

## Veritas Access Appliance with IBM Spectrum<sup>®</sup> Protect

Backup, Archive and Long-Term Retention Solution

This whitepaper provides a technical overview of Veritas Access Appliance as a secondary storage solution with IBM Spectrum Protect for backup, archival and long-term retention. It highlights the overall solution architecture components, integration flow, best practices, sizing guidance, and deployment of Access Appliance with IBM Spectrum Protect.



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# Contents

INTRODUCTION	3
EXECUTIVE SUMMARY	3
SCOPE	
TARGET AUDIENCE	3
SOLUTION VALUE	
SOLUTION KEY FEATURES	5
STORAGE EFFICIENCIES	
SECURITY	4
AUTOSUPPORT FEATURE	
MONITORING AND INTRUSION DETECTION	5
SOLUTION ARCHITECTURE	5
IBM SPECTRUM PROTECT	5
ACCESS APPLIANCE 3340	6
SOLUTION INTEGRATION	7
Cloud Container Storage Pool	9
Directory Container Storage Pool	
File Device Class Storage Pool	
DISASTER RECOVERY	
BEST PRACTICES AND RECOMMENDATIONS	
DATA LAYOUT ON ACCESS APPLIANCE	
ACCESS PROTOCOLS	
DEDUPLICATION AND COMPRESSION	
ACCESS S3 TUNABLES FOR PERFORMANCE	
NETWORK CONNECTIVITY	
LOAD BALANCING	
MONITORING	14
SIZING GUIDANCE	14
CONCLUSION	14
REFERENCES	15
APPENDIX	16
ACCESS APPLIANCE STORAGE CONFIGURATION AND PROVISIONING	
Configure Storage Pools	
Creation of Bucket on Access Appliance	
CONFIGURATION OF ACCESS WITH IBM SPECTRUM PROTECT	
Configure as a Cloud Container storage Pool	
Modify Domain Policy	25
Register a Client Node and Associate With a Domain Policy	
Validation of the Setup	
USING SSL	

### **Revision History**

Version	Date	Changes
1.00	3/05/2019	Initial Version (Internal only)
1.01	07/03/2019	Modification of Access version
2.0	06/02/2021	Updates related to Access release v7.4.3

#### INTRODUCTION

#### **EXECUTIVE SUMMARY**

As data increases at an accelerating pace, companies are striving to determine the best strategy in the management, preservation, and retention of their valued data. There are several challenges that come to mind when talking about backup, archival and long-term retention storage solutions which include cost, complexity, control, and visibility. Traditionally, the solution for backup, archival or long-term retention has been to send data to tape because of its low cost. However, the complexity in tape management in addition to the time to restore has been an issue. Recently companies have looked to the public cloud for a possible solution, however, issues in total cost of ownership and control become a concern.

To address these challenges, Veritas has designed the Access Appliance as a purpose-built, on-premises secondary storage appliance for backup, archival and long-term retention use cases. Together with IBM Spectrum® Protect, a comprehensive data protection, data resource and space management solution, the Access Appliance provides a resilient and cost-effective storage platform for the preservation of data backups that companies want to retain and have readily available. In addition, Veritas Access V7.4.2. plus patch is a validated cloud object storage device for IBM Spectrum Protect.

#### SCOPE

The purpose of this document is to provide technical details to assist in understanding the Access Appliance with IBM Spectrum Protect as a solution for backup, archival and long-term retention of data. It describes the components of this solution, its value, sizing guidance, and some best practices. It is advised to refer to Veritas and IBM product documentation for installation, configuration and administration of each of the products discussed in this whitepaper. NOTE: This document gets updated periodically and if you downloaded a local copy of this document, please get the latest from this link.

#### TARGET AUDIENCE

This document is for customers, partners, and Veritas field personnel interested in learning more about the Veritas Access Appliance with IBM Spectrum Protect for backup, archival and long-term retention. It provides a technical overview of this solution, guidance in sizing, and highlights some best practices.

#### SOLUTION VALUE

The Access Appliance acts as an on-premises storage platform for data that has been backed up and/or archived using IBM Spectrum Protect. The integration of these solutions provides a compelling offering for the backup, archival and long-term retention use cases.

Key values of utilizing Access Appliance with IBM Spectrum Protect include:

- Minimize cost—Access Appliance provides a low-cost, disk-based solution that is easy to manage. With IBM Spectrum Protect
  deduplication feature, the amount of storage space is reduced by saving only one copy of the data blocks and having the duplicates
  point to that one copy, thus providing a more storage efficient solution and reducing overall costs.
- Increase visibility and control—more and more companies would like to leverage the data that has been backed up, archived and retained for IT or business analysis and investigations so having the data on-premises under the company's control and visibility allows for quick restores.
- Improve Recovery Point Objective (RPO)/Recovery Time Objective—on-premises storage for backups and archived data improves service levels over tape or public cloud.

#### SOLUTION KEY FEATURES

There are certain key features that companies look for in a backup, archive and long-term retention solution product such as storage efficiency, security, and ease of management. The Access Appliance with IBM Spectrum Protect provides these features to assist customers in preserving their most valued data.

#### STORAGE EFFICIENCIES

Support for storage efficiency is one of the main factors when choosing and purchasing a backup, archival and long-term retention solution. The ability to maximize storage space assists in reducing overall cost. IBM Spectrum Protect has both compression and deduplication features. Any data compressed and deduplicated by IBM Spectrum Protect is preserved on the Access Appliance.

Compression improves storage utilization by reducing the number of bits required to represent data. IBM Spectrum Protect provides client side and server side compression prior to sending data to the Access Appliance. The difference between client side and server side compression is where the compression occurs. By compressing at the client side, it reduces network bandwidth since less bits or data is being sent to the server. IBM Spectrum Protect does examine the data prior to compression and it will not perform compression if the data is not a good candidate for compression. In either scenario, the Access Appliance stores the compressed format of the data conducted by IBM Spectrum Protect components.

Similarly with deduplication feature, IBM Spectrum Protect offers both client side and server side deduplication. There is a capability to do inline or post processing deduplication. For even better storage utilization, utilize compression with deduplication. When using compression, data is first deduplicated prior to being compressed. Refer to Strategies to Minimize the Use of Storage Space for Backups for more details on this feature.

#### SECURITY

For enhanced security, IBM Spectrum Protect offers encryption of data. Any encryption done by IBM Spectrum Protect is maintained on the Access Appliance. The Access Appliance also has encryption capabilities in conjunction with an external Key Management System (KMS). The appliance encrypts the volume that the "file system" resides on. An external KMS such as IBM KMS is required to create the keys for the encryption.

At a transport level, IBM Spectrum Protect sends data over dedicated network ports to Access. Additional security that is employed for this solution is the requirement to use Access user keys and credentials when configuring Access as a cloud storage destination. When SSL is enabled, certificates are generated on Access and placed in IBM Spectrum Protect repository of security certificates (Java Key Store) and data is sent via HTTPS. When Access is utilized as a Network Attached Storage (NAS) share, the ownership of the share belongs to an IBM Spectrum Protect administrator, hence, limiting the access control of the contents.

#### AUTOSUPPORT FEATURE

Veritas Access Appliance has the ability to call home if the health monitoring services observe hardware or software issues. Veritas AutoSupport service provides proactive monitoring, alerting 24x7, automated support case management, and guided workflows on the health of the appliances. This feature alerts customers and/or service engineers to quickly handle the issue and reduce further risks. Enabling this feature can be done simply by registering the appliance(s) at the Veritas MyAppliance portal as shown in Figure 1 and enabling the call-home functionality.





#### MONITORING AND INTRUSION DETECTION

Available on the Access Appliance is Symantec Data Center Security (SDCS), an intrusion detection system. SDCS is a real-time monitoring and auditing software. It performs host intrusion detection, file integrity monitoring, configuration monitoring, user access tracking and monitoring, and produces logs and event reports. SDCS adds security hardening and monitoring for the Access Appliance to reduce security risks and attacks. For more information on the Access Appliance intrusion detection system, refer to the Access Appliance Initial Configuration and Administration Guide.

#### SOLUTION ARCHITECTURE

At a high level, sources are backed up or archived utilizing IBM Spectrum Protect and the Access Appliance is the target secondary storage for the backup and archived data as shown in Figure 2.



Figure 2 - Solution Overview

In order to get a better understanding of how the Access Appliance integrates with IBM Spectrum Protect, all involved solution components are explained in further detail in the following sections.

#### **IBM SPECTRUM PROTECT**

IBM Spectrum Protect provides protection for a variety of data and platforms such as operating systems, virtual systems, databases and applications, files, and other content. It has the capability to backup data to tape, storage area network (SAN), network attached Storage (NAS), public or private cloud. Schedules, retention periods, and the ability to backup and archive data to different types or tiers of storage are defined in policies. A typical IBM Spectrum Protect environment consists of the following components:

- Server—manages and controls the backup and recovery activities, hosts the database, and maintains logs. Elements of the server include:
  - Database—contains information relating to the policies and schedules, metadata about the backups, archives, and migrations and server settings.
  - Logs—keeps records of database transaction in which the database utilizes to validate data consistency in the database.
     The logs include an active log, containing current transactions, and an archive log holding copies of log files that were closed.
     Optionally a log mirror, a copy of active logs and an archive failover log, a secondary copy of the archive log can be configured for redundancy.
  - Storage Pool—logical storage pools that map to varying types of storage such as local disks, tape, SAN, NAS, and cloud (onpremises and off-premises). The storage pool is the target for backup or archive data
- Clients—client components are installed on hosts that have the data to be backed up and responsible for sending and receiving data to and from IBM Spectrum Protect server for backup and recovery. There is also a backup and archive allowing end-users.
- Operation Center—a web-based console for managing, monitoring, and reporting of IBM Spectrum Protect servers and clients. The command-line interface (CLI) is also available within this console.

The components of IBM Spectrum Protect can be run on a single system. However, multiple systems running different instances of IBM Spectrum Protect handling different sources to backup or archive can be managed by a single administration console - Operations Center. Figure 3 illustrates a sample configuration of an IBM Spectrum Protect environment and its components. The clients communicate to the server over TCP/IP via a specified port (between 1000 to 32767, default 1500). Administration via the Operations Center is over HTTP(s).



Figure 3 - An Example of an IBM Spectrum Protect Environment



Figure 4 - Access Appliance Rack Units

The Access Appliance model 3340 is comprised of two clustered nodes and one primary storage shelf and up to three additional expansion storage shelves. The appliance can scale up to 2,800 TB of usable space as can be seen in Figure 4.

#### ACCESS APPLIANCE 3340

IBM Spectrum Protect can send backup and archival images to various storage types (disk, tape, cloud, etc.). For those seeking an on-premises disk-based solution for faster recovery times, control and/or simplicity when compared to tape or cloud, Veritas has developed the Access Appliance for ease of acquisition, management, and support. Access Appliance is a cost-optimized, turn-key storage solution designed for high capacity, making it well suited for long-term retention. Highlights of Access Appliance 3340 specifications are shown in Table 1. Refer to the Access Appliance datasheet for more detailed information.

Model	CPU Processor	RAM	Ports		Capacity	Rack Units
			1 GbE	10 GbE		
3340 (2 nodes)	2 x Xeon® 4108	384 GB	4 per node	2 per node	280 TB - 2800 TB	Server: 2U
	( 1.8 GHz)	per node			(254 TiB - 2544 TiB)	Storage per Shelf: 5U
	per node					
	Total: 16 core					
	per node					

Table 1 - Highlights of Access Appliance Specifications

Note: TB - Capacity values are calculated using Base 10; TiB - Capacity values are calculated using Base 2.

The two nodes are clustered in active/active configuration such that each node can handle I/O requests. Storage shelves are connected to each node and configured with dynamic multipathing so I/O can be sent to either node for performance and availability. The redundant hardware RAID controller in the primary storage shelf configures and presents the shelves' physical disks into disk groups (volumes) protected by a RAID 6 storage layout. With a RAID 6 configuration, data with dual parity is striped across the configured volumes (5 volumes per storage shelf with each volume containing 16 disks and each shelf with 2 hot spares). Each data volume can remain operational despite two concurrent disk failures.

The nodes run RHEL 7.4 or later as the operating system platform and Access software version 7.4.2 or later. The Access Appliance is a scale-up NAS platform that supports multiple protocols, including NFS, SMB, FTP, iSCSI and S3. With IBM Spectrum Protect, the Access Appliance is seen as an S3, NFS, or SMB target.

When using Access as an S3 target, data written to Access from IBM Spectrum Protect is placed in an S3 bucket. A bucket maps to a file system of type "cluster filesystem". The Access Appliance supports a maximum usable capacity of 2.8 PB and thus the maximum size of an S3 bucket in an appliance is 2.8 PB. When using the S3 protocol to backup or archive data, the S3 object URL, access key and secret key are presented to clients. The IBM Spectrum Protect server utilizes this URL as the S3 endpoint for reading and writing to the Access bucket. A dedicated S3 communication port, 8143, is required for both HTTP and HTTPS and thus firewalls have to keep this port open.

Similarly, Access can also be an NFS or SMB target. A "cluster filesystem" type is created where shares on that filesystem can be exported and mounted or mapped by the IBM Spectrum Protect server. The shares should be exported at the minimum with "rw" and sync option set on Access. After mounting or mapping share on the server, permissions of IBM Spectrum "administrator" user would need to be set appropriately for the share exported.

For management, the appliance can be managed by the command-line shell referred to as the CLISH and/or a web-based graphical user interface (GUI) where one can provision storage pools, create filesystem and provision Access as an S3, NFS, or SMB target.

**NOTE**: For an example of how to deploy and configure the Access Appliance as an S3 target with IBM Spectrum Protect, refer to the Appendix section of this whitepaper.

#### SOLUTION INTEGRATION

This section explores how all these components integrate together and how data flows through each component. The policies configured in IBM Spectrum Protect define where the client's backup and archive data will be stored and how long to retain it. A client is associated or bound to one active policy set within IBM Spectrum Protect. The Access Appliance acts as a storage platform for the data being backed up or archived by IBM Spectrum Protect.

IBM Spectrum Protect maps various type of storage platforms such as NAS, SAN, tape or cloud to a logical construct referred to as storage pool. In context with the Access Appliance, the types of IBM Spectrum storage pools that can be configured include:

- Container Storage Pool—automatically deduplicates data inline or as it is ingested. No device class or volumes need to be defined. There are two types of container storage pool that include:
  - Directory Container—file based storage using filesystem directories. If multiple directories are specified within a directory container, the data is distributed across the available directories.
  - Cloud Container—data is sent in object format using TCP/IP connection and target storage is an on-premises cloud object storage.
- File Device Class Storage Pool—legacy storage pools in which a device class of type file would need to first be defined. Data is written to this storage pool sequentially as in tapes. The File device class storage pool only supports post-processing deduplication which is data is deduplicated after it has been ingested.

There is no option to disable the deduplication on container storage pools and thus if your data are not good candidates for deduplication, such as encrypted or compressed data, it is recommended that the legacy FILE device class storage pool be utilized. The next sections provide a more detail view of Access as a cloud container, directory container and FILE device class storage pool for IBM Spectrum Protect. However, highlights of the differences are shown in Table 2.

Feature		Storage Pool Type	
	Cloud Container	Directory Container	File Device Class
Protocol	S <sub>3</sub>	NFS/SMB	NFS/SMB
Storage Pool	One bucket per storage pool.	Can specify multiple directories	Can specify multiple directories
	More than one storage pool can	per storage pool	per storage pool
	point to the same bucket.		
Deduplication	Automatic Inline	Automatic Inline	Post Processing
Read Sizes	Range reads of 10 KB – 100 KB	Range reads of 10 KB - 100	256 KB
		KB (avg. 256 KB)	
Write Sizes	S3 Multi-part uploads (100 MB	50 KB - 4 MB (avg. 256 KB)	256 KB
	default).		
File Sizes	Varies but maximum 1 GB	Varies but maximum 10 GB	Varies but maximum 2 GB
	(Default)	(Default)	(Default)
Ports	8143	NFS: 2049, 111, 4001, 4045	NFS: 2049, 111, 4001, 4045
		<b>SMB</b> : 139, 445	<b>SMB</b> : 139, 445
Transmission	Asynchronous	Synchronous	Synchronous

Table 2- Highlights of the Differences in the IBM Spectrum Protect Storage Pool Types for Access

#### **CLOUD CONTAINER STORAGE POOL**

Configuring Access as a cloud container, deduplicated data is sent asynchronously to the Access Appliance via the S3 protocol from a local disk cache on the IBM Spectrum Protect server. To reduce network contention and for performance, a local disk cache is required on the IBM Spectrum Protect server to initially stage the data prior to sending to an Access S3 bucket as shown in Figure 5. Per IBM Spectrum Protect documentation, it is recommended to have at least 3 TB of local cache or enough cache to handle a single days' worth of backup data. If there is a fast network connection, then a smaller staging area can be used. If compression and encryption is enabled, data is first deduplicated, compressed and then encrypted prior to sending to a cloud container. Multiple threads can process multiple containers at a time. Thus, backups involve disk writes to a cache and as the containers are filled, data is sent to Access. Transfers to Access are conducted using large I/O sizes and multi-part uploads. Once transferred, data is removed on local cache. The Access object URL, access and secret keys, and bucket name are required when configuring Access as cloud container storage pool. Multiple storage pools can be configured to point to a single bucket or each storage pool has its own bucket, but multiple buckets cannot be assigned to a single storage pool.





When using a cloud container, both client side and server side deduplication is supported. In client-side deduplication, the data is deduplicated prior to being sent to IBM Spectrum Protect whereas server side deduplication is conducted on the IBM Spectrum Protect server. Decision-making on where deduplication occurs highly depends on network bandwidth and compute resources available on clients and server.

IBM Spectrum Protect deduplication algorithm involves using a variable chunk segment size for analysis of duplicate data within the container pool. Only unique data is stored and a reference pointer is used when duplicate data is identified. IBM Spectrum Protect data or metadata inside container storage pools are stored into parts referred to as extents. The extents can range in size from 50 KB to 4 MB with an average of 256 KB. Any data smaller than 2 KB or data that cannot be deduplicated, such as encrypted or compressed, are not deduplicated. Data that are deduplicated are stored on Access as files with extension names \*.dcf (deduplicated container file) or with \*.ncf (non-deduplicated container file) extensions. A

PNew bucket 💥 Delete bucket 🔗 Refresh	Path: /	3a5-3804462d0	06e2e8119a610	cc47a3a31fc	-L/				1 🗆	7 d
	File	File			Size		Туре		Last Modif	ed
- 🚅 s3b1 - 🔄 nb9 - 🛫 tbucket	·	00000000003a5.dcf		334.09 MB		DCF File		1/28/2019	3:58:30 /	
					New Folder	Refres Statu		1 file Speed	(334.09 MB) a	nd 0 folde
Tasks (25) Permissions Http Headers Ta Task	Up Up		ersions Eve	ntLog					(334.09 MB) a	nd 0 fold

Figure 6- View of Container Files on Access

sample view of a container file is shown in Figure 6. By default, these files are 1 GB in size and are configurable using the parameter CloudTransferContainerSize server option (i.e. specifying in dsmserv.opt or using the "setopt" server command). These files are transferred to Access using S3 multipart-upload. With 1 GB default file size, the default part size that the file is broken up to is 100 MB. This value is configurable using the server parameter, CloudMinUploadPartSize. For restores, IBM Spectrum Protect does range reads in smaller sizes of 10 KB – 100KB.

Note: Access Appliance v7.4.2 plus patch was utilized to conduct the S3 validation with IBM Spectrum Protect v8.1.5.

#### DIRECTORY CONTAINER STORAGE POOL

Using a directory container pool, deduplicated data is sent to the Access Appliance synchronously via NFS (Linux environment) or SMB (Windows environment) protocol as pictured in Figure 7. The file system created on the Access Appliance is exported as a read/ write and synchronous share and is either mounted to a directory or mapped to a drive letter on the IBM Spectrum Protect server. As previously mentioned, the data within container storage pools are automatically deduplicated inline prior to being sent to the storage platform and both client and server-side deduplication is supported.



Figure 7 - Access as a Directory Container Storage Pool

As in cloud container storage pools, the same algorithm and method is used for deduplication and the files on an NFS/SMB share would have files with extensions of \*.dcf and \*.ncf for deduplicated and non-deduplicated data respectively. The size of the container or files can vary depending on the amount of free space that is available in the storage pool directories and how many concurrent containers or files that can be opened to avoid using all the free space. However, the default container or file size is 10 GB. This size can be changed with the ContainerSize server option, specified in units of megabytes. Figure 8 provides an example view of the directory container storage pool contents of an NFS share. When multiple directories for the directory container are specified, data distributes the write across the directories improving performance, assuming that different volumes, disks or filesystems are assigned to each directory.

[root@tmesavm8157 00]# ls -h	
00000000000022.ncf 00000000000024.dcf 000000000026.dcf 0000000000028.dcf 00000	)0000000002a.dcf
00000000000023.dcf 000000000000025.dcf 0000000000027.dcf 00000000000029.dcf	
[root@tmesavm8157 00]# ls -lh	
total 624M	
-rw 1 tsmuser tsmgrp 4.6K Oct 24 13:27 0000000000000022.ncf	
-rw 1 tsmuser tsmgrp 100M Oct 24 13:27 0000000000000023.dcf	
-rw 1 tsmuser tsmgrp 53M Oct 24 13:29 0000000000000024.dcf	
-rw 1 tsmuser tsmgrp 100M Oct 24 13:28 0000000000000025.dcf	
-rw 1 tsmuser tsmgrp 100M Oct 24 13:28 0000000000000026.dcf	
-rw 1 tsmuser tsmgrp 100M Oct 24 13:29 0000000000000027.dcf	
-rw 1 tsmuser tsmgrp 8.7M Oct 24 13:29 0000000000000028.dcf	
-rw 1 tsmuser tsmgrp 100M Oct 24 13:29 00000000000000029.dcf	
-rw 1 tsmuser tsmgrp 64M Oct 24 13:29 000000000000002a.dcf	
[root@tmesavm8157 00]#	

Figure 8 - Example Contents of a Directory Container Storage Pool on Access

#### FILE DEVICE CLASS STORAGE POOL

Implementing a FILE device class storage pool stores data in a sequential fashion as on tape, however, data is stored in files. Files are viewed by IBM Spectrum Protect as volumes. Exported Access NFS or SMB shares are mounted to a directory or mapped to a drive on the IBM Spectrum Server and then the directory or mapped drive is specified when defining the file device class (i.e. def devclass nasclass1 devtype=file mountlimit=20 maxcapacity=20g directory='/mnt/dir'). As for other considerations when configuring FILE device class, refer to "Defining Sequential-Access Disk (FILE) Device Classes". Data can be sent synchronously or asynchronously to the Access Appliance via NFS or SMB protocol as shown in Figure 9. However, IBM recommends to mount share synchronously.



Figure 9 - Access as a File Device Class Storage Pool

The size of each file is defined by the parameter MAXCAPACITY where default is 2 GB. This value should not exceed the maximum size of file supported on the Access Appliance which is the maximum usable space of 2.8PB. For more details on this parameter, refer to "Optimal number and size of volumes for storage pools" in IBM product documentation.

[root@tmesavm8157 accessfs1]# ls -lh total 3.9G -rw-----. 1 tsmuser tsmgrp 3.9G Oct 24 11:47 000000d4.bfs drwxr-xr-x. 2 root root 96 Oct 17 10:35 lost+found

Figure 10 - Example Content a FILE Device Class Storage Pool on Access

#### **DISASTER RECOVERY**

Having a disaster protection plan is imperative for business continuity. IBM Spectrum Protect offers node replication where copies of the data are incrementally copied automatically to a remote or off-site IBM Spectrum Protect server. Client restores failovers to target if primary server is down. An Access Appliance can be deployed at the target side as the storage platform to store the replicated data. For information on how to best protect an IBM Spectrum Protect environment and node replication, please refer to IBM Product Documentation and Strategies for Disaster Recovery with IBM Spectrum Protect and Node Replication Guidelines. Note: A cloud container storage pool can NOT be a source target pool, however, it can be a destination pool as shown in Figure 11. Also, the use of PROTECT STGPOOL command which allows for only the data to be replicated without the associated metadata is not supported for cloud container storage pools.



Figure 11 - Example of Access as an S3 Target for Replication

#### BEST PRACTICES AND RECOMMENDATIONS

Following best practices is important in creating an optimum deployment. This section covers some best practices relating to the Access Appliance as a backup, archival and long-term retention storage for IBM Spectrum Protect.

#### DATA LAYOUT ON ACCESS APPLIANCE

The appliance contains hardware RAID 6 controllers and inherently does striping with dual parity across disks on the storage shelves for high performance and data durability. Selecting other layouts such as mirrored or erasure coding layout for data protection is not necessary. As a best practice, for backup, archival and long-term retention use case, it is recommended to configure the Access Appliance using defaults such as clustered file system, simple layout, and block size of 8 KB. For additional performance, the layout can be configured to be stripe. **NOTE**: To maintain the stripe performance, when growing the storage pool, the volumes must be added in multiples of the stripe columns (the entire shelf), and thus, it is advisable to plan or size the system appropriately.

#### ACCESS PROTOCOLS

IBM Spectrum Protect storage pools can map to Access as an S3 bucket, an NFS share or SMB share. IBM has technical validations and certification processes for when sending data to a cloud container storage device via S3 protocol. After completing this validation and certification process using the Access Appliance, Access v7.4.2 plus patch is now supported as an IBM Spectrum Protect cloud object storage device. Refer to the following IBM web page indicating the support: https://www-01.ibm.com/support/docview. wss?uid=swg22000915. As previously mentioned, when conducting restores from a cloud object storage device, IBM Spectrum Protect does range reads of 10 KB to 100 KB in size. If there is a requirement for a faster RTO then it is recommended to make use of disk-to-cloud tiering using "storage rules" which was introduced in IBM Spectrum Protect 8.1.3. For some additional recommendations when using Access as a cloud object storage, refer to IBM documentation relating to Optimizing Performance for Cloud Object Storage.

There is no formal validation or certification when configuring Access as an NFS target for IBM Spectrum Protect, however, IBM provides some recommendations in the below links relating to when using NFS:

- http://www-01.ibm.com/support/docview.wss?uid=swg21470193
- http://www-01.ibm.com/support/docview.wss?uid=swg22005129

In general, it is recommended to mount the NFS share with "sync" option, not to use a device type of disk (i.e. devtype=disk) and to conduct a proof of concept or tests to validate that NFS provides the Service Level Agreement (Recovery Point Objective/Recovery Time Objective) required by the customer in addition to running periodic audits on the storage pool volume on an NFS mount. Similar recommendations should be followed when using Access SMB protocol.

#### DEDUPLICATION AND COMPRESSION

Deduplication is done inline when defining a container pool such as directory or cloud container storage pool. As a FILE device class, deduplication can be enabled or disabled. When using container storage pools or enabling deduplication, more server resources are needed such as DB capacity, CPU and memory and should be sized appropriately. Notable recommendations stated in Effective Planning and Use of IBM Spectrum Protect Container Storage Pools and Data Deduplication include:

- Deduplication is recommended for backup data that is less than 4 PB total and limited to 100 TB per day for each server instance.
- For the Database, use high performance SSD or flash disk.
- Use only for data that can benefit from deduplication. Data such as encrypted or does not have much change will not benefit from deduplication.

For compression, it is an option and best to be done before data is deduplicated. Thus, if using client-side compression, client-side deduplication must also be enabled.

#### ACCESS S3 TUNABLES FOR PERFORMANCE

When utilizing Access as an S3 target for IBM Spectrum Protect, there are tunables on Access that is recommended to be modified for improved performance. The following tunables can only be set using Access command-line interface and would require a restart of the object services on Access:

- cf\_max\_s3\_threads controls the number of threads to handle S3 requests
- cf\_mp\_calc\_md5 MD5 internal calculation at multipart merge

It has been observed that increasing the number of cf\_max\_s3\_threads to 128 and disabling of cf\_mp\_calc\_md5 provided the optimum performance for IBM Spectrum Protect workload.

#### NETWORK CONNECTIVITY

The Access Appliance has two 10 GbE uplinks per node. Each physical port maps to a virtual IP. Thus, there are four virtual IP addresses. Always present the virtual IP to clients or client applications so it will automatically transition to the other node if one node fails or the physical links on one node fails or is unreachable. For instance, map one of the virtual IPs to the S3 object URL when using the S3 protocol or use the virtual IP when mounting the NFS share on the server.

Bonding is an option on Access Appliance. Joining or bonding multiple network interfaces on the Access appliances into a single interface improves the bandwidth and network throughput through the combined single interface. Bonding is only configurable via the Access command-line interface. As a best practice, the switch that the uplinks of the Access Appliance are connected to should be configured appropriately for the link aggregation.

#### LOAD BALANCING

There are two nodes on the Access Appliance configured as active/active. As a best practice, balancing the load across nodes on Access is recommended. Load balancing can be achieved using any of the following techniques:

- External load balancing—using an external load balancer such as HAProxy or F5, allows for more algorithms to distribute load across nodes such as least connections or weights. It also frees the Access nodes from the proxy handling and balances the network traffic between the nodes.
- Manual load balancing—virtual IP addresses of the nodes can be manually assigned to applications in a distributed manner. The disadvantage of this approach is that even distribution might be difficult to gauge since applications are not all equal in sense of workload.
- DNS load balancing—the S3 object URL name for an Access S3 bucket, s3.<clustername> is created in DNS and includes all the virtual IP addresses of the nodes. DNS round-robins through the virtual IP addresses. The disadvantage of using DNS is in case of connectivity issues, the virtual IP is still in rotation until it is manually removed.

#### MONITORING

It is important to monitor or be aware of the alerts especially storage utilization warnings and hardware critical alerts. The AutoSupport features assists in this manner, but as a best practice, it is advisable to be pro-active instead of re-active. For instance, once the capacity reaches 60%, it might be a good time to revisit the storage utilization or plan for growth.

#### SIZING GUIDANCE

In planning for data protection, two considerations come to mind: recovery point objectives (RPO) and recovery time objectives (RTO). From a backup and recovery standpoint, the RPO and RTO determine which policies are implemented, and therefore the resources required by an IBM Spectrum Protect deployment in terms of the necessary amount of systems, appliances, and storage. Other considerations include the number of users and applications, amount of data that is backed up, the frequency, and how long to keep the data. When planning for a long-term retention storage solution for backup data there are two factors:

- • Capacity the amount of data that can be stored.
- Performance how much workload (concurrent streams and bandwidth) the storage platform can handle.

The Access Appliance can store up to 2.8 PB worth of backup, archival and long term retention data. It is best to confer and work with both IBM and Veritas personnel for sizing of the IBM Spectrum Protect resources and the Access Appliance. Some parameters that might enter in the equation when estimating backup, archival and long-term storage requirements include:

- 1. Volume of source data.
- 2. Daily data change ratio
- 3. Annual storage growth
- 4. Data retention for daily incremental.
- 5. Retention for weekly, monthly and yearly full backups.
- 6. Estimated deduplication ratio for initial backup and daily incremental.
- 7. Estimated deduplication ratio for weekly, monthly, and yearly full backups.
- 8. Compression/Encryption enabled or disabled, client-side or server sided.
- 9. Performance and/or service level requirements.

There is an IBM Spectrum Protect blueprint that provides examples of a small, medium and large environments and has some guidance on how to configure IBM Spectrum Protect servers. There is also IBM Spectrum Protect Optimizing Performance document available for reference.

#### CONCLUSION

The addition of the Access Appliance in the Veritas appliance portfolio provides a competitive disk-based solution for backup, archive and long-term retention of data. Integrated with IBM Spectrum Protect, the Access Appliance becomes a great option in data protection, and preservation of critical digital assets. Implementing the Access Appliance with IBM Spectrum Protect as a backup, archival and long-term retention solution minimizes costs, improves control and visibility. CONCLUSION

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- IBM Spectrum Protect Blueprints
  - Blueprints -
    - https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/Tivoli%20Storage%20Manager/page/ IBM%20Spectrum%20Protect%20Blueprints
  - Spectrum Protect Blueprint Sizer (may require login)
    - https://www-356.ibm.com/partnerworld/wps/servlet/mem/ContentHandler/TSJ03927USEN/Ic=en\_ALL\_ZZ?mhq=IBM%20Spectrum%20Protect%20Blueprints&mhsrc=ibmsearch\_a
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    - 7.4.2 https://sort.veritas.com/documents/doc\_details/AAPP/7.4.2/Appliance%203340/ProductGuides/
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    - 7.4.2 plus patch https://www.veritas.com/support/en\_US/article.100045858.html
    - 7.4.3 https://sort.veritas.com/documents/doc\_details/AAPP/7.4.3/Veritas%203340/Documentation/

#### **APPENDIX**

This section has only sample configurations and readers are expected to refer to the Veritas Access Product Documentation and IBM Spectrum Protect documentation for definitive and specific installation, administration and configuration details.

The deployment example walks through the configuration of the Access Appliance as an S3 target with IBM Spectrum Protect include as shown in Figure 12.



Figure 12 - Configuration Used in this Example Deployments

Highlights of the steps involved in this example include:

- Configuration and storage provisioning of the Access Appliances as an S3 target.
- Configuration of the Access S3 bucket as a cloud container pool in IBM Spectrum Protect
- Modification of the STANDARD domain policy to utilize the storage pool mapped to an Access S3 bucket
- Validation of configuration by conducting an archive and retrieval using the Backup-Archive client tool
- SSL configuration example

#### ACCESS APPLIANCE STORAGE CONFIGURATION AND PROVISIONING

In this example, the Access Appliance graphical user interface and command-line is utilized to provision the storage. It is assumed that the Access Appliance has already been installed and connected to the same network as the IBM Spectrum server. Highlights of steps to configure and provision Access Appliance as an S3 target involves the following:

- a. Configure the storage disk pools
- b. Set the default S3 parameters (i.e. layout, size, filesystem type, storage pool, etc.), start the S3 service and generate the S3 keys for the user,
- c. Create a bucket via Access CLI where a filesystem will manually be created and map a bucket to the filesystem.

#### **CONFIGURE STORAGE POOLS**

Step 1) Using a web browser, login to the Access Appliance graphical user interface: https://<consolelP>:14161. Click on "Go to HomePage".



Step 2) Click on **Infrastructure** on left pane. Select the number of disks or volumes to be added to storage pool and click "Add to Storage Pool".

	ĸ	NAS Infrastructure						
≏	Overview	Disks	Nodes	Hardware	0			
Ð	Shares	Total: 29 Add to Storage Pool	Run Scanbus More -				Searc	h Q
ж.	File Systems	Namel2	Usage	Storage Pool	Spare	Enclosure	Nodes	
	Infrastructure	tmeaccess2000_dis_	0.00% of 59.60 GB		no	disk	tmeaccess2-01	
	Policies	Imeaccess2000_dis_	0.00% of 59.60 GB		no	disk	tmeaccess2-01	1
		tmeaccess2001_dis_	0.00% of 59.60 GB		no	disk	tmeaccess2-02	. I.
B	Reports	tmeaccess2001_dis_	0.00% of 59.60 GB		no	disk	tmeaccess2-02	1
*	Settings	vrts_appliances0_0	0.00% of 128.00 MB	*coordinator*	no	vrts_appliances0	tmeaccess2-01,tmeaccess2-02	1
		vrts_appliances0_1	0.00% of 127.20 TB		no	vrts_appliances0	tmeaccess2-01,tmeaccess2-02	
		vrts_appliances0_10	0.00% of 127.20 TB		no	vrts_appliances0	tmeaccess2-01,tmeaccess2-02	
		vrts_appliances0_11	0.00% of 127.20 TB		no	vrts_appliances0	tmeaccess2-01,tmeaccess2-02	1
		vrts_appliances0_12	0.00% of 127.20 TB		no	vrts_appliances0	tmeaccess2-01,tmeaccess2-02	E.
		vrts_appliances0_13	0.00% of 127.20 TB		no	vrts_appliances0	tmeaccess2-01,tmeaccess2-02	I.
		vrts_appliances0_14	0.00% of 128.00 MB	*coordinator*	no	vrts_appliances0	tmeaccess2-01,tmeaccess2-02	1
		vrts_appliances0_15	0.00% of 127.20 TB		no	vrts_appliances0	tmeaccess2-01,tmeaccess2-02	1
		vrts_appliances0_16	0.00% of 127.20 TB		no	vrts_appliances0	tmeaccess2-01,tmeaccess2-02	1

Step 3) Select "Add to new storage pool" and enter a Storage Pool Name, i.e. tsmpool and click Next. On next screen, click Finish.

Add to Storage Poo	ol –				? :
Select Disks to Add into	Existing or New	Storage Pool			
Selected: 5	Storage	Pool Capacity: 0 byte			
Name		Usage	Storage Pool	Enclosure	Nodes
<ul> <li>vrts_appliances</li> </ul>	s0_1	0.00% of 127.20 TB		vrts_appliances0	tmeaccess2-01,tmeaccess2-02
<ul> <li>vrts_appliances</li> </ul>	s0_10	0.00% of 127.20 TB	% of 127.20 TB vrts_appliances0		tmeaccess2-01,tmeaccess2-02
<ul> <li>vrts_appliances</li> </ul>	s0_11	0.00% of 127.20 TB		vrts_appliances0	tmeaccess2-01,tmeaccess2-02
<ul> <li>vrts_appliances</li> </ul>	50_12	0.00% of 127.20 TB		vrts_appliances0	tmeaccess2-01,tmeaccess2-02
Select Storage Pool :	Add to new	storage Pool	•		
Storage Pool Name :	tsmpoo	bl			

Step 4) Check the Activity icon, the clock on top and click on "Show All Recent Activities". Wait until pool creation succeeds.

uick Actions 👻	- <u>6</u>	0	2	
Recent Activity				
Ongoing	Comple	eted	Search	
Show All Re	Show All Recent Activities			

Total: 1 of 1				Search				
Name		Status	Start Time	End Time				
- Create Storage Poo	l tsmpool	Success	2018-12-12 11:08:17	2018-12-12 11:08:47				
vxdisk_init		Success	2018-12-12 11:08:22	2018-12-12 11:08:26				
vxdisk_init		Success	2018-12-12 11:08:26	2018-12-12 11:08:31				
vxdisk_init		Success	2018-12-12 11:08:31	2018-12-12 11:08:35				
vxdisk_init		Success	2018-12-12 11:08:35	2018-12-12 11:08:39				
vxdisk_init		Success	2018-12-12 11:08:39	2018-12-12 11:08:44				
Setting up DG		Success	2018-12-12 11:08:44	2018-12-12 11:08:46				
Output:         ACCESS Prod SUCCESS V-493-10-2011 Created pool tsmpool successfully           Command executed:         NAS_OUTPUT-ipion /opt/VRTGnas/clish/bin/clish -u-master -c "storage pool create tsmpool vrts_appliances0_1,vrts_appliances0_10,vrts_appliances0_11,vrts_appliances0_12,vrts_appliances0_13'								

Step 5) Next step is to set the S3 parameters when creating a bucket on Access. Click on **Settings** on left pane and click on **"S3 Management**".

	«	Settings					
₽	Overview						
모	Shares	User Management	Cloud Storage	Service Management	Replication	Events	NetBackup
ж.	File Systems		Registration				Configuration
<b>m</b>	Infrastructure						
E	Policies						0
Ŀ	Reports	Licensing	S3 Management	SmartIO Management	FTP Management	Veritas Data Deduplication	Alert Management
⇔	Settings						

Step 6) Click on **Edit** on the Default parameters for S3 buckets.

×	Settings 🕨 S3 Management							
Overview	Default parameters for S3 buckets Edit							
Shares	S3 URL File system size	http://s3.tmeaccess2:8143 20.00 GB						
File Systems	File system layout Pool(s)	mirrored						
Infrastructure	SSL enabled S3 server status		lo Storage pool assigned to S3 service					
Policies								
Reports	Group related parameters (Set default File System parameters that can be used while creating a File System for users in that Group)							
Settings	Total: 0 Add Group					Search Q		
	Group Name	File System Size	File System Layout	Pools	Encryption			
	Overview Shares File Systems Infrastructure Policies Reports	Overview     Default parameters for S3 I       Shares     S3 URL       File system size     File system layout       Pool(s)     SSL enabled       Infrastructure     S3 server status       Policies     Group related parameters       Settings     Total: 0	Overview     Default parameters for S3 buckets       Shares     S3 URL     http://s3.tmeaccess2:8143       File system size     20.00 GB       File system layout     mirrored       Pool(s)     SSL enabled     No       Infrastructure     S3 server status     Offline       Policies     Group related parameters        Settings     Total: 0     Add Group	Overview         Default parameters for S3 buckets         Edit           Shares         S3 URL         http://s3.tmeaccess2:8143           File system size         20.00 GB           File system layout         mirrored           Pool(s)         SSL enabled           S3 server status         Offline           Policies         Reports           Group related parameters         (Set default File System parameters that can be used while creating a File System for users in that Group           Settings         Total: 0	Overview     Default parameters for S3 buckets     Edit       Shares     S3 URL     http://s3.tmeaccess2:8143       File system layout     mirrored       Pool(s)     S3 server status       Stares     Offline       Policies     Croup related parameters       Reports     Group related parameters that can be used while creating a File System for users in that Group)       Settings     Intra.to	Overview     Default parameters for S3 buckets     Edit       Shares     S3 URL     http://s3.tmeaccess2:8143       File system layout     mirrored       Pool(s)     S3 server status       Stares     Offline       Policies     Offline       Reports     Group related parameters       (Set default File System parameters that can be used while creating a File System for users in that Group)       Settings		

Step 7) Modify the default parameters such as file system size, file system layout, block size, and select the storage pool to use, ssl, etc. These default parameters are used when a bucket is created by other applications, e.g. S3 Browser. In this example, a bucket is created with a cluster filesystem of size 5 TB with a simple layout inside storage pool tsmpool with SSL not enabled. Click Next.

Set default parameters for S3 buckets						×
File system size 5 File system layout Simple	TB V	Scale-out F	ile system ● No			
Block size 8192 Encryption	✓ Bytes		<ul> <li>No</li> <li>tition Directory</li> <li>No</li> </ul>			
Set pools tsmpool 🖊		Enable SSL	● No			
				Next	Can	cel

Step 8) Click on Activity icon and click on "Show All Recent Activities" and wait until operations succeeds.



Recent Activities				?	? ×
Click any task to view t	he details.				
Total: 10 of 12				Search Q	
Name		Status	Start Time	End Time	
+ S3 server set defau	It parameters.	Success	2018-12-11 16:35:10	2018-12-11 16:35:37	1
Creating NFS share or	n /vx/testfs1	Success	2018-12-11 15:09:25	2018-12-11 15:09:47	
+ Create File System	testfs1	Success	2018-12-11 15:05:45	2018-12-11 15:06:37	
+ Create Storage Poo	l tsmpool	Success	2018-12-11 15:01:33	2018-12-11 15:02:03	
+ Destroy File System	n tsmfs-stripe1	Success	2018-12-11 14:32:37	2018-12-11 14:33:34	
+ Destroy File System	i tsmfs1	Success	2018-12-11 14:31:16	2018-12-11 14:32:10	
Delete NFS share /vx/	tsmfs1	Success	2018-12-11 14:25:10	2018-12-11 14:25:22	
Start NFS server.		Success	2018-12-11 14:21:21	2018-12-11 14:21:48	
Output: Command executed:	S3 server set default parameters operatil python /opt/VRTSnas/pysnas/bin/va_s3 \\\\argefs\\:\\no\\\\blkSize\\:\blkSize I\\}	_server_mgmt.pycommand s			

Step 9) By default, the S3 URL is s3.<clustername>. However, in this example, one of the virtual IP addresses will be used instead. Thus, to modify the S3 URL to use the IP addresses on each node prior to starting the S3 Service, **ssh as admin to the Access CLI** (i.e. ssh admin@<IP of console>). Enter in objectaccess and then use the **"set data\_endpoints**" command to set the new name or IP. As shown in the example below, "set data\_endpoints 10.182.81.86" is specified. More than one endpoint or virtual IP address separated by a comma can be specified, for instance, "set data\_endpoints 10.182.81.86,10.182.81.87". **NOTE**: For all the aliases to be picked up, one would need to specify all of the aliases in a single set command. Also, any changes made to the endpoints would require the objectaccess server to be restarted via GUI or CLI if already started.

tmeaccess2>ot	jectaccess
tmeaccess2.Ob	jectAccess> set data_endpoints 10.182.81.86
ACCESS Object	tAccess SUCCESS V-493-10-0 Data endpoints set successfully.
tmeaccess2.Ob	jectAccess> show
Name	Value
Server Status	Enabled
Admin_URL	http://admin.tmeaccess2:8144
S <sub>3</sub> _URL	http://10.182.81.86:8143
SSL certificate	validity -
admin_port	8144
s3_port	8143
ssl n	0
pools	tsmpool
fs_size	sT
fs_type	simple
fs_ncolumns	5
fs_stripeunit	512
fs_blksize	8192
fs_pdirenable	yes
fs_encrypt	off

Step 10) On the Access GUI, enable the S3 Service by clicking on the "S3 server status" slider and moving it to the right.

	«	ettings 🕨 S3 Management							
⊕	Overview	Default parameters for S3 buckets Edit							
₽	Shares	S3 URL http://s3.tmeaccess2:8143 File system size 5.00 TB							
A.	File Systems	File system layout simple Pool(s) tsmpool							
<b>m</b>	Infrastructure	SSL enabled No S3 server status Offline							
E	Policies								
G	Reports	Group related parameters (Set default File System parameters that can be used while creating a File System for users in that Group)							
۵	Settings	Total: 0 Add Group Search Q							
		Group Name File System Size File System Layout Pools Encryption							

#### Step 11) Click Start.



Step 12) Monitor the **activity** and wait until complete.

Quic	k Actions 👻	Ē	C
	Recent Activity		
	Ongoing	Comple	ted
	S3 server set defa		ers. 50%
	Show All Rec	ent Activitie	s

				Search	
Total: 3 of 3				search	
Name		Status	Start Time	End Time	
- Start S3 Server		Running	2018-12-12 12:44:46		
Enable S3 server		Running	2018-12-12 12:44:46		
NLM FS create		Running	2018-12-12 12:44:48		
- S3 server set defaul	t parameters.	Success	2018-12-12 12:43:05	2018-12-12 12:43:32	
Set default FS siz	re	Success	2018-12-12 12:43:06	2018-12-12 12:43:10	
Set default FS lay	rout	Success	2018-12-12 12:43:10	2018-12-12 12:43:21	
Set default pools		Success	2018-12-12 12:43:21	2018-12-12 12:43:32	
+ Create Storage Pool	tsmpool	Success	2018-12-12 11:08:17	2018-12-12 11:08:47	
Output:         S3 server set default parameters operation started successfuly.           Command executed:         python /opt/VRTSnac/pyena/bin/va_s3_server_mgmt.py -command set_default_parame -dsta (\\fs_size\\\\ST\\\fs_type\\\{\\layout\\\simplifyers_command set_default_parame -dsta (\\fs_size\\\\ST\\\fs_type\\\{\\layout\\\Stronger_command set_default_parame_dsta (\\fs_size\\\ST\\\fs_type\\\{\\layout\\\Stronger_command set_default_parame_dsta (\\fs_size\\\ST\\\fs_type\\\{\\stronger_command set_default_parame_dsta (\\fs_size\\\ST\\\fs_type\\\{\\stronger_command set_default_parame_dsta (\\fs_size\\\ST\\\fs_type\\\{\\stronger_command set_default_parame_dsta (\\fs_size\\\ST\\\fs_type\\\{\\stronger_command set_default_parame_dsta (\\fs_size\\\ST\\\fs_type\\\{\\stronger_command set_default_parame_dsta (\\fs_size\\\ST\\\ST\\\fs_type\\\{\\stronger_command set_default_parame_dsta (\\fs_size\\\ST\\\fs_type\\\\stronger_command set_default_parame_dsta (\\fs_size\\\ST\\\fs_type\\\\stronger_command set_default_parame_dsta (\\fs_size\\ST\\\ST\\ST\\ST\\ST\\ST\\ST\\ST\\ST\\					

Step 13) Under the S3 Management page at the bottom, click on Create Keys.

	ĸ	Settings  S3 Management							
	Overview	Default parameters for S3 buckets		Edit					
모	Shares	S3 URL File system size	http://10.182.81.86:8143 5.00 TB						
ж	File Systems	File system layout Pool(s)	striped tsmpool						
	Infrastructure	SSL enabled S3 server status	No Online						
	Policies								
D	Reports	Group related parameters (Set default File System parameters that ca	n be used while creating a File System for users in that Group)						
۰	Settings	Total: 0 Add Group							
		Group Name	File System Size	File System Layout	P				
		S3 User Management To access S3 buckets, user will need access Total: 1 Creats Reys	s and secret keys. The keys can be generated by signing-in to Veritas Access with A	ctive Directory credentials. Those users for whom the keys have been generated will be lis	ted below.				
		S3 User Name		Access Key					

Step 14) Enter the user name and password of user. Click Next. Save the Access Key and Secret Key. Click Finish after saving the keys. These keys would be used to connect to Access S3 Bucket on the application.

Create S3 Keys		? ×	Create S3 Keys ? 🗙
S3 User Name S3 User Password	admin		✓ Create S3 Keys successful
	Novt	Cancel	Access Key MzUxMDNIZmYxM2U4OGF Secret Key NjRINjhhMDJhOWRINjIwYmE0Y 2E3NDBjYzU3NzE
	Next	Cancel	Finish

#### **CREATION OF BUCKET ON ACCESS APPLIANCE**

At this point, there are two ways to create an S3 bucket. One can use an S3 Browser or similar applications to create bucket by providing the S3 URL(<hostname or IP:8143), access key and secret key or it can be done via the command line on Access. In either methods, a filesystem is first created and then a bucket is created within the filesystem. In this example, creation of bucket is done via the Access CLI using the virtual IP of the console.

Step 1) ssh onto the Access CLI (i.e. ssh admin@<console IP>) and then do the following on the CLI:

a) Go into the storage mode and create a file system by entering "fs create <layout> <name> <size> <storage pool name created in previous step>". Then exit out of the storage mode.

b) Enter the objectaccess mode and then map the filesystem created in previous step to a bucket by the following command: "map / vx/<fs name>/<new bucket name>"

c) Validate the bucket has been created by entering "bucket show" or you can validate using the Access GUI.

tmeaccess2> storage tmeaccess2.Storage> fs create simple s3tsmfs 5t tsmpool 100% [#] Creating simple filesystem ACCESS fs SUCCESS V-493-10-2095 Created simple file system s3tsm
tmeaccess2.Storage> fs list FS STATUS SIZE LAYOUT MIRRORS COLUMNS USE% USED NFS SHARED CIFS SHARED FTP SHARED SECONDARY TIER ====================================
tmeaccess2.Storage> exit tmeaccess2> objectaccess Entering Object Access Service configuration mode tmeaccess2.ObjectAccess> map /vx/s3tsmfs/tbucket admin ACCESS ObjectAccess SUCCESS V-493-10-4 Successfully mapped bucket tbucket to admin. tmeaccess2.ObjectAccess> bucket show Bucket Name FileSystem Pool(s) Owner ====================================

#### CONFIGURATION OF ACCESS WITH IBM SPECTRUM PROTECT

To configure the Access Appliance onto IBM Spectrum Protect as a cloud container storage pool, a directory on the IBM Spectrum Protect server is required to act as a local disk cache for staging of the backups prior to sending the container files to the Access Appliance. In addition, the following information is required:

- Access and secret keys saved previously.
- Access Object S3 URL (in this example it would be: http://10.182.81.86)
- The bucket name created in previous step (i.e. tbucket)

#### CONFIGURE AS A CLOUD CONTAINER STORAGE POOL

Step 1) Create a directory to act as temporary disk cache for data to back up or archive on the server running IBM Spectrum Protect. NOTE: Make sure the directory created is owned by the IBM Spectrum Protect administrator.

[root@scltselnx27 ~]# cd /home/
[root@scltselnx27 home]# ls
astgpooldir cstgpooldir dstgpooldir fpooldir inst install key.txt root self tsmNotes2 tsmuser tushar vncuser1
[root@scltselnx27 home]# su - tsmuser
Last login: Thu Jan 10 03:25:44 PST 2019 on pts/3
[tsmuser@scltselnx27 ~]\$ cd /home
[tsmuser@scltselnx27 home]\$ ls
astgpooldir cstgpooldir dstgpooldir fpooldir inst install key.txt root self tsmNotes2 tsmuser tushar vncuser1
[tsmuser@scltselnx27 home]\$ mkdir tstgpooldir
[tsmuser@scltselnx27 home]\$ ls -ld .
drwxrwxrwx. 14 root root 286 Jan 10 16:40 .
[tsmuser@scltselnx27 home]\$ ls -ld tstgpooldir
drwxr-xr-x. 2 tsmuser tsmgrp 6 Jan 10 16:40 tstgpooldir
[tsmuser@scltselnx27 home]\$

Step 2) Using a web browser, log onto the Operations Center (i.e. https://localhost:11090/oc) and click on menu bar indicated by and then click on Storage Pools on left pane.

Overview			\$ <b>D</b>
Alerts		ŵ. A	Loading
Security	Clients	1	Servers
Clients		-	
Client Schedules		$\bigcirc$	
Services		$\smile$	
Servers		Atrisk	A
Maintenance	Applications	0	Database space
Storage Pools		$\sim$	
Disk Devices			Archive log space
Tape Devices			
Replication			
Tiering Rules	Virtual Machines	0	Storage & Data Availabil
Reports			Pools
https://localhost:11090/c	oc/gui#overviews/overview		(EB)

 $\equiv$ 

Step 3) Click on the "+ Storage Pool" to add a storage pool.

Ξ			ŝ	0	🚑 tsmuser	~
> Storage Po	ols Ale	erts 🏳 0				
🔄 🕂 Storage Pool	Quick Look	Details 🦕 Back Up	More 🗸			IIŀ,
5			Q 🗸 Filter			
Туре	Name	Server	Status ^	Capacity Used		Device
Primary	ARCHIVEPOOL	SCLTSELNX27	🗾 Normal	<ol> <li>No capacity</li> </ol>		DISK
(iii) Primary	BACKUPPOOL	SCLTSELNX27	🛃 Normal	<ol> <li>No capacity</li> </ol>		DISK
Primary	SPACEMGPOOL	SCLTSELNX27	Normal	No capacity		DISK
Showing 3   Selected 0				Refi	eshed 4 minute	s ago

Step 4) Enter name of pool, for example, "tpool" and then click Next.

Add Storage P	ool			
Identity	SCLTSELNX27 Create a storage pool to store	client data. Learn more		
	Name Server Description	TPOOL	~	
		Next		Cancel

Step 5) Select "On-premise cloud" and then Next.

Туре	CUITEENNOT TOOL CONCENTENNOT TOOL CONCENTENNOT CONCENTEN		
------	---	--	--

Step 6) Enter the access key, secret key, bucket name, object URL of the Access Appliance. Click Next.

Credentials			
	SCLTSELNX27	TPOOL	
	Choose whether to encrypt storage cloud. Learn more	pool data and enter the connection information for accessing the	
	Pool type	On-premises cloud	
	Encryption	Enable	
	Cloud type	Other certified providers - S3 API	
	Access key ID	MzUxMDNIZmYxM2U4OGF	
	Secret access key	•••••	
	Existing bucket name	tbucket	
	URL	http://10.182.81.86:8143	+

Step 7) Enter the directory of the local disk cache created in the previous step. Then, click "Add Storage Pool".

Local Storage			
	SCLTSELNX27	TPOOL	
		es where TPOOL can temporarily store dat it. If data is backed up directly to the pool,	
Directories			
/home/tstgpooldir	+		

Step 8) The next step is to create policies thus, click Close and View Policies. The steps to modify existing domain policies are described in the next section.

	k	
	Succeeded	
1:24 PM	Connected to SCLTSELNX27.	
	Adding TPOOL	
	Adding directory /home/tstgpooldir/.	
	The storage pool was added successfully.	
	To start using this pool, update your management classes. To add or modify a management class, click Close & View Policies,	
	3 succeeded	

#### MODIFY DOMAIN POLICY

The policies within IBM Spectrum Protect specifies which storage pool is utilized as the backup and archive destination. Clients are bound to one active policy at a time. Multiple client nodes can be associated to the same active domain policy. Thus, backups and archives from multiple clients can be directed to a single storage pool. The steps in this section define how to set up policies using the storage pool created in previous section. If you did not click on "Close and View Policies" in the previous section, then click on the Menu and click on "Services".

Step 1) In this example, the default STANDARD domain policy is modified to use the storage pool just created in the previous step that maps to the Access Appliance. Double click on the policy domain STANDARD.

✓ Policies	👘 Backup & Restore	6	Archive & Retrieve		🕒 Mig	rate & Recall	
Quick Look	E Details				Q 🗸 Filter		I
olicy Domain 🗸 🗸	Server	Clients Mgm	t Classes Option S	Sets Sche	dules	Default Mgmt Class	
] TEST	SCLTSELNX27	0	1	0	0	TESTMGMT	BA
STANDARD	SCLTSELNX27	0	1	0	0	STANDARD	SP
STANDARD	SCLTSELNX27	0	1	0	0	STANDARD	

Step 2) Click the "Configure" slider and slide the button to right to modify the Archive Destination to the storage pool TPOOL.

back one page ht-click or pull d	own to show	w history							٢	Ľ	0	🍇 tsmuser	~
*		STANDA	RD	)							🛃 so	LTSELNX27	
		Active policy set Default manage		t class	STANDARD STANDARD	Activated Jan	11, 2019, 7:25 PM						
Summary	3	+ Management	Glas	s 🛉 Ad	ctivate			9.	Filter				IR
Policy Sets		e STANDAR	D	_								Configure	•
	Mana	igement Class	^	Default	Backup	Destination	Backups		Keep E	xtra Backups		Co Arch	tive De:

Step 3) Select **TPOOL** as the new archive destination from the drop down.

=		٢	Ľ	0	🍇 tsmuser 🗸 🗸
¥ 111	STANDARD			SCL	TSELNX27
	Active policy set STANDARD Activated Jan 11, 2019, 7:25 PM Default management class STANDARD				
Summary	🖪 🕂 Management Class 💠 Activate 🔍 🗸	Filter	ł.		
Policy Sets	Active STANDARD 4 1 of 1 ►				Configure
	Backups 🔯 Keep Extra Backups 🔂 Deleted Backups 🕃 Keep Deleted Backups		Archive D	estination	С Кеер
	2 🗸 1 month 🗸 1 🗸 2 months -	~	TPOOL	~	
	Name Status (None) ARCHIVEPOOL S Norm BACKUPPOOL S Norm SPACEMOPOOL NOrm	mal	Capacity I No ca No ca No ca	pacity	
	TPOOL 2 Norr	mal	No ca	pacity	
		_			

Step 4) Click Save and confirm in the following pop-up window. After it succeeds, close the pop-up window.

	STANDARD						
Active policy set	STANDARD					SCLTSI	ELNX27
	STANDARD	Activated Ja	an 11, 2019, 7:	25 PM			
ummary 🔁 🕂 Management Class 💠 Activ	vate			Q 🗸 F	iter		
olicy Sets Active STANDARD	◀ 1 of 1 ►		_			Cor	nfigure 🔘
Backups 🔀 Keep Extra Backups	Fa Dek						
2 🗸 1 month	Der Deit	leted Backups	Keep D	eleted Backups	Archive D	estination	C Kee

Step 5) The policy would need to be activated to put into the affect the changes. Thus, click on "Activate".

<b>₽</b>	4							ŧ	8 🖸	04	tsmuser	~
*	ST	ANE	DARD							SCLT:	SELNX27	
	1.	ve polic			IDARD	Activated J	an 11, á	2019, 7:25 PM				
Summary	œ + M	Manager	nent Class 🕴 🛉 Activ	ate				Q, 🗸 🛛 Fil	er			
Policy Sets	Active	STANE	DARD	•	1 of 1 ▶					C	onfigure	•
	Backups	5	Keep Extra Backups		De De	leted Backups	5	Keep Deleted Backups	Archive	Destination		Keep
	2 🗸		1 month	~		1 🗸		2 months 🗸	TPOOL	~		
			_				_	_				_

Step 6) Acknowledge by **checking the box at the bottom**, that you understand that changing the policy can cause data loss or deletion. After it succeeds, close the pop-up window.

Activate STANDAF	e policy set can cause da	ta loss! Learn more				
Management Class	Changes	Default	Backup Destination	Backups	Keep Backups	Deleted Ba
STANDARD	Pending Activation					
		I understand that the	ese updates can cause data deletion.			
		Cance	I Activate			

Step 7) The STANDARD policy would now indicate that the Archive Destination is TPOOL.

=		Ę	ê 🖸	0	tsmuser	~
TE III	STANDARD			<b>7</b> S	CLTSELNX27	
	Active policy set STANDARD Activated Jan 28, 2019, 4:45 PM Default management class STANDARD					
Summary	Hanagement Class + Activate	Q V Fil	iter			IIĻ
Policy Sets	Active STANDARD				Configure	
N	Aanagement Class A Default 🕃 Backup Destination	5	Keep Extra Backup:	s	C Arct	rive Destin
	STANDARD 🖌 SPACEMGPOOL	2		30 days	TPOOL	

#### REGISTER A CLIENT NODE AND ASSOCIATE WITH A DOMAIN POLICY

Clients that require backup and archive would need to register with the IBM Spectrum Protect server managing the backup and archival as well as the target storage platform for the backups and/or archives. After client is registered then a domain policy is associated with the client. A client is associated with only one active domain policy. This section describes the steps to register a client and associate that client with a domain policy.

Step 1) Click on Menu indicated by and then click on Clients.

Overview			\$ D
Alerts		-	Loading
Security	Clients	1	Servers
Clients		-	
Client Schedules			
Services		Atrisk	
Servers		ALTISK	Inventory
Maintenance	Applications	0	Database space
Storage Pools		$\sim$	
Disk Devices			Archive log space
Tape Devices			
Replication			
Tiering Rules	Virtual Machines	0	Storage & Data Availabil
Reports			Pools
https://localhost:11090/	oc/gui#overviews/overview		

Step 2) Click on "+ Client" to register a client.

∽ Clier		ts 🏳 0			-	
F	Applications	0	Virtual Machines	0	1 Systems 1	
1		$\bigcirc$		$\bigcirc$	$\cup$	
F 🕂 Clie	nt 🔄 Quick Look. 🔳 Detai	n 😽 Back Up 🗄 S	et At Risk, More 🗸		Q V Filter	I
ype	Name	🌒 At Risk 🔨	Server	Target Server	Replication Workload	
ype	Name	📢 At Risk 🔨	Server	Target Server	Replication Workload	

Step 3) Select the name of the IBM Spectrum Protect Server managing this client.

ld Client		
Server and Authentication		
SCLTSEL	NX27	
Use this wizard You cannot use t	to register a system or application client on the server. this wizard to register a NAS file server or a virtual machine. Learn more	
Server	🗿 SCLTSELNX27 🗸	
Replication	Enable	
SSL	Always use	
	Next	Cancel

Step 4) Enter in client name, client password and verify password.

Identity			— E	
	SCLTBELNK27			
	Enter the information for the new cli-	ent. Leam more		
	Client name	TMESAVM8151		
	Client paseword			
	Verify password	•••••		
	Contact name			
	Email address			
	Remote access URL	-		
	Client-side deduplication	Enable Enable		

Step 5) Review configuration information and click "Next".

Add Client	extensione d	
Configuration		
	SCLTSELNX27	TMESAVM8151
	To configure the client to back up options tile. Learn more	data to SCLTSELNX27, install the client software and add the information that is shown below to the client
	TCPSERVERADDRESS TCPPORT NODENAME	(ADDRESS_CF_SCLTSELNK27) 1500 TMESAYM8151
		Back Next Cancel

Step 6) Associated with an existing domain policy. In this example, it is STANDARD.

Ac	ld Client		
	Policy Domain	SCLTSELNX27 TMESAVM8151 Select a policy comain to manage data for TMESAVM8151. Learn more	
	Name	Description	
۲	STANDARD	Installed detault policy d	
0	TEST	toot	
		Back	Cancel

Step 7) Click **Next**. In this example, no existing schedule is defined since we are doing the backup and restore manually via the Backup-Archive client tool.

Schedule							
		SCLT	SELNX27	TMESAVMB151	STANDARD		
		Select a sche	edule to automate data prot	ection services for TMESAV	/M8151 (optional). Learn mo	ore	
Name	^	Action	Start	Start	Window		

Step 8) Just selecting Default for now as the at-risk setting, then click "Add Client" and "Close" after it succeeds.

Set At Risk	
	SCLTSELNX27 TMESAVM8151 STANDARD
	Configure al-risk settings for TMESAVM8151. Learn more
	Detault
	Applications: 1 day Systema: 1 day
	O Bypass
	Suppress all at-risk warnings for TMESAVM8151
	O Custom
	Time since last backup
	Romannia (12 martine) 6 mm (12 martine) 7 martine) 12 martine)

Step 9) Review the client page and validation that the client has been registered.

×0	Overvie	we <b>Clients</b> Servi	ces Servera	Storage	Reports	Updates	۲	U O	🍇 tamuser 🗸 🗸
∽ Cli	ients 1 Clients receive	data protection services from	1						
	>	ations 0		Virtual Mach	nes 0	0	🔲 Systems 1	0	
3 +	Clerr Esck Look	Details 👋 Back Up	$\overline{\mathcal{T}}_{+}^{0}$ Set $\mathcal{X}$ Hick	More V			Q 🗸 Filter		IIL
Туре	Name	🗿 Ar Risk	A Server			Target Server	Replication Wo	rkicad	
Showing 1	Selected 0							Rolman	ed a few moments ago

#### VALIDATION OF THE SETUP

To validate the configuration of the Access Appliance as an S3 target for IBM Spectrum Protect, the backup and archive client is installed on the system registered as the client in the previous section. An archive of several directories and files in the registered client is conducted. Afterwards a restore to temporary location is done to validate restores.

#### Archive

Step 1) Start up the backup and archive client by entering in **dsmj** on an open terminal. To validate that this client is using the Standard domain policy, click on **Utilities** at the top pane and select "**View Policy Information**".



Step 2) Validate that TPOOL is the Copy Destination.

Displ	ay Polic	y Information	
Policy Information			
oney mornation	Server:	SCLTSELNX27	
	Domain:	STANDARD	
Active P	olicy Set:	STANDARD	
		01/28/2019 16:45:00	
		STANDARD	
v		The second se	
Manageme	nt class:	STANDARD	
Copy Destination: Lan Free Destination: Deduplicate Data: Copy Group Copy Group Name: Copy Type: Copy Frequency: Retain Version: Copy Serialization:	SPACEM No No STANDAR Archive CMD 365 day Shared S	RD (s)	•
Copy Mode: Retain Initiation: Retain Minimum: Copy Destination: Lan Free Destination:	Absolute Create 65,534 c TPOOL No		
Deduplicate Data:	Yes		×
			P



Step 4) Select the files or directories to archive. In this example, the **binaries** directory is archived.

	Archive (on tmesavm8151)	)	_ = ×
Eile Edit View Help	Name           .vmlinuz-3.10.0-862.el           config-3.10.0-862.el           initramfs-0.rescue-5           initramfs-3.10.0-862           symvers-3.10.0-862           System.map-3.10.0-86           vmlinuz-0-rescue-c5           vmlinuz-3.10.0-862.el	Size         Modified           166         03/21/2018 15:18.           70.62 MB         11/06/2018 14:16.           30.06 MB         11/06/2018 14:22.           297.77 KB         03/21/2018 15:18.           3.25 MB         03/21/2018 15:18.           6.06 MB         11/06/2018 14:22.	Acces 01/08/2019 01/08/2019 01/08/2019 01/08/2019 01/08/2019 01/08/2019 01/08/2019
	4	Hair	•

Step 5) Wait until the archive is complete.





Step 6) Using an S3 Browser, validate the contents of the bucket. Contents of the bucket are directories with \*.dcf or \*.ncf files.

53 Browser 8-1-5 - Free Version (for non-commer	cial use only] (Administrator) -	tmeaccess2				- 🗆 X	Τ							
Accounts Buckets Files Tools Upgrade to	Pro! Help													
💠 New bucket 🞉 Delete bucket 😥 Refresh	Peth: /					1096	8							
	<ul> <li>3a4-3804462d06e</li> <li>3a1-3804462d06e</li> <li>3a3-3804462d06e</li> </ul>	<ul> <li>3-32-3804462d06e2e8119a610cc47a3a31tc-L/</li> <li>3-4-3804462d06e2e8119a610cc47a3a31tc-L/</li> <li>3-a1-3804462d06e2e8119a610cc47a3a31tc-L/</li> </ul>				Last Modified (for non-commercial u: cols Upgrade to Pro!		dministrator) - tmea	access2					- 0 X
				🗣 New buck	ket 💥 Delete bucket	🔁 Refresh	Path: /	3a5-3804462d06e	2e8119a610cc47a	i3a31fc-L/				10 7 3
	1			- 🛁 s3b2			File				Size	Туре		Last Modified
		6. 6. K	Delete 🤖 N	w Fol			0000	000000003a5.dc	f		334.09 M	B DCF File	,	1/28/2019 8:58:30 AM
Tasks (25) Permissions Http Headers Tag	s Properties Preview													
		Size	% Pro				۲ ۷p	load + 📄 Down	nload 🕞 Del	ete 🤖 I	New Folder	Refresh	1 file (	\$ (334.09 MB) and 0 folders
				Tasks (25)	Permissions Http	Headers Tags F	Properties	Preview Versi	ions EventLo	9				
Running 🕊 Queued 📱 Stopped 🕨	Failed (25) Σ All (25)			Task					Size	% Pr	ogress	Status	Speed	
				Running	g 🐔 Queued 📑	Stopped 🕨 Failed	d (25)	Σ All (25)				P2 Start All	Stop A	All 🧕 Cancel All

#### Restore

Step 1) Click on Retrieve in the Archive box.



Step 2) Expand the Archive Date and then select the desired directory archived in previous section to retrieve.

	Re	etrieve (on tmesavm815	1)	-	. 🗆 ×
<u>Eile E</u> dit ⊻iew <u>H</u> elp					
国 Q 三 田					
Retrieve Options					
		Name	Size	Modified	Acce
i Chrive Date: 01/28/2019 Christell Chris		dsmerror.log dsminstr.log dsminstr.log.lock sesstest_v12.tar.gz	19 5 KB 0 B 5.78 KB 0 B 1.1 MB 382.21 MB		01/08/201 01/10/201 01/08/201 01/10/201
	4	11101			

Step 3) Select a destination location to place the retrieved files.

Eile <u>E</u> dit ⊻iew <u>H</u> elp			
			f
Retrieve Options			
TMESAVM8151	Retrieve Destination (on tmesavm8151) ×		
└── ☐ /home └── ☐ install └─ ☑	Select destination for retrieved objects	2019 10:14 2019 10:14 2019 10:14	01/10/2019
	<ul> <li>Original location</li> <li>Following location</li> </ul>	2018 14:37 2018 14:34	
	Select /tmp/rfiles		
	<ul> <li>Retrieve complete path</li> <li>Retrieve partial path</li> <li>Retrieve partial path without base directory</li> <li>Do not preserve directory structure</li> </ul>		
L.	Retrieve         Cancel         Help		

Step 4) Wait for the retrieval to complete.

dit <u>A</u> ctions	<u>U</u> tilities	View	<b>0</b>	I	Ì
Spectrum Protect	. Click belo	w to perform a task.			
		Retrieve Report (on tmesavm81	51)	-	;
estore copies of da dated.	Stat Performance	us: ce			
Backup Copies files to s storage to prev data.	LanFree I Transfer Netv	Data Bytes: 0 B Rate vork (KB/s):			
Restore Restores savec server storage.	Object Cou Inspected:	nt Retrieve			
_	Last Error I				
	estore copies of da dated. Backup Copies files to s storage to prev data. Restore Restores savec server storage.	estore copies of da fated. Backup Copies files to storage to prev data. Restore Restores savec server storage. Discussional data Restores files to storage to prev data. Restore Server storage.	estore copies of da dated. Backup Copies files to storage to pre- data. Restore Restores saves server storage	Retrieve Report (on tmesavm8151)         Detailed Status Report         Backup         Copies files to storage to predata.         Restore         Restore saved server storage.         Object Count         Inspected: 7         Failed: 0         View         Last Error Message	Retrieve Report (on tmesavm8151)

Step 5) Open a terminal and validate that the directory and its contents have been retrieved.

root@	tmesavm8151:~ _	×
File Edit View Search Terminal Help		
<pre>[ldot@tmesavm8151 ~]# ls /tmp/rfiles binaries [root@tmesavm8151 ~]# ls /tmp/rfiles/ citScanOutput.xml dsminstr.log dsmerror.log dsminstr.log.lock [root@tmesavm8151 ~]#</pre>	sesstest_v12.tar.gz	

#### USING SSL

When using SSL, Access certificate would need to be added the IBM Spectrum Protect keystore. The certificates get generated when SSL is first enabled on Access. **NOTE**: Any changes to the endpoint in the portald.conf would require a re-generation of the certificate ticket using the "certificate renew" from the objectaccess mode on the command-line interface (CLI). SSL can be enabled using GUI or CLI. In this example, SSL is enabled using the CLI.

Step 1) Connect to the Access CLI using ssh (i.e. ssh admin@<console IP>).

Step 2) Enter the objectaccess mode and enable SSL and then stop and start the object services.

tmeaccess2> objectAccesss tmeaccess2.ObjectAccess> set ssl\_enabled yes tmeaccess2.ObjectAccess> server stop ACCESS ObjectAccess SUCCESS V-493-10-4 ObjectAccess stopped successfully. tmeaccess2.ObjectAccess> server start ACCESS ObjectAccess SUCCESS V-493-10-4 ObjectAccess started successfully.

Step 3) Get the certificate and save the -----BEGIN/END---- clause inside a temporary file (i.e. cert.pem) inside the IBM Spectrum Protect server.

tmeaccess2.ObjectAccess> certificate show
Type Self-signed
CA certificate expiry Jan 31 21:19:05 2022 GMT
Server certificate expiry Feb 1 21:46:57 2020 GMT
CA certificateBEGIN CERTIFICATE
MIIDhTCCAm2gAwIBAgIJAPJ30XIJwsMqMA0GCSqGSIb3DQEBCwUAMFkxCzAJBgNV
BAYTAIVTMRMwEQYDVQQIDApDYWxpZm9ybmlhMRAwDgYDVQQKDAdWZXJpdGFzMQ8w
DQYDVQQLDAZBY2Nlc3MxEjAQBgNVBAMMCXMzLmFjY2VzczAeFw0xOTAyMDEyMTE5
MDVaFw0yMjAxMzEyMTE5MDVaMFkxCzAJBgNVBAYTAlVTMRMwEQYDVQQIDApDYWxp
Zm9ybmlhMRAwDgYDVQQKDAdWZXJpdGFzMQ8wDQYDVQQLDAZBY2Nlc3MxEjAQBgNV
BAMMCXMzLmFjY2VzczCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBANTD
6Nf4n9sxIR7ZgXezLX7I8mZS+Js+XiedyLBcrhwdduziLvQ/zrfouwCbKYIu+wW4
/3Xv3D40PBJ6FOLaddS5TDNo5JSaIPKV+6dkAzHfBpio1OlJiwX0jW2+6iW8rj9k
tOhrerWAyLiy3x3GLb9y5E0JH+NP6XbIAQP9V07D4GoZ1pXnhNeWe/31Ng1odDo4
w Dq Qg Jp q N0 s b hayz d A 9 I Z B y Y b M t H P q 2 X u I U e z Y H o s i B s 2 1 R Y y a s A b p n v h s Z c I R 6 B hayz d A 9 I Z B y b hayz d A 9 I Z B
w32MxPVXIUrsjsLSMTT0I+Yiemmw8smB52C3sv/7TQqUbaPsXiTmxUc2+j7/Bil9
6ixY4bQh9fBfrRLXgd8CAwEAAaNQME4wHQYDVR0OBBYEFJmCJkIQXc2KwsAnRNID
8V66EqUFMB8GA1UdIwQYMBaAFJmCJkIQXc2KwsAnRNID8V66EqUFMAwGA1UdEwQF
MAMBAf8wDQYJKoZIhvcNAQELBQADggEBABJ7U3HmZP6hQ647ZDYDKw/dOt4mA1m4
pN0iJ8pRW3Do57k1fAzyclG7iavFv/pQMPGPHCWmhGtt0h6jzGpTHnOvgzaE4fYC
ZzViHi4M3RloQLgFJiXTt71ghj13uuYa+87H5WclbJyHmru8e/KlKVxUovai1Ovm
ZBu378GIZjKp1sj/lzyGkPFLDrD8ftpYovKkhV4nm03nKbKcwtQIHklnww8m0wzG
108jN+KvlF3SS1QM6xs+QH+KCtAKE8M+SUu9H/qlXHHK7OiOFHrSGjBGTD2es4py
A4emuO19jA3joRBOAWz+BHkW06PQXaJpuEW+b+Yww4XcnFRhV6Q4VAE=
END CERTIFICATE

Step 4) On the IBM Spectrum Protect Server, use a terminal window to convert the certificate file \*.pem (a Base64 encoded ASCII files) to a \*.der (the binary form of the certificate that does not contain "BEGIN CERTIFICATE/END CERTIFICATE" statements.

#### # openssl x509 -outform der -in cert.pem -out /tmp/cert1.der

Step 5) Save the old keystores in the <IBM Spectrum Protect directory>/jre/bin (i.e. /opt/tivoli/tsm/jre/bin)

#### # cd /opt/tivoli/tsm/jre/bin # cp ../lib/security/cacerts ../lib/security/cacerts.original

Step 6) Import the certificate into the keystore using the keytool utility in the jre/bin directory.

/keytool -import -keystore ../lib/security/cacerts -alias <somealias> -file <yourfile> where <some alias> is a unique alias you chose to identify this certificate in the keystore. This is important if you have more than one certificate and <yourfile> is the path and file name of the certificate created in previous step.

If a password is asked, use "changeit" and enter yes to trust the certificate.

#### # ./keytool -import -keystore ../lib/security/cacerts -alias acert -file /tmp/cert1.der

Step 7) Stop the IBM Spectrum Protect Server. To halt IBM Spectrum Protect, ssh onto the client 10.182.81.51 as root/P@ssw0rd and enter into the IBM Spectrum Protect CLI and issue a halt command. This can also be done via the IBM Spectrum Protect GUI using the Command builder.

[root@tmesavm8151 ~]# dsmadmc -id=tsmuser -pa=P@ssword

IBM Spectrum Protect

Command Line Administrative Interface - Version 8, Release 1, Level 4.0

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Session established with server SCLTSELNX27: Linux/x86\_64

Server Version 8, Release 1, Level 5.000

Server date/time: 01/09/2019 17:46:45 Last access: 01/09/2019 17:45:46

Protect: SCLTSELNX27> halt

Step 8) Verify IBM Spectrum Protect is halted by checking the services (e.g. dsmserv) has stopped by doing a "ps -eaf | more".

Step 9) Restart the server, on the Spectrum Protect server by doing an ssh onto the IBM Spectrum Protect server as the administrator (e.g. tsmuser/P@ssw0rd) and source the db2profile and run dsmserv.

# . ~/sqllib/db2profile # dsmserv

NOTE: It takes a while for Spectrum Protect to come up. The way to verify it is fully up is to logon to the client and run the "dsmadmc -id=tsmuser -pa=P@sswOrd" to get into the server CLI. If you can get in, then it is up.

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