



NORTHROP GRUMMAN

Storage Tiers

Storage History

- Previously one tier of storage, defined as Tier 1, available at the Commonwealth Enterprise Solutions Center (CESC)
 - One storage resource unit (RU) included:
 - Backup
 - Refresh
 - Maintenance
 - Service level agreement (SLA) performance
- New amendment recognized the enterprise need for multiple tiers or platforms of storage to support enterprise operations

Storage Service	Billing Unit	Storage Type	Replication Supported	Location	Rate (per gigabyte)
Tier 1 at CESC	Allocated space	High availability Network attached storage (NAS) or Storage area network(SAN)	Y	CESC/SWESC	\$2.86
Tier 2 outside of CESC	Allocated space	NAS or SAN	N	Customer site	\$2.69
Tier 2 at CESC	Allocated space	NAS or SAN	N	CESC/SWESC	\$2.58
DASD	Raw space	Physically attached storage	N	Any	\$2.29
Tier 2 at CESC no backup	Allocated space	NAS or SAN	N	CESC/SWESC	\$1.29
DASD no backup	Raw space	Physically attached storage	N	Any	\$.92



- Tier 1 -- highly available, high-performance storage
 - Performance
 - Internal Operations Per Second (IOPS) counts in excess of 15,000
 - Storage attached network (SAN) fabric redundancy, component level redundancy within the storage array
 - Remote administration – automation in place
 - Provisioning changes are transparent
 - Array caching algorithms provide high-cache hit rate for host read/write
 - Streamlined provisioning for faster storage allocation response times
 - Allocate, grow and reclaim storage efficiently
 - Only at CESC (three-tier facility)
 - Data replicated to Southwest Enterprise Solutions Center (SWESC)
 - Array-based replication with SWESC requires no host involvement
 - Tier 1 allocation:
 - SAN high availability storage allocated to the server (i.e. useable space allocated)
 - Backup is provided



- Tier 2 is highly available scalable performance storage
 - Performance
 - IOPS approaching Tier 1 are possible
 - SAN fabric redundancy and component level redundancy within the storage array
 - Remote administration – automation in place
 - Provisioning changes are transparent
 - Streamlined provisioning for faster storage allocation response times
 - Array caching algorithms provide high cache hit rate for host read/writes
 - Allocate, grow and reclaim storage efficiently
 - Located at CESC/SWESC and agency locations
 - Tier 2 allocation
 - Network attached storage (NAS)/SAN standard availability storage allocated to server (i.e. useable space)
 - Standard backup/no backup options available at CESC/SWESC
 - Standard backup included at non-CESC/SWESC locations

- Direct attached storage (DASD) is internal or external
 - Details
 - Performance determined by attachment type, SCSI, SAS, internal disk, etc.
 - Redundancy not always possible
 - No remote automation or limited
 - Provisioning changes may require downtime and manual effort
 - DASD allocation
 - Raw storage installed to a server
 - Standard backup/no backup options available at CESC/SWESC
 - Backup options are available at non-CESC/SWESC locations

- Backup
 - Standard backup process
 - Daily incremental backup (kept offsite for 35 days)
 - Weekly full backup (kept offsite for 35 days)
 - Monthly full backup (retained for 12 months)
 - Customization and options are available
 - A work request will be required
 - Avamar product available for remote locations and daily backup capability

Moving Data to Tiered Structure Technical Highlights

- Problem Statement
 - During transformation multiple storage frames and units were moved to CESC
 - Original agreement called for Tier 1 storage, Amendment 60 established tiers

Moving Data to Tiered Structure

Technical Highlights

- Solution
 - Collapse multiple storage frames supporting multiple customers in CESC and SWESC data centers only
 - ~ 75 TB Tier 1 in CESC replicated to SWESC for DR
 - ~ 380 TB of Tier 2 storage required in CESC
 - ~ 42 TB of storage for IBM and mainframe systems replicated between CESC and SWESC
 - Support for existing 166 TB of Exchange 2003 data 83 in CESC and 83 replicated to SWESC for DR

Moving Data to Tiered Structure

Technical Highlights -- Continued

- ~275 TB of storage for Exchange 2010 of which ~186 is in CESC and 93 is in SWESC for DR
- Reporting for Tier 1 and 2 storage for all assigned agencies by host by usage for billing/reporting
- Integration into Symantec and Avamar backup solutions
- Snap technology and clone technology to be incorporated

Moving Data to Tiered Structure Action Plan

- August
 - Commence infrastructure review; set up new hardware; create target environments
 - Meet with Tier 1 server customers and detail plans on migration and time frames
- September
 - Target Tier 1 customers moving to new Tier 1 equipment
 - Virtual machines (VM) move without outages
 - Physical servers switched over during Sunday maintenance window
 - Meet with Tier 1 to Tier 2 customers and detail plans on migration and timeframes
- October
 - Continue with migrations

Managing Storage

- Consider what is consuming storage; delete or move to lower tier
 - Consider percentages by file type, e.g., jpeg, mp3, database or Office documents
 - Duplicates files -- How much space is consumed by the same file and e-mail attachments sent to numerous individuals saved to local disk?
 - Large files -- How much space is consumed by freeware applications from the Internet, versions and backups created by multiple users?
 - Files that are archived – How long since the file was accessed?
 - Identify application trends for better capacity planning. For example, how fast is my database growing?
 - Determine input/output performance requirements

Managing Storage

- Tools for determination
- User tools
 - Command line utilities, e.g., “find,” “du – k,” “df –k,” etc., for UNIX. Windows explore utilities and Windows search utilities.
 - Free downloadable tools that will produce lists of files by type, date, owner, etc. (examples: UltraSearch or FileList)
- IT partnership tools (may require work request; some tools available after storage consolidation)
 - EMC Storage Scope + SRM (Storage Resource Management)
 - EMC Control Center
- Storage mitigation strategies
 - Create business policies for user storage utilization, e.g., quotas, limitation on personal files, identify storage for non-essential data, etc.
 - Review monthly storage utilization rates

Managing Storage

- Storage Service Requests
 - Request may require a work request via the VITA Customer Care Center (VCCC or help desk)
 - Anticipate new form for storage space provisioning/de-provisioning
 - Accurately record requests and changes to storage environment
 - Request new storage
 - Request additional storage
 - Reduce amount of currently allocated storage
- Customer Actions
 - How to remove files
 - Based upon review of generated file lists, customers delete unneeded files following agency change control practices

Managing Storage – Next Steps

- Share information
 - Meetings and webinars being developed to share technical information, guidance and practical how-to information on storage management with agency teams
- New Service Offerings
 - Examining new service offerings
 - To address archiving
 - To identify and manage data

FAQs

- Answers to questions posed to AOMs or CSLs will be posted regularly on the AITR section of the VITA website.