PURESTORAGE®

FLASHBLADE™ DATA PROTECTION WITH RUBRIK

Seamlessly Protect and Restore Your Data

July 2017

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INTRODUCTION

Rubrik and Pure Storage have partnered to provide an integrated, performant, and simple-to-manage solution that will enable IT professionals to seamlessly protect and restore content for the Pure Storage FlashBlade™ array.

These complimentary products will enable customers to truly have the best of both worlds: FlashBlade for performant, dense, scale-out storage for unstructured workloads combined with robust data protection and recovery from Rubrik that enables granular point-in-time recovery for individual files or entire massive directories. No longer do system administrators need to waste time managing multiple siloes and a seemingly endless range of products that are expensive, difficult to integrate, and provide a point solution to a single use case.

FlashBlade with data protection from Rubrik will perform and protect whatever unstructured workloads you can throw at it. This paper will showcase real world dataset examples which confirm that setting up and managing this integration is exceedingly easy, yet comprehensive as far as meeting your data retention requirements.

FLASHBLADE CONFIGURATION

For this whitepaper, we used a half-populated FlashBlade chassis comprised of seven 8TB blades. Because this chassis was only half-populated, note that overall available network throughput would approximately double if some of the remaining 8 blade slots were filled.

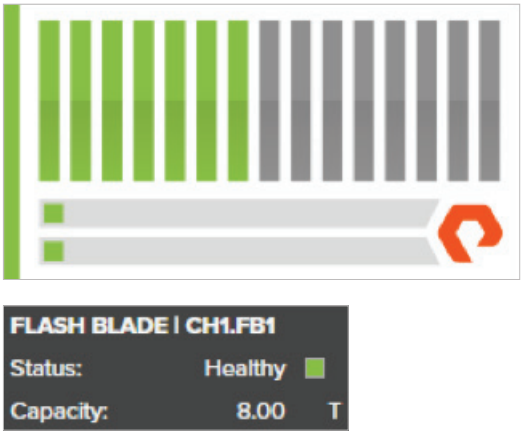

Figure 1. FlashBlade configuration used in this whitepaper

For more detailed information about FlashBlade and available configurations, please follow this **link**.

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RUBRIK CONFIGURATION

The Rubrik appliance used in this whitepaper was a four node Brik with hybrid storage comprised of a 1.6TB SSD and a 95.3TB HDD for roughly 60TB of usable secondary storage space with overhead considered. We used firmware version 3.2, which includes native NAS share protection. For more information on Rubrik, please follow this **link**.

UNSTRUCTURED DATASET USED IN TESTING

For our source dataset, we opted to include a wide range of files of different types and sizes to provide a challenging and realistic dataset for backup that would simulate a customer using a mixture of small HPC/EDA files as well as larger media and entertainment files, all residing on FlashBlade and Rubrik. The files used in our testing were comprised of multiple copies of the **Login VSI Pro Library** traditionally used for VDI testing and included a wide variety of PDFs, large MP4 movies, as well as Microsoft Office files. We also used **Splunk** index and raw data files and some data files of varying sizes and compressibility generated via the **Oracle VDBench tool**. Lastly, these files were stored in subdirectories varying in depth from 1 to 10 levels.

We created four identical FlashBlade NFS file systems that were each about 500GB in written size and contained approximately 550,000 files from the above sources to show that FlashBlade and Rubrik can execute as well as ingest a wide range of file types and sizes from multiple sources in parallel without sacrificing usability or performance. The combination of these four file systems resulted in over 2 million files and 2 TB of overall data for our testing.

Creating a file system on FlashBlade is effortless. From the FlashBlade GUI, highlight the **Storage** option and then click on the **+** sign on the right.

Figure 2. FlashBlade GUI with File System creation highlighted

Next, give the File System a name, a provisioned size, and select the protocol(s) you wish to use. If using NFS, set the export rules. In our example, we used NFS exported to all VLANS and set the permissions to allow read and write privileges to all users, though SMB is also completely supported as well. Network export as well as permissions can be restricted as needed for your unique environment.

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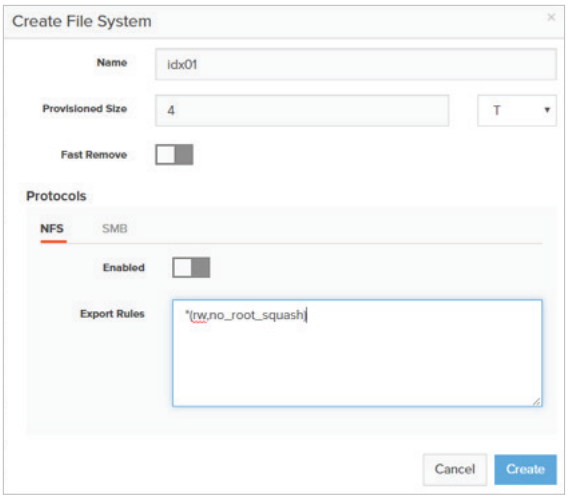

Figure 3. Simple NFS File System creation on FlashBlade

We repeated these steps three additional times to create a total or four File Systems. Once that was completed, we copied and generated our source datasets into each of the four File Systems.

The created File Systems populated with data can be seen in the graphic below. With our datasets built, we next moved on to setting up our protection scheme on Rubrik.

idx01	4.00 T	499.92 G	12%	1.0 to 1	492.88 G	NFS
idx02	4.00 T	488.55 G	12%	1.0 to 1	485.66 G	NFS
idx03	4.00 T	493.63 G	12%	1.0 to 1	488.71 G	NFS
idx04	4.00 T	482.31 G	12%	1.0 to 1	477.66 G	NFS

Figure 4. Characteristics of the four FlashBlade File Systems used in our testing

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FLASHBLADE AND RUBRIK DATA PROTECTION SETUP

The first step of creating the SLA policy for backing up the FlashBlade File Systems was easily accomplished from within the Rubrik GUI. Rubrik also features a REST API so all the setup and functions shown here can also be accomplished with the scripting language of your choice (e.g. Python, PowerShell).

Expand the **SLA Domains** menu and highlight the **Local Domains** option.

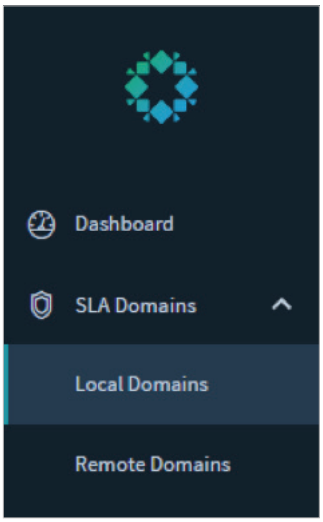

Figure 5. Rubrik Local Domains SLA creation

In the top-right of the GUI, click on the **+** sign that is spawned to get into the SLA domain creation wizard.

For our test dataset, we will take a snapshot of the four FlashBlade File Systems every 12 hours and keep them for five days. Monthly backups will also be created and retained for two years. Time windows for when you want to run or not run the protection job can be assigned here, and you can also set replication between multiple Rubrik appliances.

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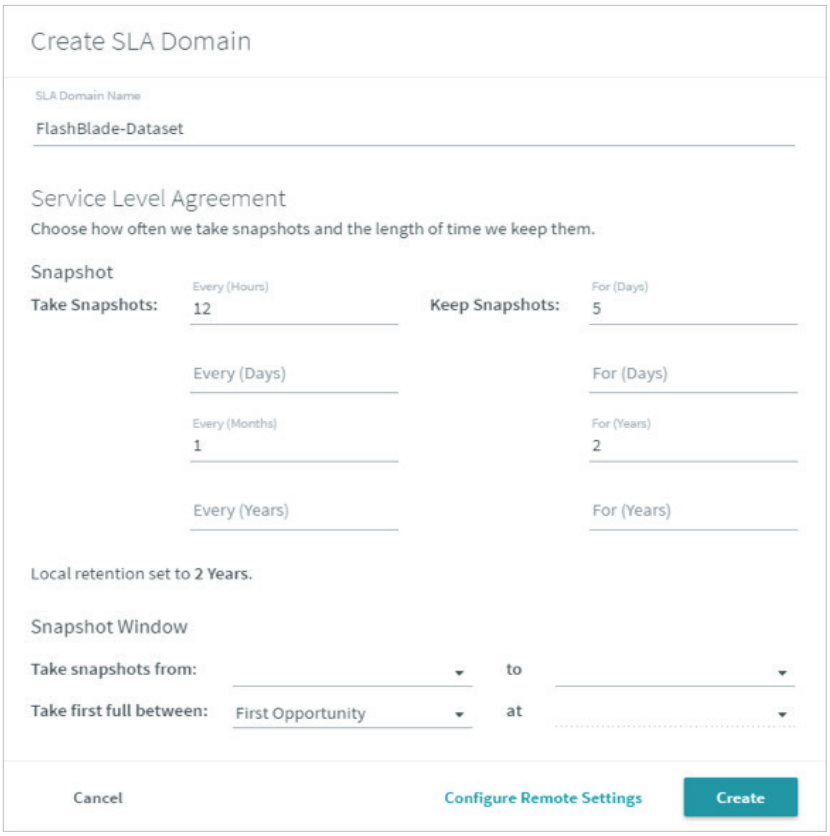

Figure 6. Options selected in creating our test SLA Domain

With our SLA domain built, the next step is to mount the four FlashBlade File Systems from within the Rubrik appliance. In the main menu on the right, expand the **Protection** menu and highlight the **NAS Shares*** option.

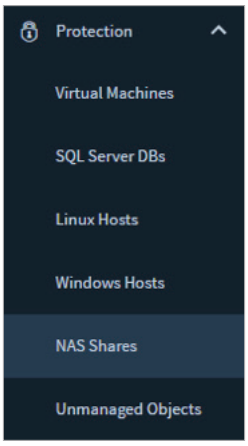

Figure 7. NAS Shares option under the Protection menu of the Rubrik GUI

* *Please note that in the addendum section we show how Linux hosts can be used as an intermediary mount point for FlashBlade to Rubrik.*

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Clicking on the **Add NAS Share** button in the top-right of the GUI will launch the wizard to mount FlashBlade to Rubrik.

Figure 8. Add NAS Share button in Rubrik GUI

Before we can access our test file sets, we first need to mount the NAS host. To do so, select the **Add Host button**.

Figure 9. Add an NAS host mount point in Rubrik GUI

Enter a data IP address for FlashBlade and the pureuser **username** and **password** combination.

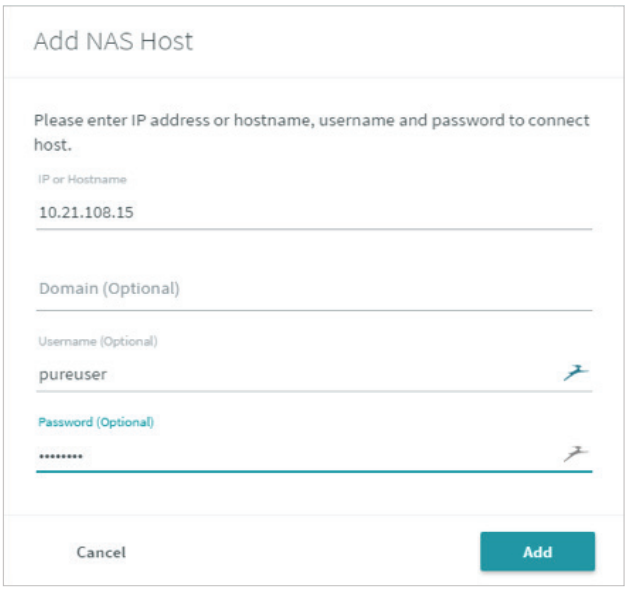

Figure 10. Include NAS hostname or IP address along with credentials

The host should now appear in the **Add Share** wizard. Click on the radio button for the FlashBlade IP or FQDN from the previous step, and click **Next**.

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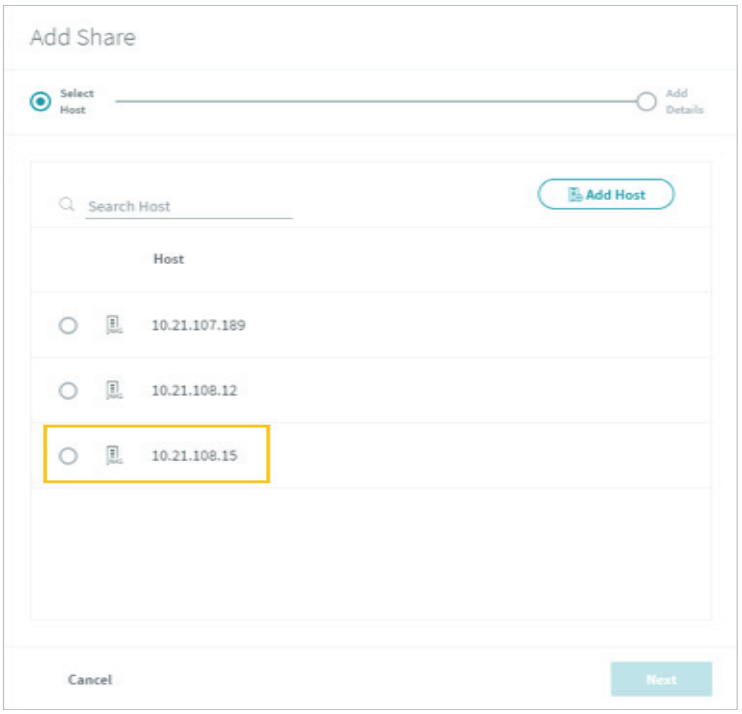

Figure 11. With the host added, select it and click the Next button

We will now enter in the first FlashBlade File System location as a share that Rubrik will be able to protect.

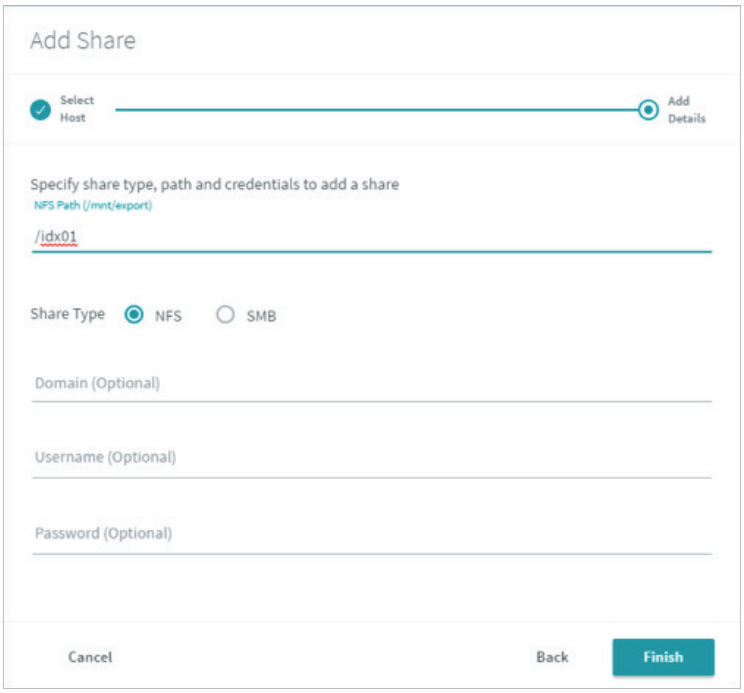

Figure 12. Specify the FlashBlade File System to add to the mount point as well as Share Type

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While you can host multiple shares from the same NAS mount point, we elected to mount four separate NAS hosts, each on a separate data IP address, to maximize network bandwidth and resiliency. After creating the four NAS host mount points we added one File System to each, as can be seen in the NAS Share summary screen below.

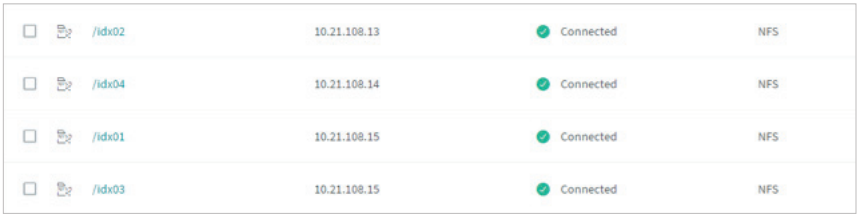

Figure 13. Four FlashBlade File Systems mounted to Rubrik

With all four File Systems mounted and available within Rubrik, we selected all four and clicked on the **Manage Protection** option in the top right.

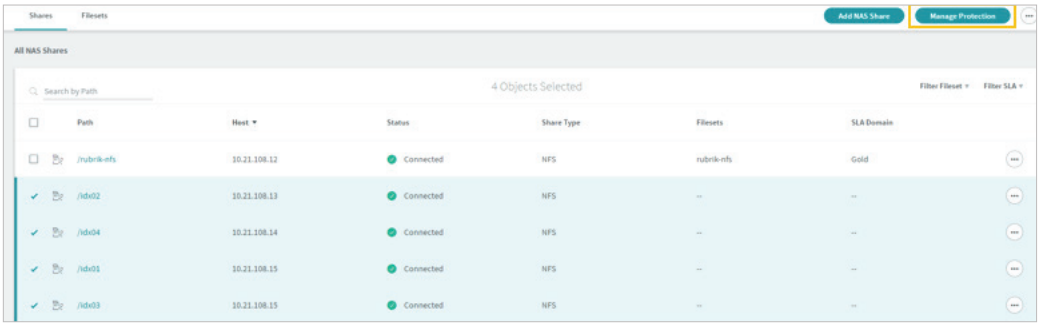

Figure 14. Select the four FlashBlade File Systems and select Manage Protection

After that, we needed to create and select a fileset to apply to our shares. Filesets enable you to filter what types of files to include or exclude from your protection job. To create it, click on the **+** button in the window below.

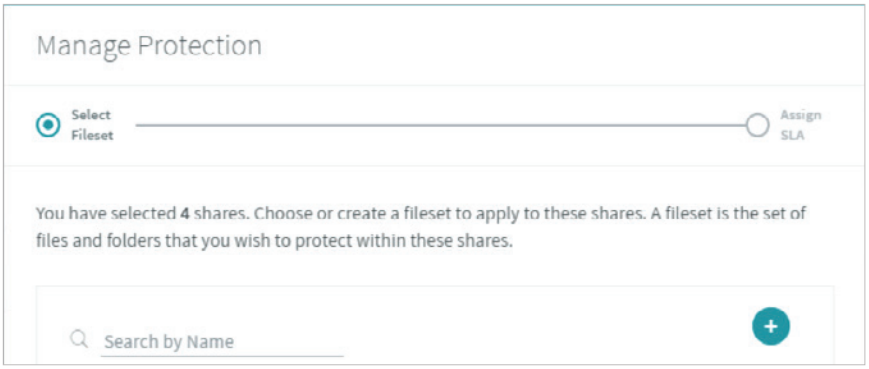

Figure 15. Click on the + sign to add a Fileset

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We are protecting all data on our four FlashBlade File Systems so our fileset rules were very straight forward:

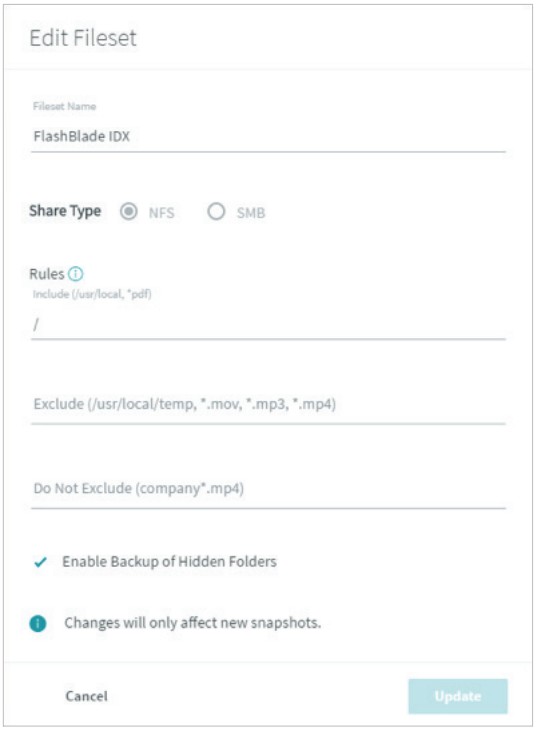

Figure 16. Provide a name for the fileset and assign any exclusion and/or inclusion rules

With our fileset rules established, we assigned them to our four source FlashBlade File Systems.

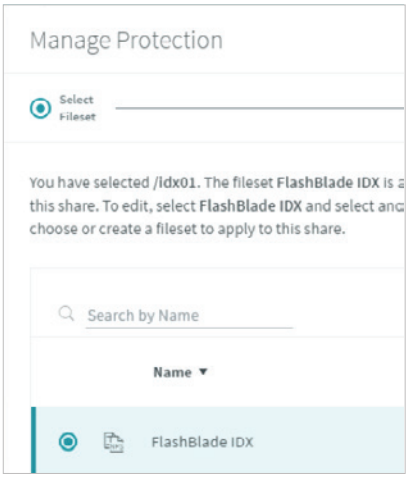

Figure 17. Select the newly created fileset for use

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The final step is to assign the SLA we built in the first step, which is illustrated in the screenshot below.

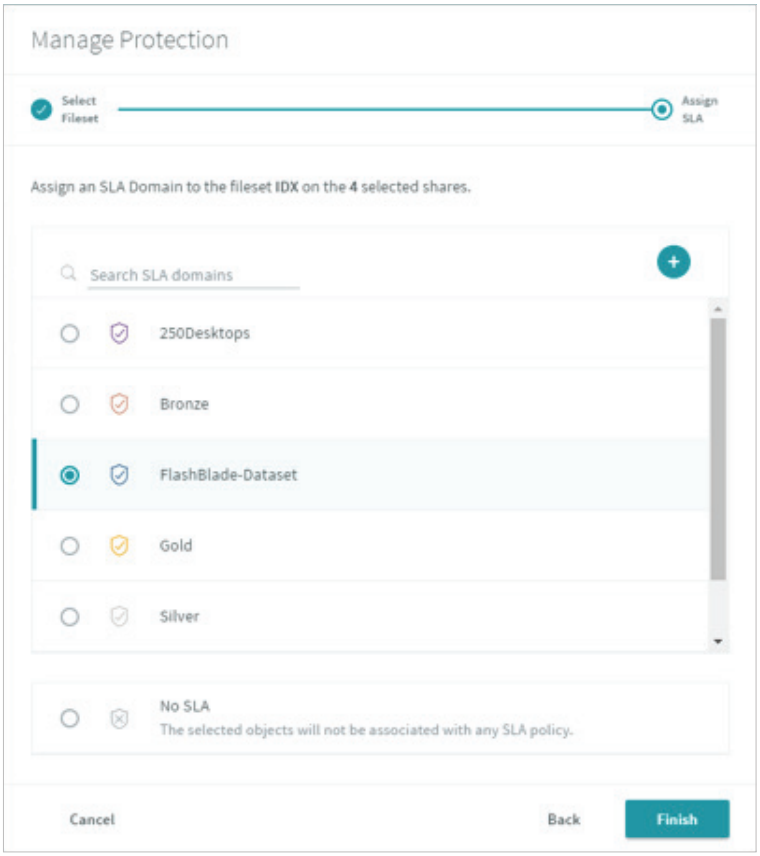

Figure 18. Assign the earlier created Rubrik SLA to the four FlashBlade File Systems

A summary screen shows that all four FlashBlade File Systems have been successfully assigned the fileset and SLA Domain.

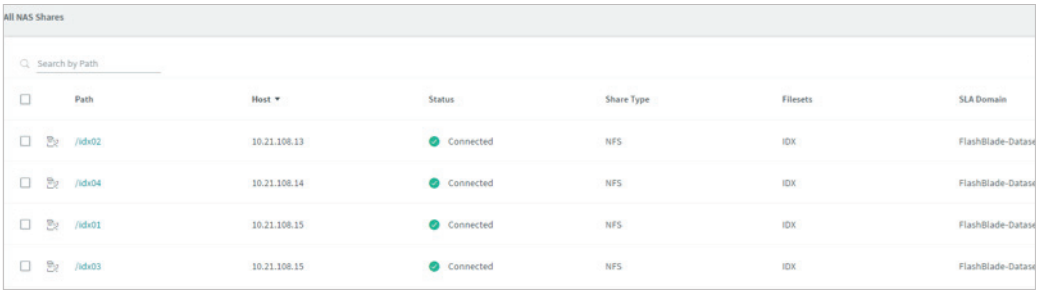

Figure 19. SLA successfully assigned to the four FlashBlade File Systems

After a few moments, Rubrik begins to read and ingest data from our four FlashBlade File Systems in parallel for content retention and protection.

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Figure 20. Data ingestion from FlashBlade to Rubrik starting

From the FlashBlade GUI, we observed a consistent high throughput of data ingest during the initial backup operation. Worth noting is that subsequent backup jobs to Rubrik will only include files that are changed or added, which should significantly decrease the amount of time and network bandwidth needed. As Rubrik features data compression technologies, the data footprint required will also remain small over time. Snapshots on Rubrik are also immutable, allowing for recovery to any retained snapshot instantly.

The following screenshot of the FlashBlade GUI shows that it took just under an hour to ingest our four File Systems as an initial snapshot. Data is ingested and parity is built within the Rubrik cluster for further resiliency.

Figure 21. FlashBlade GUI showing data being read into Rubrik for protection

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The example below of an incremental backup shows that subsequent File System snapshots are created in relatively little time with respect to the initial backup run:

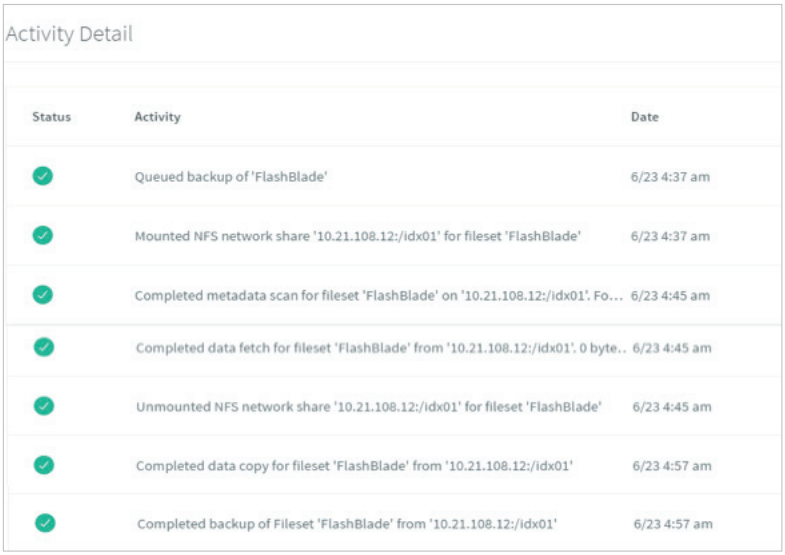

Figure 22. Incremental FlashBlade File System backup

FLASHBLADE RECOVERY FROM RUBRIK

The last phase of our testing was to restore two different directories in parallel from Rubrik to FlashBlade from two separate File Systems. One test directory included subdirectories of varying depth as well as many small files, while the second was a collection of a few very large files. To start, we selected one of our mounted NAS shares which spawned the window in Figure 23.

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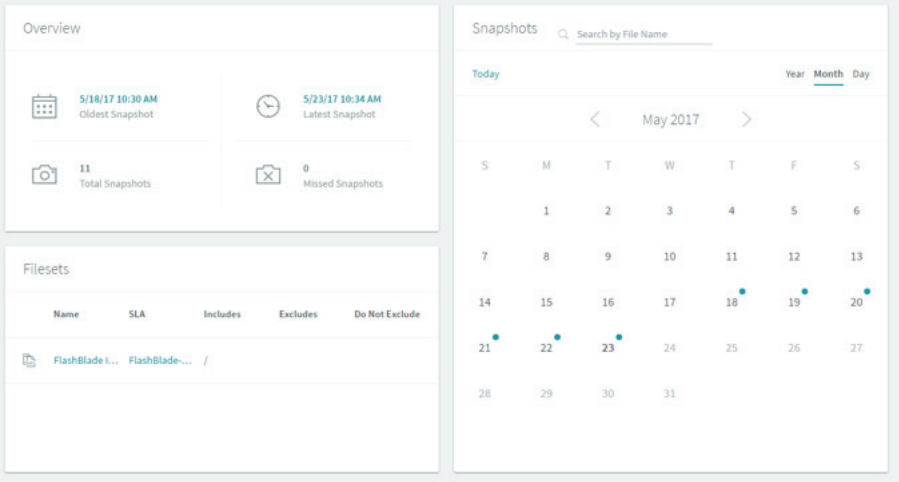

Figure 23. Single FlashBlade File System recovery pane in Rubrik GUI

Next, click on the date that you wish to restore back to on the calendar.

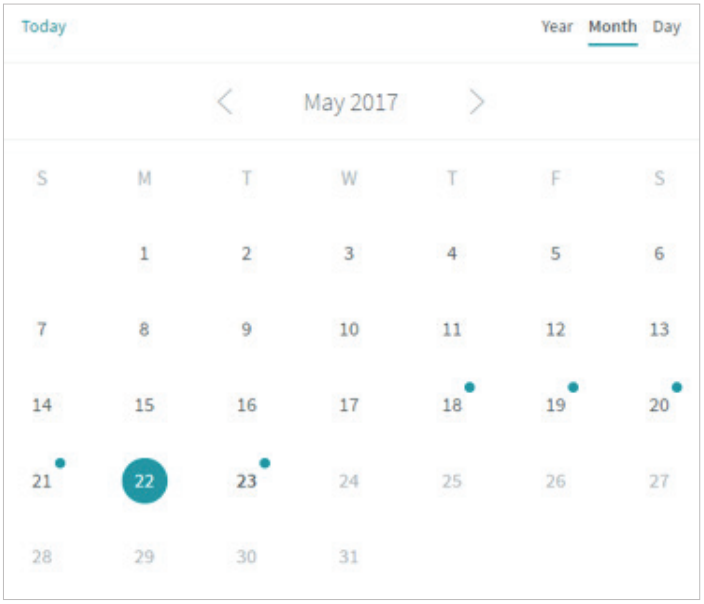

Figure 24. Select a snapshot to recover to from the calendar view within Rubrik GUI

Snapshots taken for the date selected will be displayed. Click on the icon to the right and select **Browse Files** to drill down to the directory or file that needs to be recovered. Individual files or folders can also be searched for and recovered.

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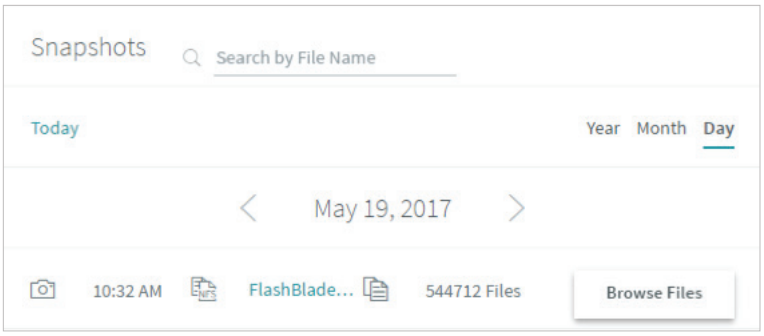

Figure 25. Select date, time, and files/folders to be restored

In this case, we are going to restore the entire **LoginVSI-2** directory, which is comprised of over 25,000 unique files, and is about 20GB in size. Navigate to the directory and click on the circle icon alongside of it to show the available recovery options. We are choosing the **Restore** option in this test.

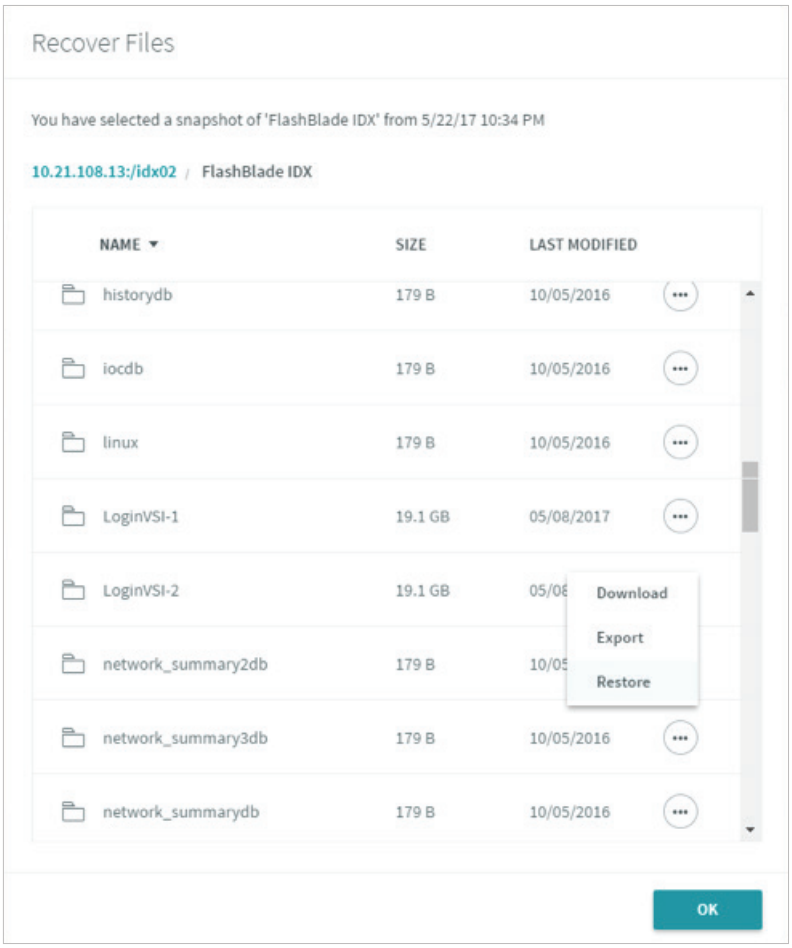

Figure 26. Once the directory is located, click on the circular icon and select Restore

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The recovered directory will be entirely overwritten on our FlashBlade file system for this test, but customers can also choose to create a separate volume to restore to.

Clicking the **Restore** button will kick off the operation.

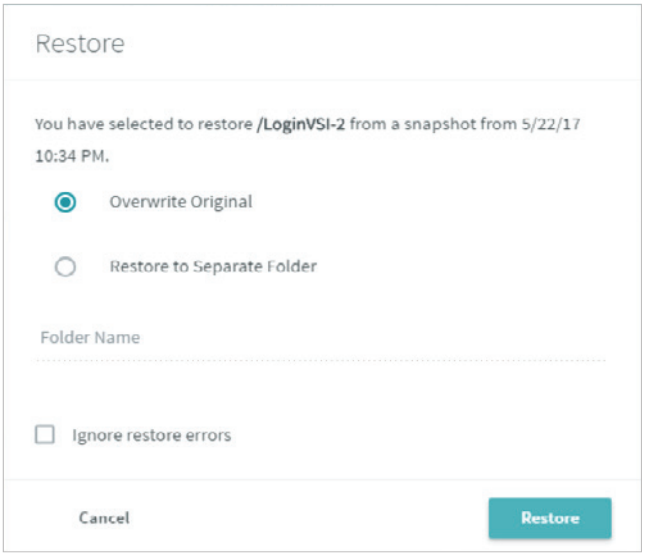

Figure 27. Choose to overwrite the original files or restore to a separate directory, then click Restore

Immediately after this restore operation was created, we repeated the process for a larger directory that was approximately 96GB in size and comprised of fewer, bigger files.

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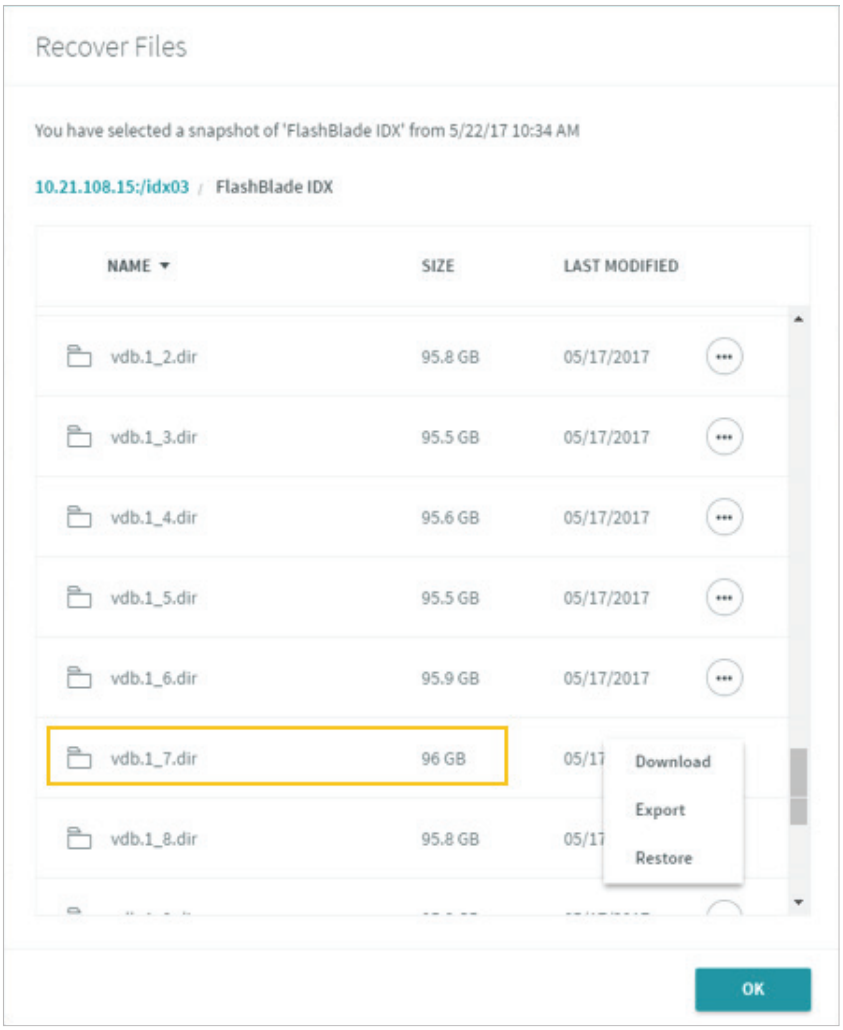

Figure 28. Repeating directory recovery on a larger directory with less files

The following two screenshots show our two simultaneous recovery tasks being executed. The smaller sized recovery with the larger number of files completed in just about 14 minutes, while the second job with larger files finished in under an hour, proving that rapid recovery of very different sets of data is smoothly achieved, even in parallel.

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Figure 29. Activity details for our first directory recovery

Figure 30. Activity details for our second directory recovery

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CONCLUSION

In just a few short pages, we have clearly demonstrated that the paradigm of backup and recovery has dramatically shifted – from what has traditionally been a pain point in both large and small enterprises, to an easy to setup and manage, holistic solution. FlashBlade provides the density, scalability, and unparalleled performance to handle your most demanding unstructured workloads, while Rubrik allows for exceedingly simple and smooth recovery of entire directories, all the way down to individual files.

This partnership and integration allows our joint customers to focus on improving their business processes rather than struggling daily to keep their proprietary data available to the right individuals and rapidly recoverable should disaster, ransomware, or accident strike. This kind of solution provides just what the IT industry has been asking for: consolidation, protection, and ease of management for exponentially increasing datasets into denser footprints, with access to deeper data analytics for the new stack.

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ADDENDUM: USING A LINUX HOST

Using a Linux host as an intermediary for backing up a FlashBlade NFS share is an alternative option provided by Rubrik. Because the Linux host is a single point of failure, this method is not recommended over the native NAS option shown earlier in this guide. However, there certainly are use cases where NFS volumes are mounted on a Linux host, and being able to provide data protection at that layer will be an attractive functionality to some users.

An example of how to mount a FlashBlade NFS file system to a linux host (CentOS7 in this case) is:

Syntax

```
mkdir [local Linux Host mount directory]
mount -t nfs -o nolock,hard,intr,nfsvers=3,tcp,bg [data IP for FlashBlade]:/
[FlashBlade _ FileSystem] [Linux Host mount directory]
```

Examples

```
[root@lab-fb-b01-11-01 ~]# mkdir /mnt/idx01
[root@lab-fb-b01-11-01 ~]# mount -t nfs -o nolock,hard,intr,nfsvers=3,tcp,bg
10.21.108.15:/idx01 /mnt/idx01
```

With NFS mounted on our Linux host, we can now use Rubrik to protect it. To start, click on the **Linux Hosts** option on the main Rubrik **Protection** menu.

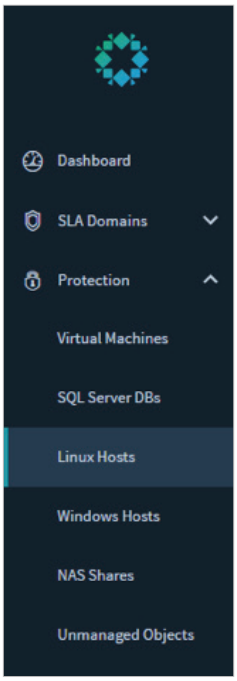

Figure 31. Select Linux Hosts under Protection Menu

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Next, click on the **Add Linux Hosts** button on the top right.

Figure 32. Click Add Linux Hosts button

The Rubrik Backup Service agent will need to be downloaded and installed to the Linux host. Supported Linux distributions as of the publishing of this paper are shown in the screenshot below. In our example, we are using CentOS7.

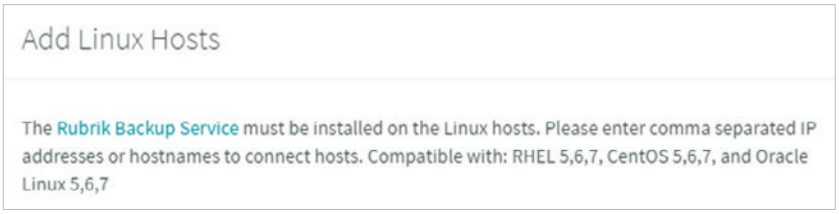

Figure 33. Download the Rubrik Backup Service binary to the Linux host

Installing the Rubrik backup package is achieved through a simple **rpm -Uvh rubrik-agent.x86_64.rpm** command. Expected output is shown below:

```
[root@lab-fb-b01-11-01 ~]# pwd
/root
[root@lab-fb-b01-11-01 ~]# ls *.rpm
rubrik-agent.x86_64.rpm
[root@lab-fb-b01-11-01 ~]# rpm -Uvh rubrik-agent.x86_64.rpm
Preparing...                          ################################# [100%]
Updating / installing...
   1:rubrik-agent-3.1.0.DA1-1.0       ################################# [100%]
Generate uuid
Generate credentials
/etc/rubrik
Generating RSA private key, 2048 bit long modulus
...................+++
.............................+++
e is 65537 (0x10001)
Using configuration from /tmp/tmp.cCbBIKQUzR/conf
Check that the request matches the signature
Signature ok
The Subject's Distinguished Name is as follows
commonName            :ASN.1 12:'876662c5-09a2-4dcc-bfc3-ed88076a6476.agent.rubr
ik.local'
countryName           :PRINTABLE:'US'
stateOrProvinceName   :ASN.1 12:'California'
localityName          :ASN.1 12:'Palo Alto'
organizationName      :ASN.1 12:'Rubrik, Inc.'
Certificate is to be certified until Oct  3 16:58:43 2044 GMT (10000 days)

Write out database with 1 new entries
Data Base Updated
Status daemon: bootstrap_agent_main [DOWN]
Starting daemon: bootstrap_agent_main
I0518 09:58:43.215813 36172 common.cpp:23] Binary built on Feb 22 2017 at 23:27:
11
                                                           [  OK  ]
Status daemon: bootstrap_agent_main [UP]
Status daemon: backup_agent_main [DOWN]
Starting daemon: backup_agent_main
I0518 09:58:43.333513 36205 common.cpp:23] Binary built on Feb 22 2017 at 23:27:
11
                                                           [  OK  ]
Status daemon: backup_agent_main [UP]
[root@lab-fb-b01-11-01 ~]#
```

Figure 34. Install the Rubrik Backup Service to the Linux host

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Now that the Backup Service is installed and running, adding the Linux host can be accomplished by adding the IP address or hostname:

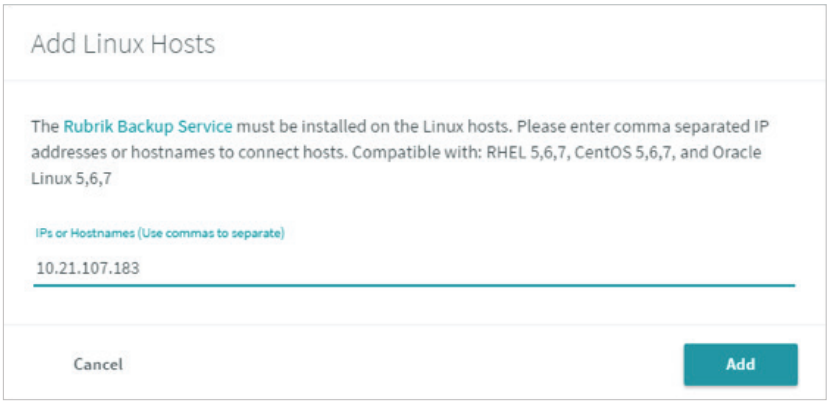

Figure 35. Enter the IP address or hostname of the Linux Host within the Rubrik GUI

With the host added, we are now able to add a fileset including our mounted NFS source from FlashBlade and assign the same SLA as used in the earlier section to back up the File System.

Figure 36. Adding a fileset and SLA domain to the Linux host

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