to those required by the Commonwealth?	
Q41.	Security	Have you supported Managed Security services in distributed environments - both physical and virtual including on premise and off premise implementations?	
Q42.	Security	Do you offer solutions supporting geographically diverse locations (e.g., remote location with satellite)?	
Q43.	Security	How have you implemented solutions similar to those in the Commonwealth making use of a centralized federated environment?	
Q44.	Security	What do you consider to be the key challenges and tradeoffs for the implementation of Managed Security Services in an environment similar to the Commonwealth?	
Q45.	Security	What do propose at a high level to be the key strategies and implementation elements of any typical security services solution migration?	
Q46.	Security	Can you recommend additional Managed Security Services that are not currently included or considered in the scope of described services?	
Q47.	Security	Based in your experience, what are the key challenges with regard to the regulatory requirements included in the scope of services? Do you have any recommendations based on your experience?	
Q48.	Security	Do you have any guidelines or best practices regarding whether the various Managed Security Services are better off being remotely hosted or on premise?	

Ref#	Category	Question	Supplier Response
Q49.	Security	Do you think you would be able to provide all the described Managed Security Services yourselves or will you require to subcontract any services to other third parties?	
Q50.	Scope Demarcation	VITA is interested in identifying the most efficient demarcation or bundling of these services between RFPs. For example, perhaps it would be more efficient to separate the Data Center facilities from the other Server services; or perhaps it would be better to include some or all of the Security services with the Server RFP. Please provide any further experience or suggestions regarding scope demarcation between potential RFPs.	
D. Financial/Managed Security			
Q51.	Pricing Structure	<p>The Commonwealth is interested in creating the best possible pricing structure for the Services. In light of that fact, Supplier is invited to both comment on the structure described in Exhibit 4.1 and 4.2, and to propose an alternate pricing structure if they believe that it will better serve the interests of both parties.</p> <p>The Commonwealth will contemplate any proposed pricing structure along five dimensions:</p> <ol style="list-style-type: none"> 1. Predictable: To the greatest extent possible, customers should be able to forecast charges ahead of time; changes in pricing that occur over time should not be a surprise. 2. Manageable: The pricing should not be so complex that it is needlessly difficult to administer. If quantities of work or equipment in the environment must be measured, then those quantities should be as easy and transparent as possible to measure. 3. Fair: The service pricing must be a reasonable proxy for a services provider's underlying costs and should adequately recover those costs. Additionally, to the extent possible, the party that causes any incremental cost should bear that cost. 4. Incentives: All pricing structures will incentivize certain behaviors and discourage others. The goals of the sourcing program must be kept in mind when considering the 	

Ref#	Category	Question	Supplier Response
		<p>behaviors that might be driven by a pricing structure. For example, a goal to encourage server consolidation might include reduced cost at a centralized data center.</p> <p>5. Flexible: As consumption moves up and down, the charges should also adjust. Technology is an evolving industry, and the ability to turn down an old service to turn up a new service is one of the benefits of an efficient IT sourcing agreement. Such adjustments may include minor volume changes month to month, significant scope additions, reductions, or terminations, and ability of large service providers to re-deploy investments.</p>	
Q52.	Inventory and Volume Collection	<p>The Commonwealth is interested in introducing new Resource Units that do not exist in the current contract; in order to fairly compensate Supplier for service delivered, and support the other goals described in question 36, Supplier is asked to describe their experience and approach to collecting and verifying volumes both before and after contract signing, and the approaches they use to adjusting financials in the event that the initial count is incorrect. For example, today database support is provided by the Supplier, but is not separately billable. The Commonwealth sees an advantage to separating out database support and making it a separate chargeable unit, how would the service provider collect and verify the volumes to support this chargeable unit?</p>	
Q53.	Asset Ownership	<p>The Commonwealth consumes certain services today which are underpinned by a set of assets (servers, firewalls, etc.). The Commonwealth (or their designee) has the right to acquire these assets. The Commonwealth has a desire to consume services; rather than own assets, and envisions Supplier acquiring these assets and using them to provide services back to the commonwealth. Please describe experiences acquiring assets from an incumbent, and also describe your recommend financial treatment of their cost recovery for these assets.</p>	

6. FEEDBACK REGARDING RFI DOCUMENTS

Please use the table below to provide commentary regarding specific documents included within this RFI, adding rows as necessary.

Ref#	Document/Section	Supplier Commentary
C1.		
C2.		
C3.		
C4.		
C5.		
C6.		
C7.		
C8.		
C9.		
C10.		