



FLASHBLADE™ AS AN ARCHIVAL TIER FOR RUBRIK

Backup, Restore, and Long Term Data Archiving

November 2017



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INTRODUCTION

The purpose of this whitepaper is to showcase the ease of integration, best practices, and expected performance results for data backup, restore, and long term data archiving using the Pure Storage FlashArray, Rubrik, and Pure Storage FlashBlade™ solutions with realistic real-world examples. The combination of these innovative products provides industry-leading performance, high levels of resiliency, simple implementation, and, perhaps most importantly, low cost per GB.

Three core pieces of next-generation storage technology will be highlighted in this document and explanations will be provided for how they seamlessly work together:

- **FLASHARRAY** Delivers high performance primary block storage for the most demanding datacenter requirements. FlashArray provides built-in snapshots and replication to other Pure Storage arrays.
- **RUBRIK** Next-generation appliance for hosting backup data, providing instant VM/file recovery, as well as orchestrating archival data movement from FlashArray to FlashBlade.
- **FLASHBLADE** A fast and dense unstructured data platform from Pure Storage that provides rapid backup and recovery of archival data, along with other primary use cases for unstructured data.

TEST ENVIRONMENT

The test cases shown here are intended to emphasize the high levels of throughput, workload consolidation, minimized RTO and RPO, and ease of administration that these connected solutions can provide. Though we will focus on virtual machines in our examples, the use cases shown here are easily extensible to other workloads, such as SQL databases, VSI, VDI, and Oracle, just to name a few.

Our test environment was comprised of the following elements:

- Five ESXi 6.5 hosts running 250 Windows 10 desktops with 50GB drives (27GB used). The desktops included MS Office 2016, Adobe Reader, and numerous iso, pdf, mp4, and many other pre-compressed, commonly used files. Each ESXi host features two redundant 10GB network connections and two redundant 16GB Fibre Channel HBA connections
- One Pure Storage FlashArray//M20 with 10TB RAW storage for primary storage (up to 25 TB effective capacity assuming a 5:1 data reduction ratio, which are typical results shown from the Pure Storage install base)
- Rubrik r348 Four Node Cluster for secondary storage backup and recovery orchestration between FlashArray and FlashBlade
- One Pure Storage FlashBlade with seven blades (a half-populated chassis) for the archival tier, with 8TB per blade
- Two Brocade VDX6740T Switches for 1/10/40GB Networking
- Two Cisco MDS 9148S 16GB Fibre-Channel Switches

The simplified connectivity diagram below illustrates how the various solutions are integrated with one another and how there is no single point of failure within the design:

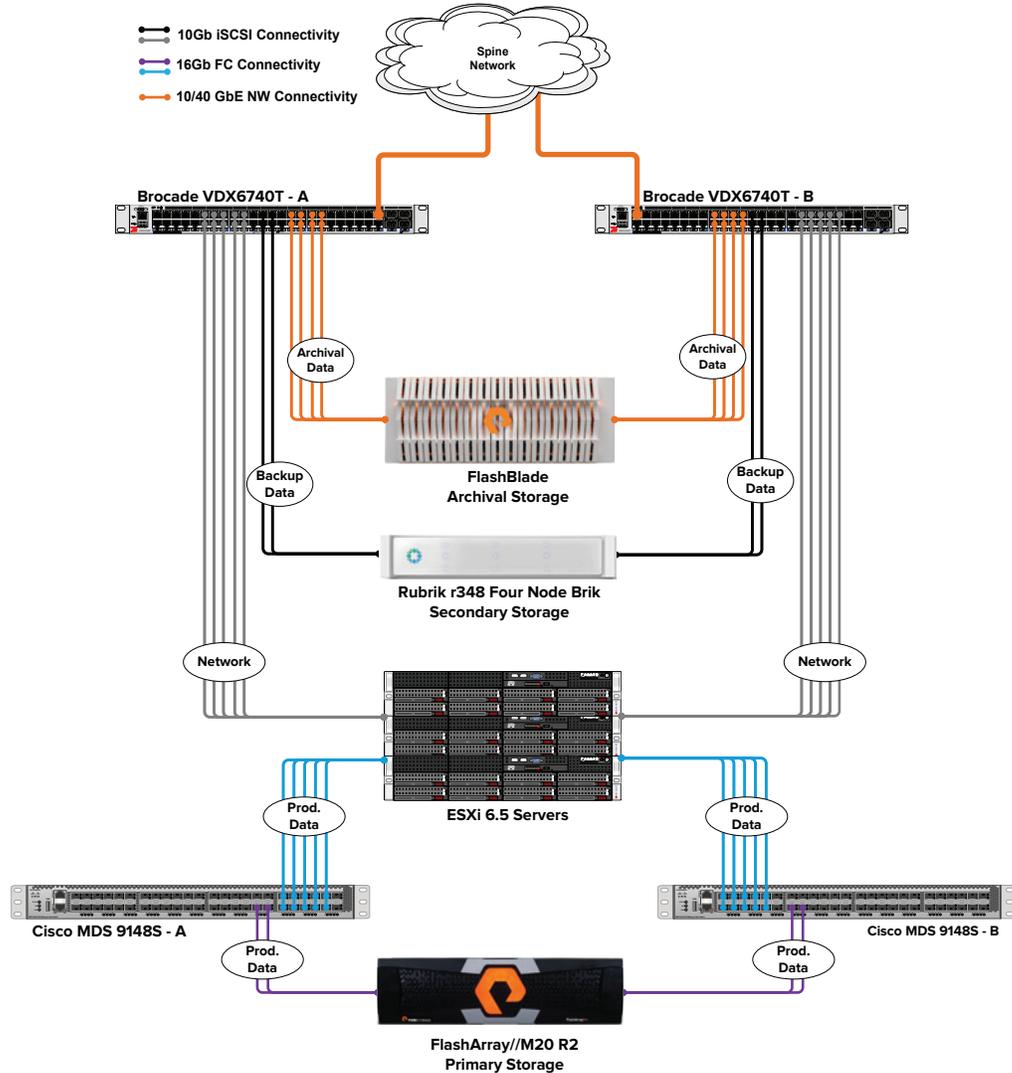


Figure 1. High-level architectural diagram of solution

TEST OVERVIEW

The 250 Windows 10 desktops were hosted on 5 ESXi SuperMicro servers running under a common vSphere 6.5 instance. Pure Storage FlashArray features a fully-integrated vCenter plug-in that enables single pane of glass administration of the primary storage array. For our testing, Rubrik leverages VMware VADP technology to integrate with vCenter and provide CBT based backup capabilities for all virtual machines running within the vCenter instance.

Our test process will cover the following steps, with instructions and explanations for each phase:

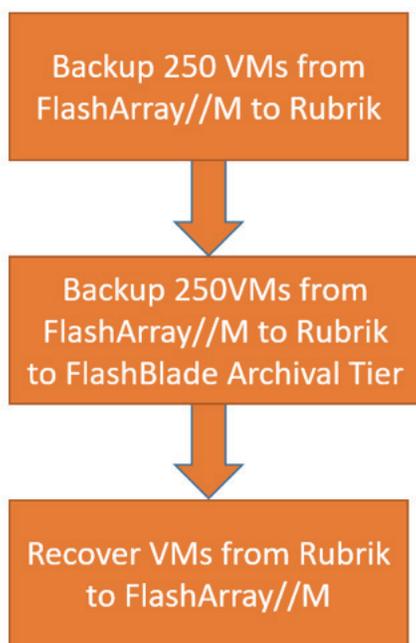


Figure 2. Test process to be executed

RUBRIK, FLASHBLADE, AND FLASHARRAY INTEGRATION SETUP

Connecting vCenter to the Rubrik appliance is easily accomplished by registering it as a source, as shown in the next few screenshots.

Under the Protection menu select **Sources**.



Figure 3. Selecting sources in Rubrik GUI



Figure 4. vCenter registration for Rubrik

Fill out the credential information for your vCenter instance. The account used to register the vCenter source to Rubrik must have administrative privileges.

Figure 5. vCenter registration wizard

We next setup Rubrik to serve as the connection and orchestration point between the Pure Storage FlashArray (primary storage) and the Pure Storage FlashBlade (archival storage) layers via the Rubrik archival tier option. FlashBlade enables extremely fast and secure backup and recovery of information, which is hugely important in the healthcare and high-performance computing industries but also extends into other businesses. FlashBlade offers inline compression and massive density (1.5PB in 4U effective) – enabling your datacenter footprint to shrink while also minimizing power and cooling costs.

Setting up the FlashBlade archival tier was straightforward. First, we name, size and set our export rules and permissions for our File System on the FlashBlade GUI:

Figure 6. File System creation on FlashBlade

With our FlashBlade File System created, the next step was to connect it to the Rubrik appliance as an archival tier.

Select the **Archival Locations** option from the Rubrik menu located under the gear on the top right.

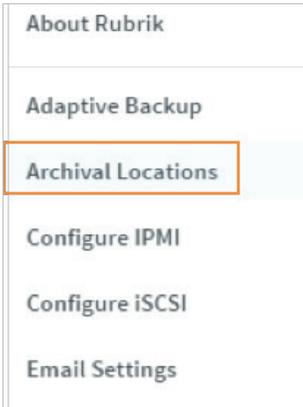
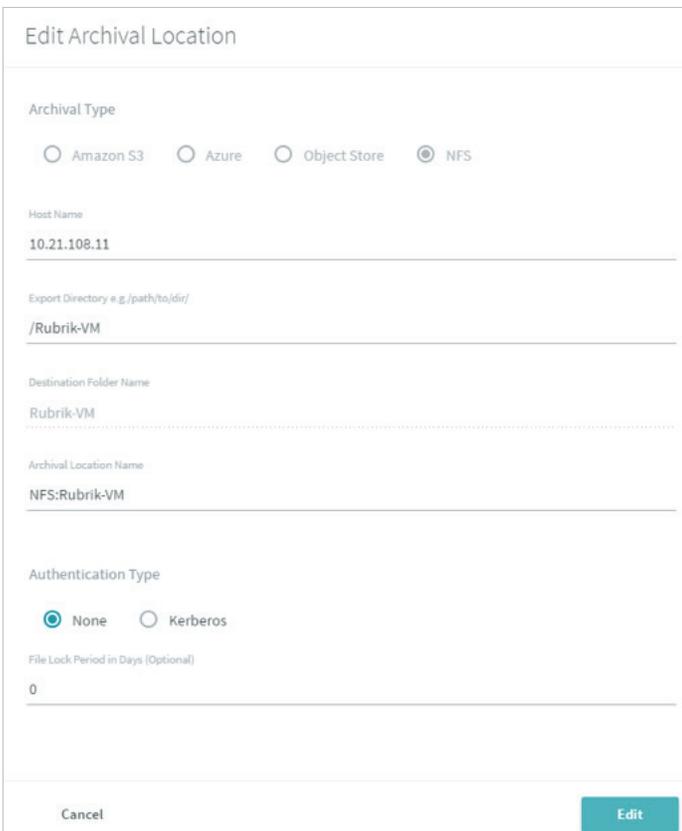


Figure 7. Registering FlashBlade File System as an archival location in Rubrik

Click on the + sign to add the FlashBlade archival tier, entering a data IP address and directory name, as shown in the below example.

A screenshot of the 'Edit Archival Location' configuration form in the Rubrik interface. The form contains the following fields and options:

- Archival Type:** Radio buttons for Amazon S3, Azure, Object Store, and NFS. NFS is selected.
- Host Name:** Text field containing '10.21.108.11'.
- Export Directory e.g. /path/to/dir/:** Text field containing '/Rubrik-VM'.
- Destination Folder Name:** Text field containing 'Rubrik-VM'.
- Archival Location Name:** Text field containing 'NFS:Rubrik-VM'.
- Authentication Type:** Radio buttons for None and Kerberos. None is selected.
- File Lock Period in Days (Optional):** Text field containing '0'.

At the bottom of the form are 'Cancel' and 'Edit' buttons.

Figure 8. Wizard for registering FlashBlade as a Rubrik archival location

Completing the wizard will connect Rubrik to the FlashBlade archival tier. An overall summary can be seen below:

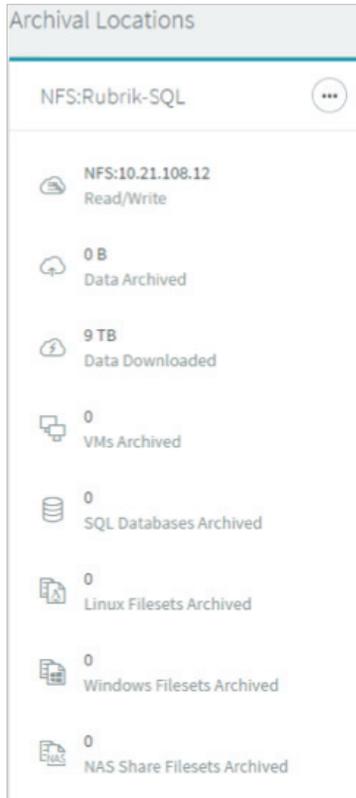


Figure 9. Summary screen of FlashBlade archival location in Rubrik

RUBRIK SLA POLICY CREATION AND EXECUTION

Once vCenter was connected to the Rubrik appliance, we generated a Protection Policy that would allow for daily recovery of any single or group of virtual machine(s) from our test group or even any single file or group of files within a selected desktop. The first step is to create a protection policy that dictates the frequency and retention of VM snapshots, as well as other options.

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

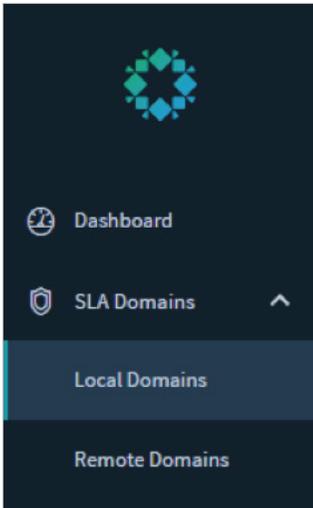


Figure 10. Rubrik Local Domains SLA creation

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 be taking a snapshot of our 250 desktops every 12 hours and keeping them for 3 days. Monthly backups will also be created and retained for one year. Windows for when you want to run or not run the protection job can also be assigned here, as well as setting replication between multiple Rubrik appliances and our archival tier, which we will cover next.

A form titled 'Edit SLA Domain' with the following fields and options:

- SLA Domain Name: 250Desktops
- Service Level Agreement: Choose how often we take snapshots and the length of time we keep them.
- Snapshot configuration:
 - Take Snapshots: Every (Hours) 12, Keep Snapshots: For (Days) 3
 - Every (Days) _____, For (Days) _____
 - Every (Months) 1, For (Years) 1
 - Every (Years) _____, For (Years) _____
- Local retention set to 1 Year.
- Snapshot Window:
 - Take snapshots from: _____ to _____
 - Take first full between: First Opportunity at _____
- Buttons: Cancel, Configure Remote Settings, Edit

Figure 11. Rubrik SLA creation wizard

With the local protection policy defined, we next click on **Configure Remote Settings** in order to add the FlashBlade archival tier.

Configure Remote Settings

Figure 12. Configure Remote Settings in Rubrik SLA

Enable the **Archival** slider button and select the NFS archival tier for FlashBlade that we created a few steps ago. For our testing, we also checked **Enable Instant Archive** to maximize bandwidth between Rubrik and FlashBlade.

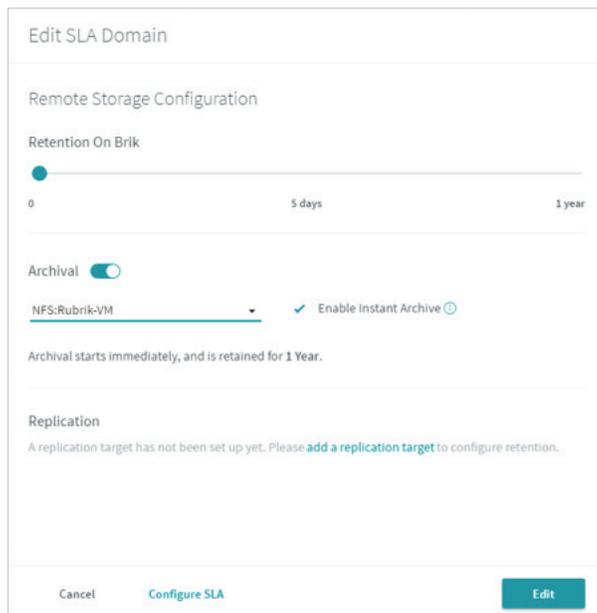


Figure 13. Setting up FlashBlade archival tier within Rubrik SLA

Next, our 250 VMs were selected and the SLA created in the previous step was assigned to them.

Finally, we selected the 250 VMs from our vCenter instance. The desktops were segregated into five folders containing approximately 50 VMs each. The following screenshots depict how they were selected.

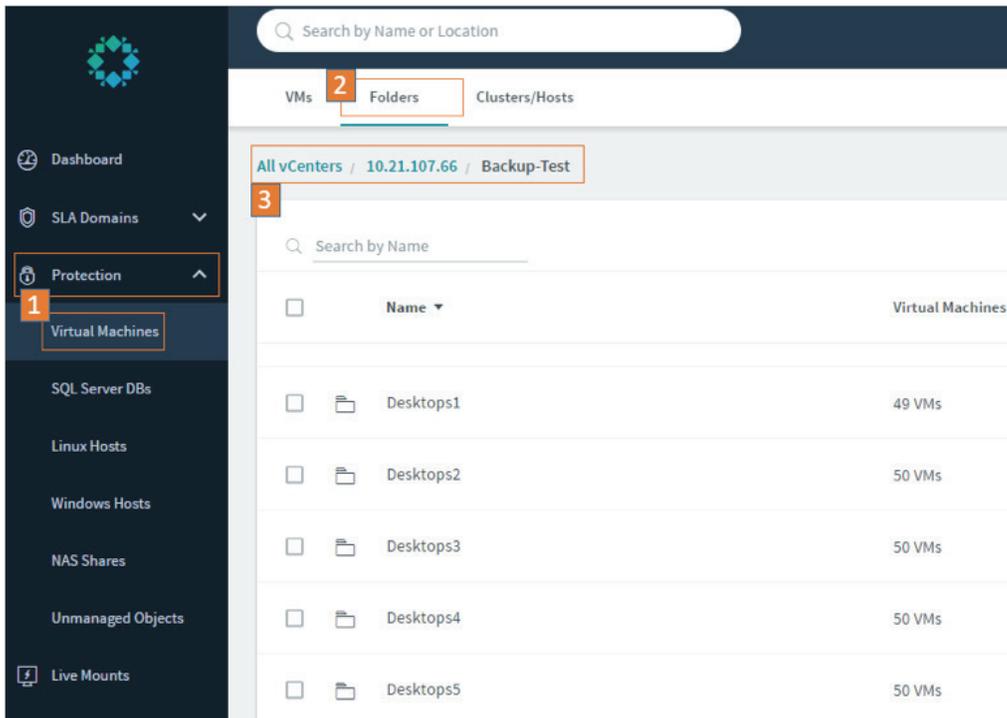


Figure 14. Selecting 250 test VMs within Rubrik GUI

After highlighting the 5 VM folders that each contain 50 desktops, we selected **Manage Protection**.

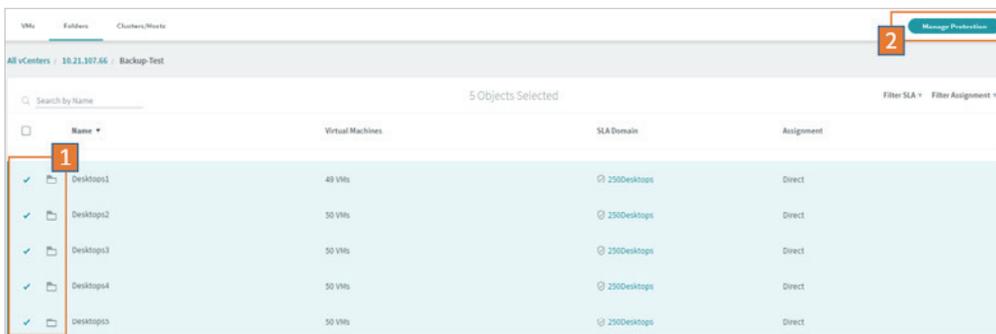


Figure 15. Selecting the 250 desktops to be protected from our vCenter source

To complete setup for protecting the 250 VMs, select the SLA we created earlier and click **Submit**.

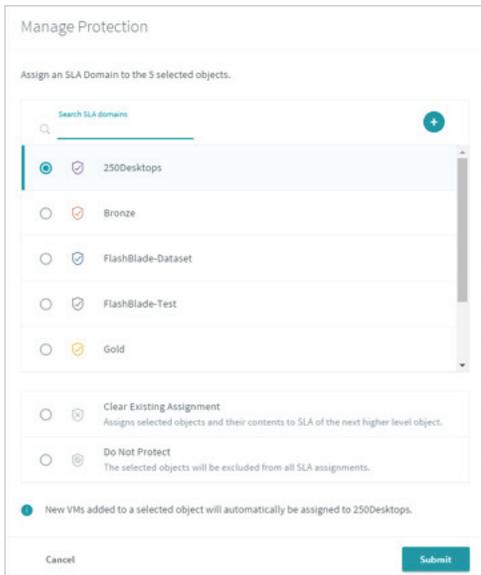


Figure 16. Assigning the SLA for 250 test VMs

During this initial protection run for our 250 VMs, we observed high transfer speeds between FlashArray and the Rubrik cluster and, later, to the FlashBlade archival tier. A screen capture of the VMs being ingested from the Pure Storage FlashArray GUI to the Rubrik appliance can be seen below.

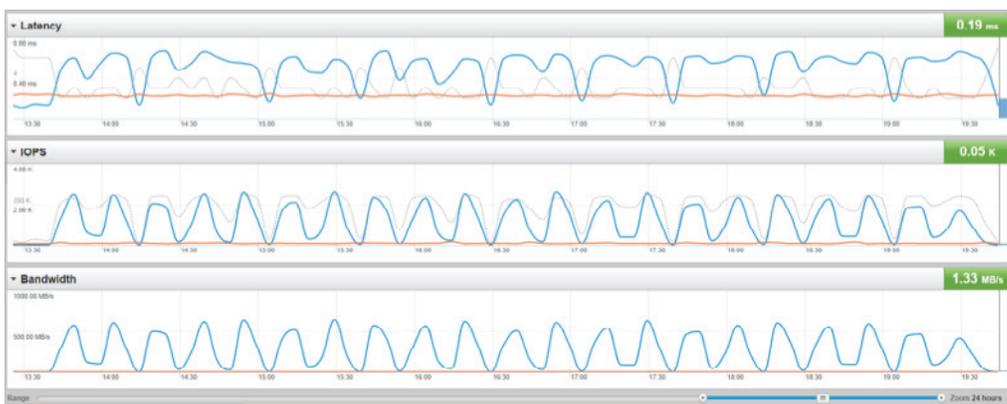


Figure 17. 250 Virtual Machines being ingested from FlashArray to Rubrik

Worth noting from this experiment is that the initial VM ingest will always be the most “expensive” in terms of bandwidth, IOPS, and time. That is, subsequent backup runs will only update the changes made to the target VMs, rather than running a full VM backup, as was done in this first example.

Moving from Rubrik to the FlashBlade archival tier introduces a new variable that will allow granular control over your workload archiving. Most important is that the number of VMs that can be sent to FlashBlade from Rubrik is a tunable value that Rubrik support can change based upon the customer's requirements, available network bandwidth, and other factors. By default, each Brik will offload one VM at a time to the archival tier, but this number can be increased dramatically by working with your Rubrik support team.

As an example of the increased archival settings in action, the FlashBlade GUI screenshot below shows a portion of our 250 VM job being written with the Rubrik archival settings increased to 2 VMs/Brik (8VMs in parallel) from 1VM/Brik.



Figure 18. Virtual Machine ingestion at 2VMs/Brik

Once this job completed we removed all archived VMs from FlashBlade and worked with Rubrik support to further increase this value to 10VMs/Brik or 40 VMs in parallel. In the next screenshot we can see more consistent sustained write performance, higher peak write bandwidth, and that the initial archive job completed in just over 6 hours. This is several times faster than using the default Rubrik archival settings.

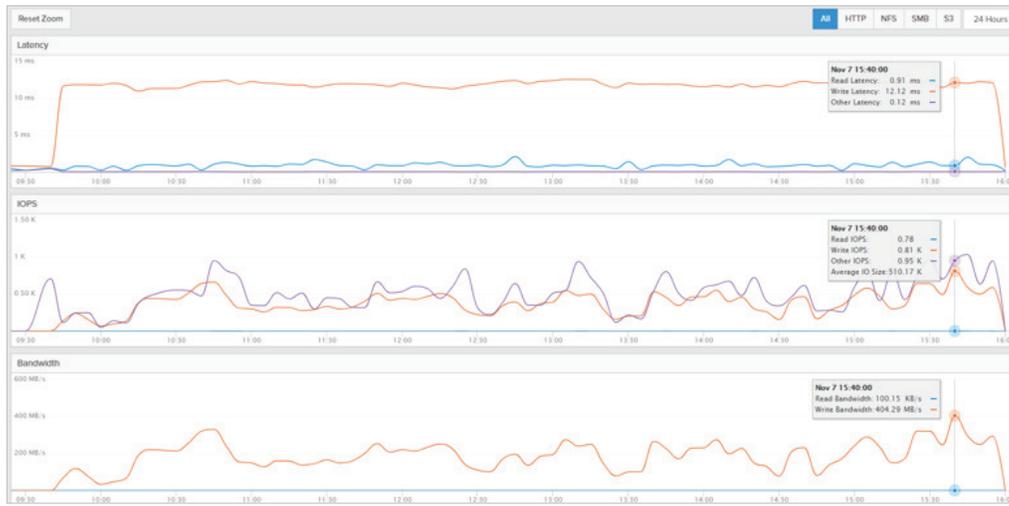


Figure 19. Virtual Machine ingestion at 10VMs/Brik

This proves that Rubrik and FlashBlade have the flexibility and performance needed to backup and restore your most critical infrastructure components according to whatever requirements are dictated by your business.

VM RECOVERY FROM RUBRIK TO FLASHARRAY

Rubrik offers multiple methods for recovering a VM or multiple VMs in parallel. For our example, we will show the steps needed to recover an entire VM or individual files or directories from within the Rubrik GUI. However, multiple VMs can easily be restored in parallel using Rubrik's REST API. Please see the following blog post for scripting examples of how to restore multiple VMs in parallel:

<https://virtuallysober.com/2017/05/15/scripting-a-rubrik-recovery-plan-using-rest-apis-powershell/>

Back to our example. First, we will select our target VM to be recovered. VMs can be searched from within the Virtual Machines section of the GUI or from the primary search bar across the top of the Rubrik UI. For this test, we chose the **Win10-10** desktop and clicked on the name.

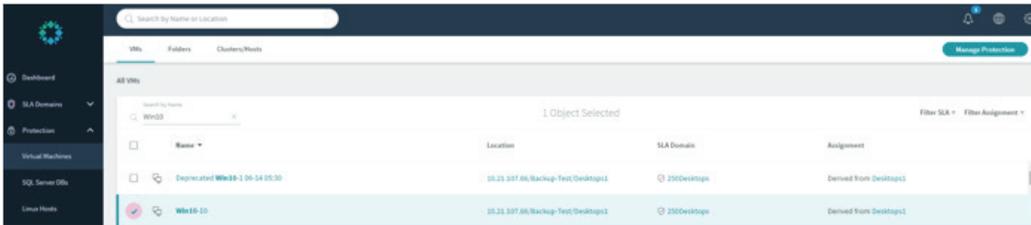


Figure 20. Selecting a test VM to be restored from Rubrik GUI

Clicking on the VM name takes us to a summary screen of the VM's protection. The blue dots on the calendar indicate available snapshots; clicking on one will show snapshot timestamp(s).

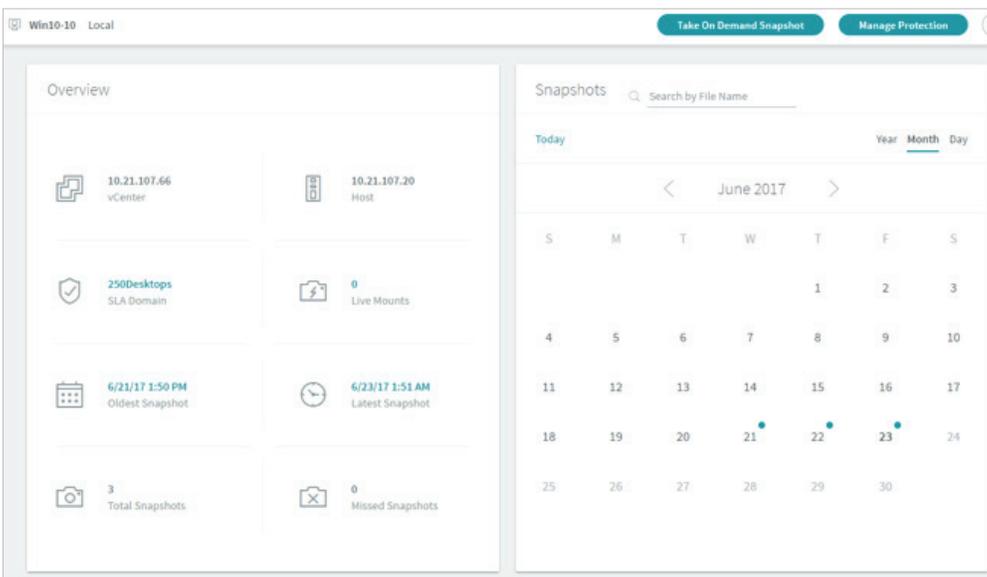


Figure 21. Detail pane for VM to be restored showing snapshot metrics in the Rubrik GUI

The snapshot in question has been archived to FlashBlade, but a copy also exists locally on Rubrik. When the icon highlighted below is not available, only the FlashBlade archival backup is available for a given snapshot. Snapshots that only reside on FlashBlade will need to be imported to the Rubrik appliance before the VM or file can be recovered, but that operation is accomplished very quickly.

To select a recovery option for the snapshot, click on the highlighted icon below. (Also worth noting is that individual files or directories within the virtual desktop can be restored either via search or drilling down into the hard drive of the VM.)

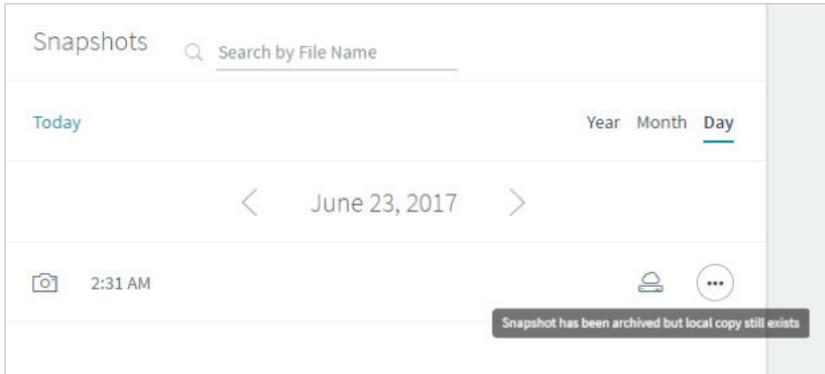


Figure 22. Selecting the Rubrik snapshot from which to restore the VM

That will open the menu to show the available restoration options for the VM.

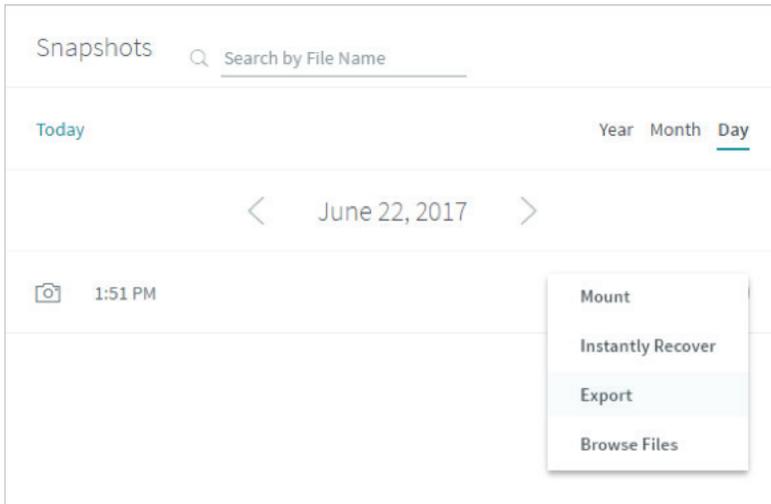


Figure 23. Snapshot restore options available within the Rubrik GUI

In our test, we are going to use the **Export** option. This option will instantly recover the snapshot onto the Rubrik appliance, boot the desktop so that it can immediately start serving IO, and then transparently vMotion it back to a location of our choosing on the primary Pure Storage FlashArray. Setting the destination host and FlashArray datastore occurs in the **Export** wizard that spawns in the next screenshot. In this example, we will completely overwrite the existing VM with this earlier snapshot using the same ESXi host and FlashArray datastore.

Export Snapshot

Choose an ESXi Host.

Search

HOST CLUSTER

10.21.107.20 (Current) Test-Data

Choose a Datastore.

NAME

CH-Data-M

Win10Desktops

Remove virtual network devices

Cancel Export

Figure 24. Selection of ESXi host, datastore for snapshot export wizard

Once initiated, we can see that the virtual desktop restoration begins immediately. Progress is tracked within the Rubrik GUI.

Activity Detail

Status	Activity	Date
✓	admin started a job to export a snapshot: 15b7366f-ad1f-4642-94bc-34eba5c5...	6/23 1:14 pm

Figure 25. VM export restoration from snapshot

The virtual machine is booted from the snapshot on the Rubrik appliance and transparently vMotioned over to the Pure Storage FlashArray from the Rubrik appliance. This operation completed in approximately 12 minutes, with the VM serving IO within 3 minutes through Rubrik.

CONCLUSION

Through this simple demonstration, we have proven that the combination of FlashArray, Rubrik, and FlashBlade delivers the entire suite of data performance, protection, and agility. Additional workloads can easily be mixed and managed from the interfaces shown in this guide across the entire business. As data capacity requirements grow in both primary and secondary use cases, both FlashBlade and Rubrik can non-disruptively scale and be upgraded – a process that is completely transparent to customers. Finally, systems administrators can move away from tedious and repetitive tasks that are focused on keeping their infrastructure online and instead move up the stack to concentrate on tasks that will improve the company as whole.

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