VEEAMON 2023

Protect Epic in EPIC Fashion

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Agenda

- What is Epic?
- Epic architecture
- What to protect?
- Cache/IRIS backup
- Cache/IRIS recovery
- Veeam lab testing

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What is Epic?

Epic is…

…the leading electronic medical record (EMR) provider in the world today.

…an EMR system that tracks patient information from admitting through the various clinical processes involved in a hospital or medical office visit.

…a wide range of data types: from cache database files, to SQL Server records, scanned document images, medical device images, audio dictation, etc.

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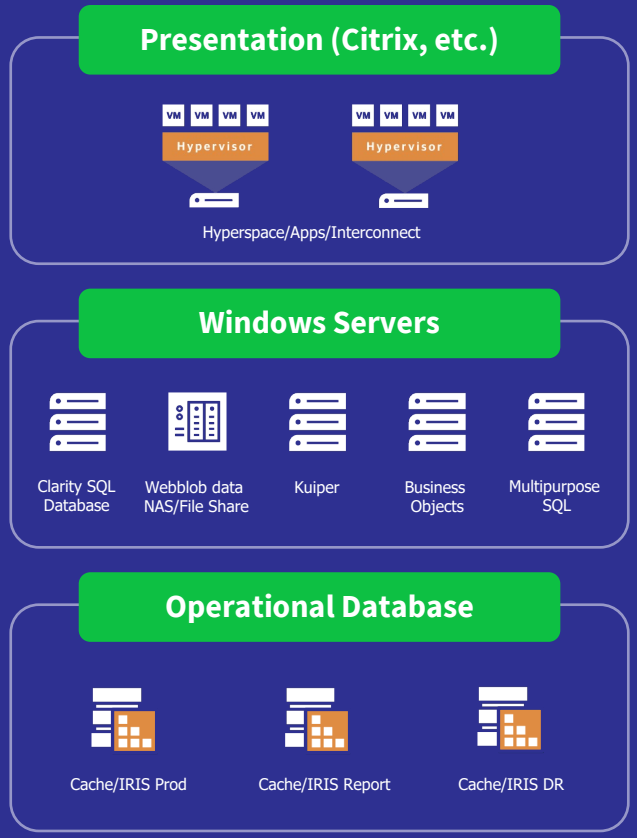
Epic architecture

Simplified Epic architecture



Presentation is typically handled via the hyperspace client that is served up via Citrix (or similar), but many applications are being ported over to delivery via a web-based interface called HyperspaceWeb.

Windows physical or virtual servers are used primarily in data analysis and support roles such as reporting, upgrade staging and presentation. Many customers will refer to this as their “ECS” environment.

Primary database is intersystem’s cache or IRIS. These can be deployed on virtual or physical servers using Windows, Linux or AIX. This is known as the operation database layer. It is not unusual for customers to have well over 20 cache/IRIS instances in their environment. When virtualized, the cache.dat files are stored on raw data mappings.

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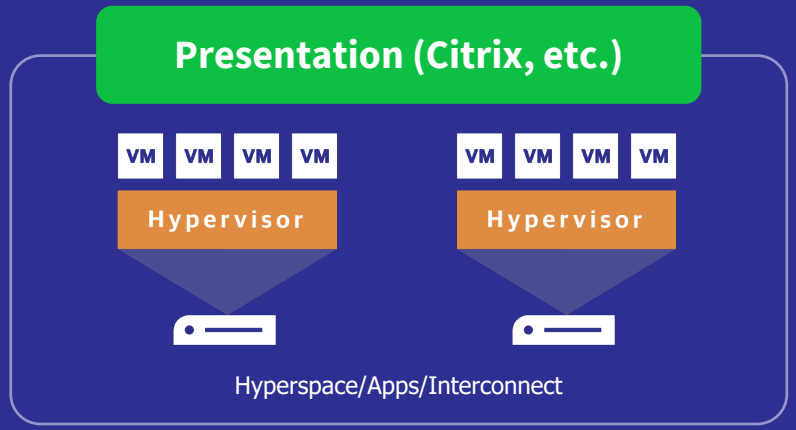
What to protect…

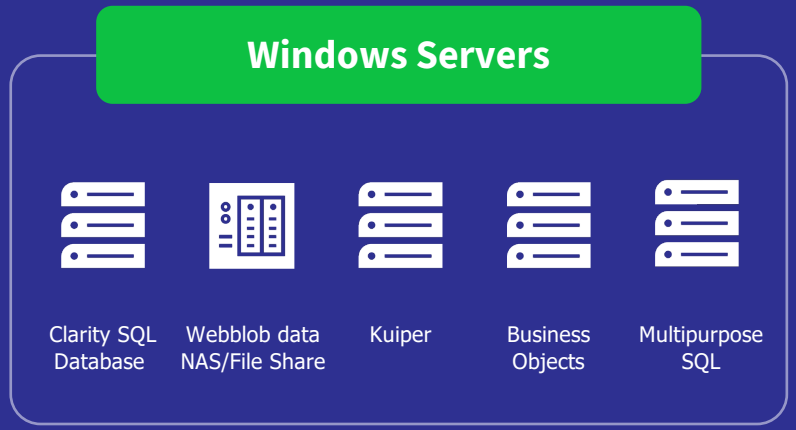
…and how we do it

Presentation Tier



- Published application & VDI images.
- Application deployment configuration.
- User profiles.

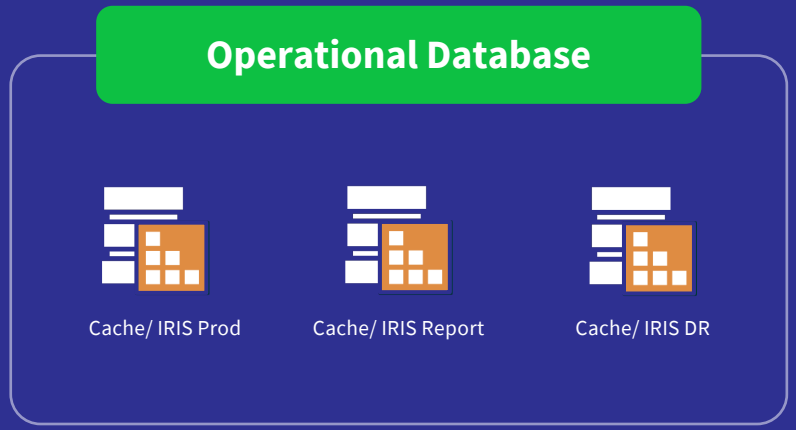
Windows servers and Web BLOB



- Archiving data.*
- All Windows with organization or site-specific configuration.
- Kuiper SQL database.
- Clarity databases.
- Caboodle databases.
- Web BLOB data.*

*Critical backup need – patient data.

Operational database



- Production DB.*
- Failover DB.*
- Reporting DB.
- Non-prod DBs.*

*Critical backup need – patient or config data

Background on Epic ODB

Epic's production ODB (cache/IRIS) server requires RDM LUNs backing the primary database volume and best practices dictate no additional third-party software should be installed (no agents).

Epic recommends that backup of the cache database happen "off box" or on another host.

The recommended approach is to script a hardware-based LUN clone of the backing RDM LUNs to another host for backup. This is to reduce the impact that backup processes have on the production database.

Epic prod. ODB prep process

To prepare the environment, a secondary RHEL or AIX host must be used as the “backup host.”

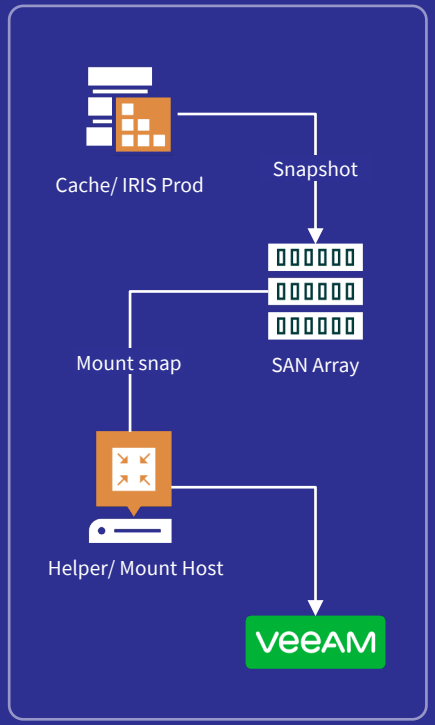
LUNs that support the cache database will be cloned and attached to this host for backup.

Prior to each backup, the LUN clones must be updated/refreshed on the backup host.

This process is scripted and can be run as the pre-job script of a Veeam® backup job or executed outside of Veeam prior to a scheduled backup.

Cache/IRIS backup process

- The cache/IRIS backup method requires using scripting and Storage Snapshots.
- The database will have it's writes suspended with the "Freeze" process, the SAN Snapshot is taken, and the database is "Thawed" so writes can resume.
- The SAN Snapshot clone is then mounted by a "helper/mount" server and a traditional backup is taken of the helper.
- There are also journal files that need to be backed up nightly. This is also typically done via the SAN Snapshot. Once all is complete, the SAN clone is unmounted from the helper server.



- Suspend DB Writes
- File System "Freeze"
- SAN Snapshot Clone
- File System "Thaw"
- Resume DB Writes
- SAN Snapshot Clone mounted
- DB Backup taken from Clone
- Journal File backup
- Unmount Clone

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Cache/IRIS file level backup

Benefits of Veeam solution for Epic ODB

- Agentless approach (no software bottleneck).
- Easy to manage and simple to operate.
- Highly parallel backup and restore for high performance.

> We have worked with Veeam to perform successful backup and restore testing of cache in Epic's internal test lab. We also have customers using Veeam in production today to protect their cache databases and others in proof-of-concept phases.

Jason Bowen | Epic | Server Systems

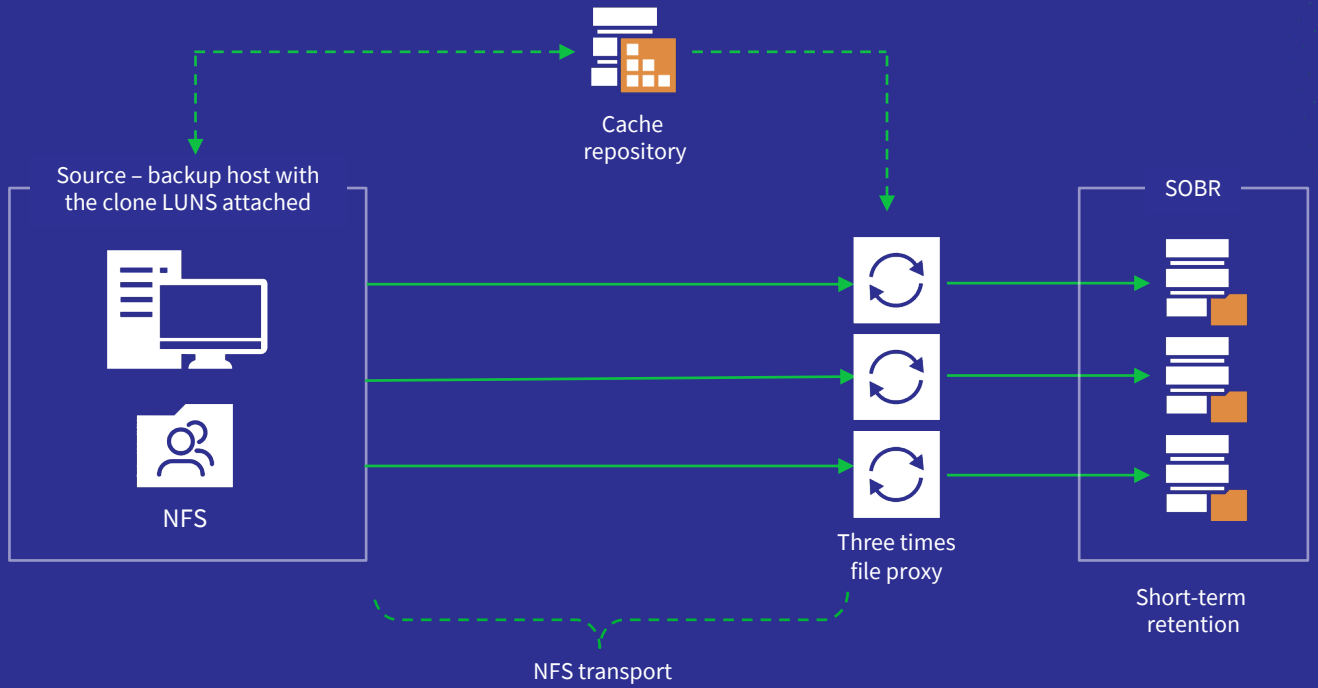
Veeam file level backup for cache/IRIS

- Veeam's approach to protecting Epic's cache is with Veeam Backup & Replication™ v12 file level backup capability.

- Cache files will be protected and recovered with the new **agentless** NAS backup functionality built in to Veeam Backup & Replication v12.

- Veeam protects cache with our NFS backup engine.

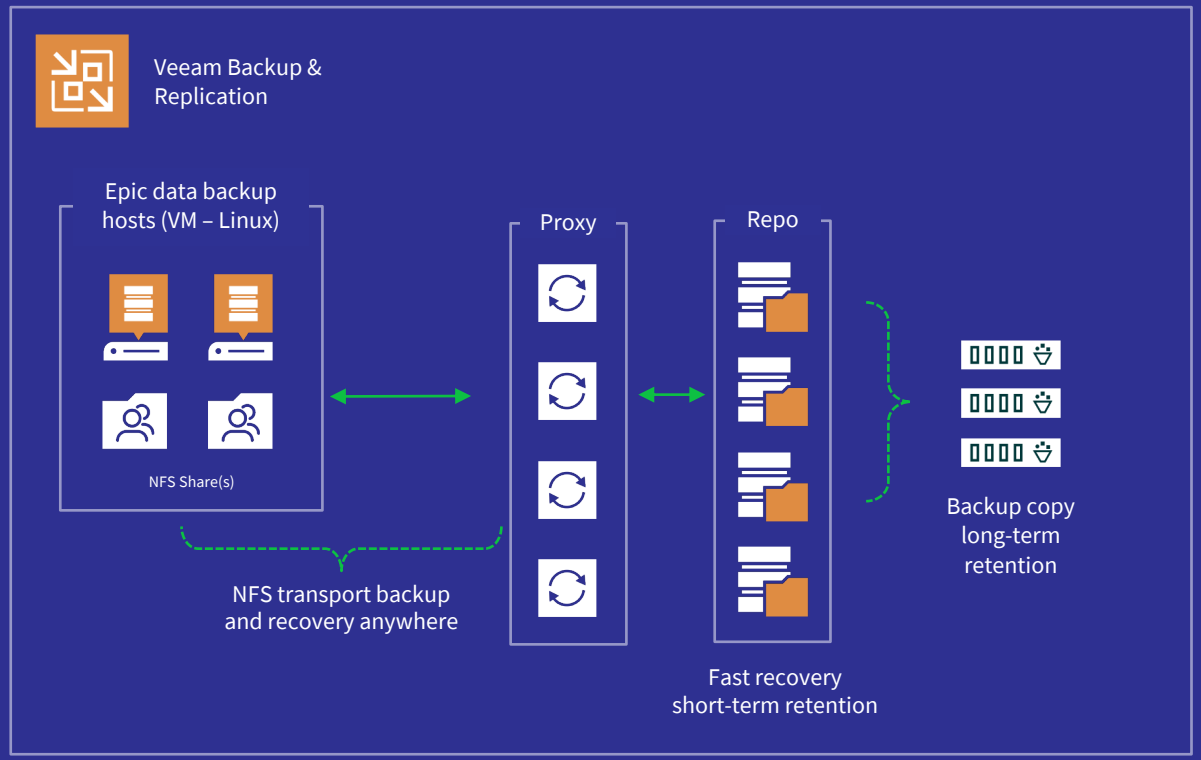
Example NFS backup architecture



Tips for performance:

- Use three to four proxy.
- Metadata extent if Veeam repo has poor random I/O performance.

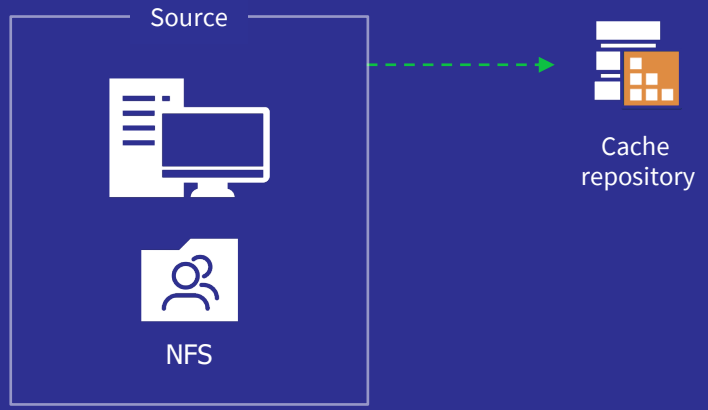
Performance - NFS backup architecture



Tips for performance:

- More source hosts.
- More proxies.
- Fast recovery short-term retention.
- Long-term cost-effective retention.

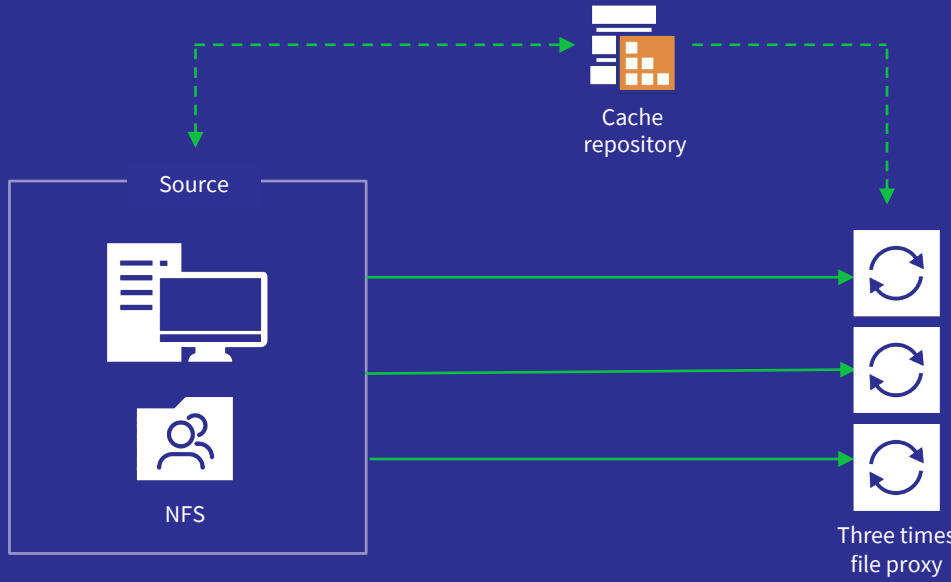
Components – cache repository



Cache repository

- Stores file metadata (hash) information.
- Coordinates file proxies at time of backup.
- Configured in NFS file share settings in Veeam Backup & Replication v12.
- Recommended to be small SSD repository, less than 5GB required.
- The cache repo can be mounted on any proxy in the Veeam v12 deployment.

Components – file proxy



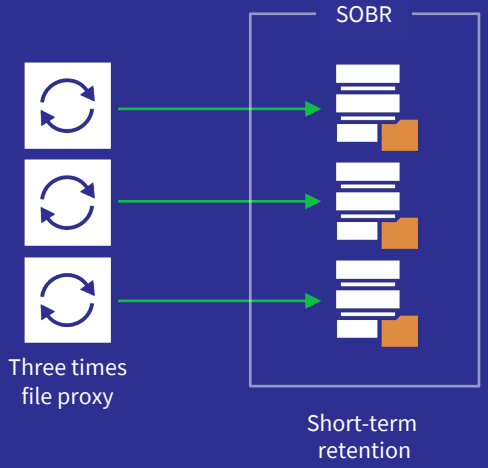
Virtual file proxy recommended sizing: 8 vCPU and 16GB RAM

Veeam file proxy

File proxies are the file scanners and data movers in the Veeam Backup & Replication architecture.

- These are Windows 2019/2022 servers and can be virtual or physical.
  - Virtual proxy VMs recommended to be on separate physical ESXi hosts.
- Each Veeam file proxy mounts the NFS share from the backup host.
  - 10gbps (4.5TB/hour max) - 1.25GB/s.
  - 25gbps (11.25TB/hour) - 3.125GB/s.
    - 10gbps or higher Ethernet is highly recommended.
- Three file proxy hosts are recommended for parallelization of file backup processes to maximize throughput.

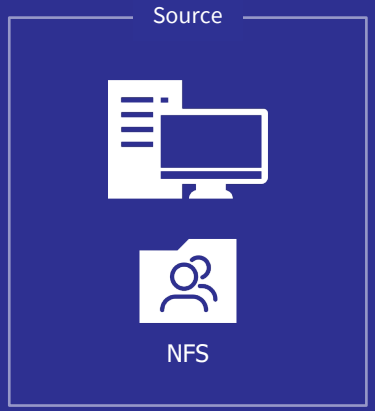
Components – repository



Short-term backup repository

- The short-term backup repository is where the initial full backup and future incremental backups land.
- A Veeam Scale-out Backup Repository™ or “SOBR” is recommended for best performance and scalability of the short-term repo.
- The recommended approach to construct the SOBR is a repo extent attached to each file proxy to allow to optimized write performance and network throughput (a three extent SOBR). *Consider having enough storage in each extent to hold and entire backup.*
- The total size of the SOBR should be equal to the total protected data size accounting for incremental growth over time.
- The short-term repo should be your fastest backup storage available to improve read and write performance.

Components – backup source host



Backup source host.

- The backup source host is the Linux host that receives the mounted LUN clones from the production Epic cache host.
  - It is recommended that this host have at least eight to 12 cores and 16GB RAM for improved backup performance and:
    - 10gbps (4.5TB/hour max) - 1.25GB/s.
    - 25gbps (11.25TB/hour) - 3.125GB/s - “highly recommended”.
- An NFSv3 (4.1 is supported) export to \epic\prod01 is the recommended NFS version for the best compatibility for Veeam v11.
- NFS export policies can be used to secure the NFS mount point to Veeam File Proxy IP addresses. In addition, the NFS service can be started/stopped as part of the Veeam backup job script for added security.

NAS backup FAQ

Q: Is using NFS to protect Epic cache a security risk?

A: NFS mount points can be protected via NFS exports IP address restrictions. Only the Veeam file proxies would be able to communicate to the backup host via NFS. In addition, the NFS service can be started and stopped as part of the pre/post job scripting. Veeam file proxies use a proprietary NFS protocol stack that is only enabled during backup and restore operations.

Q: Do I need to open NFS on my prod. cache server?

A: Not for backup operations. For backup, Veeam only communicates to the backup host. For restore, an NFS mount point would need to be presented for data recovery.

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Cache restore

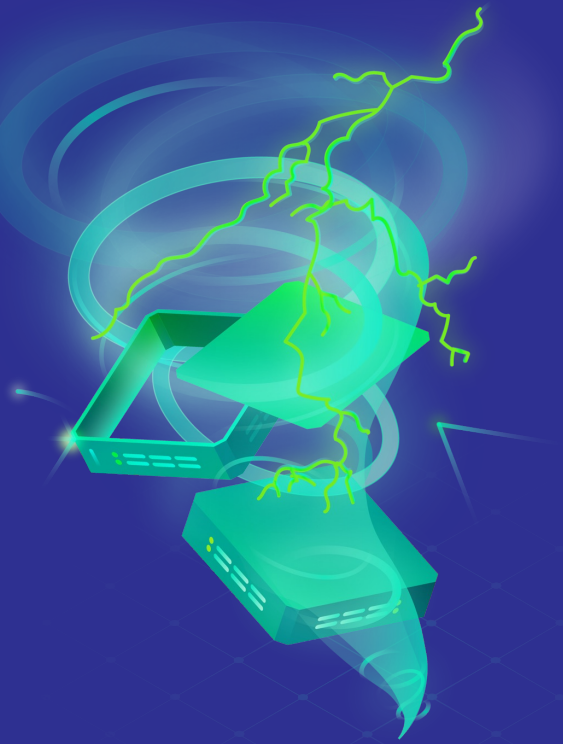
Epic data recovery

A disaster recovery event (or Protocol One) at the cache/IRIS database layer is handled via a database mirroring process that syncs all transactions via Journal files that are shared between the production, reporting and DR instances.

In cache file restore situations, there are typically one of two methods used:

- Restore from storage clone/snapshot.
- Restore from backup.

In application and presentation (Windows) restore/recovery situations, either “Entire VM” or “File Level” recovery is used.



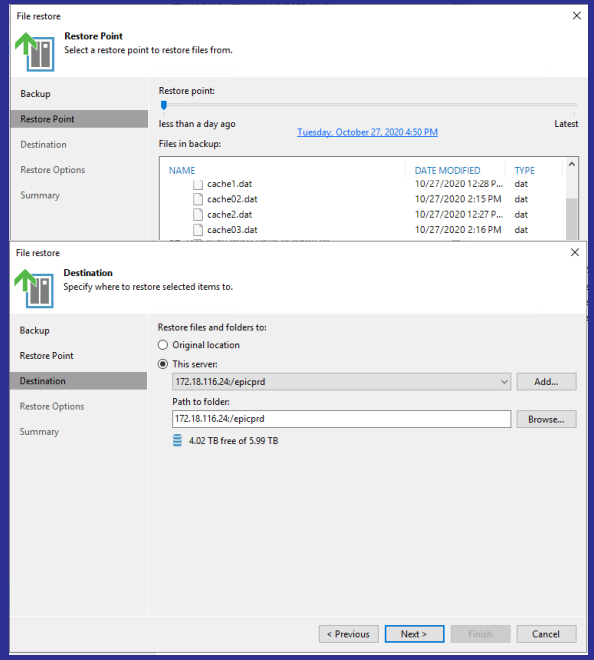
Restore FAQ

Q: How do I restore my cache .DAT files back to prod cache?

A: It's simple. Start the Veeam file level recovery wizard, choose your backup and select the destination for the restore. You will then be able to select which directory to restore the files to.

Q: Is recovery fast?

A: Veeam's restore is a multi-stream parallel restore.
Restore performance should be similar to backup performance.



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Veeam lab testing

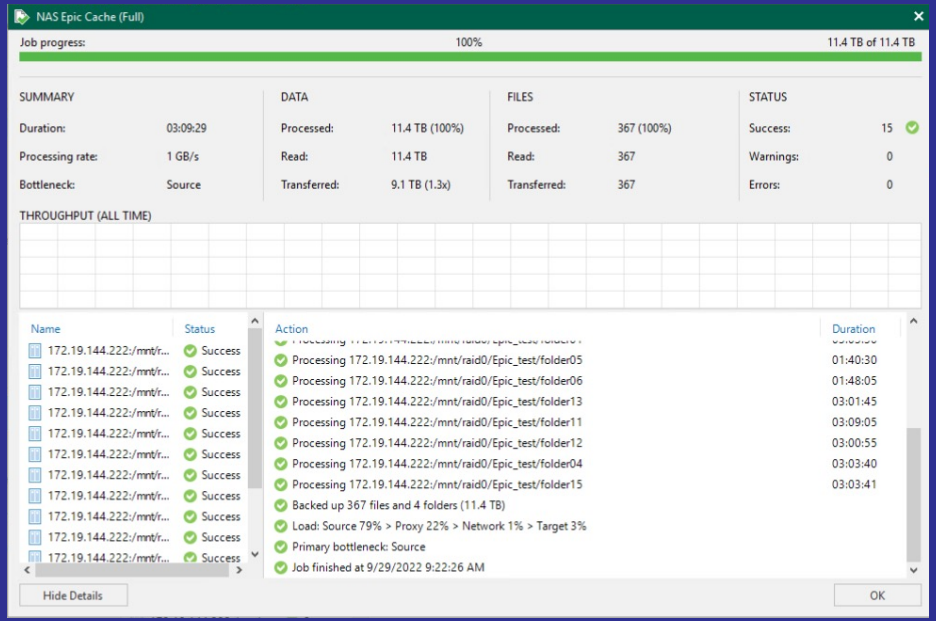
Veeam lab testing

Performance testing results in Veeam lab for Epic.

Test 1 detail:

- One NFS server:
  - **Backup: ~3.7TB.hr.**
  - **Restore: ~3.8TB/hr.**

172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:49 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:49 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:52 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:53 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:58 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:50 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:53 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:52 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:51 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 8:59 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 8:46 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:50 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:56 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 8:56 AM
172.19.144.222:/mnt/raid0/E...	NAS Restore	Warning	9/30/2022 6:56 AM	9/30/2022 9:53 AM



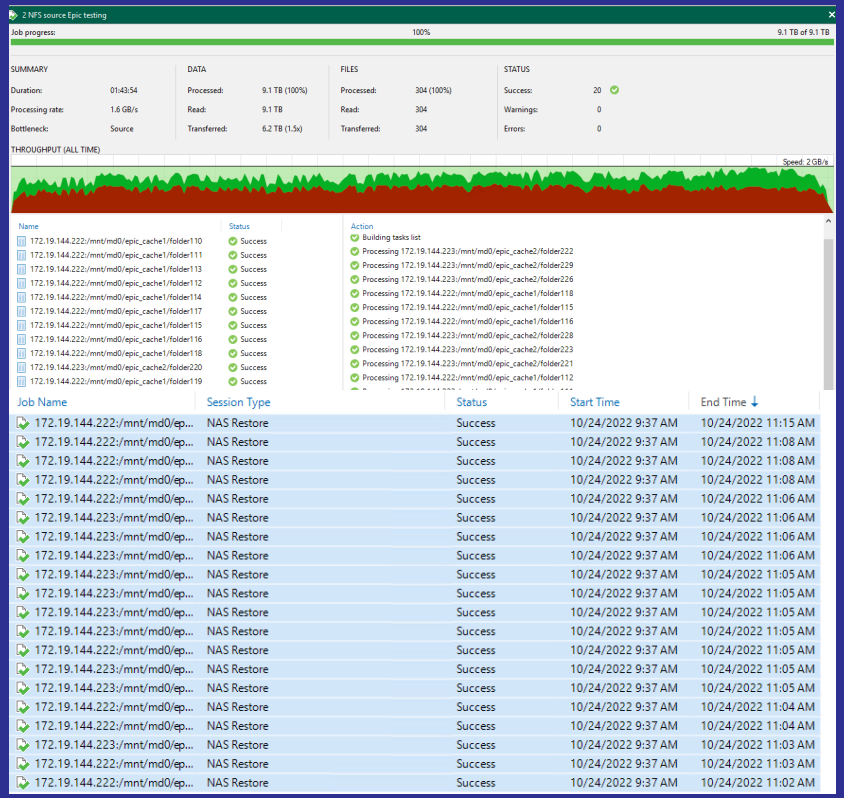
Veeam lab testing

Performance testing results in Veeam lab for Epic.

Test 2 detail:

Two NFS servers:

- Backup
  - One folder per share **Backup ran at ~5.25TB/hour on backup!!**
- Recovery
  - One folder per share **Recovery in 100mins on 20 shares ~5.46TB.hr on recovery!!**



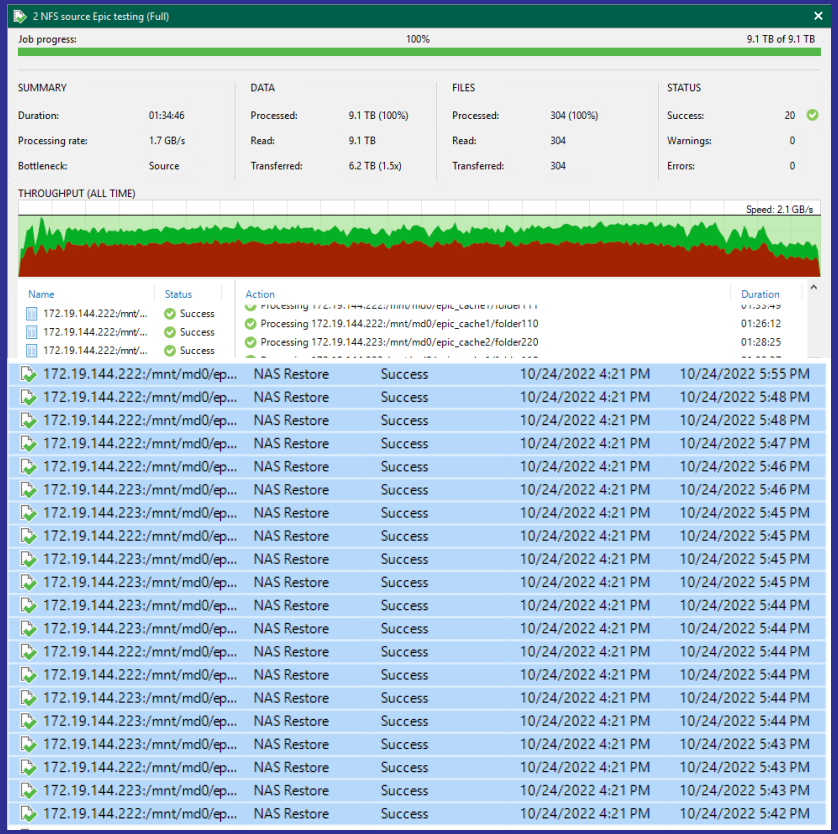
Veeam lab testing

Performance testing results in Veeam lab for Epic.

Test 3 detail:

Two NFS servers:

- Backup
  - Two folders per share - **Backup 9.1TBs in 1h34min ~5.8TB/hour!!**
- Recovery
  - Two folders per share - **Recovery of 9.1TBs in 1h34min ~5.8TB/hour!!**




Thank you
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