



# NetBackup 7.6 Best Practices: Optimizing Performance - 1725

Suresh Suseendran, Lead Architect

Praveen Vunnava, Sr. Lead Architect

# Agenda

- 1 NetBackup Architecture & Scalability
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# vision

## NetBackup Architecture & Scalability



## Master

86400 jobs per 24 hour period (based on 1 job per second)  
No hard limit on number of media servers, clients

## Media



No hard limit on number of media servers  
No hard limit on disk STU's  
Max number of concurrent jobs per disk STU – 256 (GUI) – CLI allows for 4096 as maximum

## Clients



No hard limit per Media Server or Master server

# Best Practices: NBU Architecture

## Master Server Scalability



- Catalog size not to exceed 1TB
- Number of devices in EMM not to exceed 1500
- Number of media servers not to exceed 100
- Number of jobs not to exceed 30000 within 24 hrs
- Minimum of 16 cores and 32 GB of memory
- Single core processors are more efficient than multiple core processors on a master server

- I/O intensive , available bandwidth in & out
- Amount & Type of data being protected
- NICs/HBAs/PCIe slots are critical for faster data movement
- Disk Read/Write performance if configured as disk based media server
- CPU's/memory critical if configured as deduplication media server
  - 1 GB of memory for every 1 TB of data being protected (With 7.6 MSDP, memory requirement for fingerprint indexing is decoupled from storage capacity and hence more memory can be utilized for running jobs)
  - Disk read/write is very critical – 500 MB/sec is a best practice guideline

Most modern servers work great as a Master or Media Server

- What if you want to run MSDP?
  - Same CPU recommendations as a normal media server BUT you need 1 GB RAM for each TB of disk storage (NBU 7.6 MSDP decoupled the memory requirement from storage but it's a good practice based on the number of jobs running/amount of data being backed up running on the server at any given time)
  - Dedupe hashing does not really put much load on a modern server
  - Avoid T2 and T3 Niagara chip servers as MSDP media servers
- What if you want to run MSEO
  - MSEO puts a great deal of load on the CPU's
  - If you want to use it, make sure to use fast CPUs and as many of them as you can allocate
- What if you want to run Fibre Transport Media server
  - FT requires target mode Host Bus Adapters (HBA)
  - Max number of possible FT pipes is 32 per media server
  - Same memory requirements as MSDP server

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## NBU 5230 Appliances Scalability





- Master specifications are based on:
  - Number of devices in EMM database
    - Media servers, tape drives, disk pools, storage units, SAN clients, Fibre Transport devices etc..
  - Number of Media Servers being managed
  - Number of SAN Clients
  - Number of jobs per day
  - Size of the catalog

## Best Practice Guidelines:

<1500 devices

< 50 media servers\*

< 50 SAN clients

< 30000 jobs per day\*

< 1 TB of catalog size\*

\*with max memory and CPU's

# Best Practices: NBU 5230 Appliance

## Master/Media server with dedup storage



- Master/Media specifications are based on:
  - Number of Clients
  - Number of devices in EMM database
    - Media servers, tape drives, disk pools, storage units, SAN clients, Fibre Transport devices etc..
  - Number of Media Servers being managed
  - Number of jobs per day
  - Catalog size
  - Tape out/Rehydration requirement

### Best Practice Guidelines:

- < 1000 clients
- < 500 devices
- < 20 media servers/SAN Clients
- < 10000 jobs per day
- < 500 GB of catalog size
- < 400 MB/sec Tape out/ Rehydration requirement
- < Max i/o limit is <96

\* Do not configure as Fibre Transport Media server also



- Media server specifications are based on:
  - Amount of storage configured as MSDP
  - Max number of concurrent jobs (max i/o limit) per disk pool
  - Number of tape drives configured
  - Number of Fibre Transport (FT) target ports
  - Number of Fibre Transport pipes
  - Tape Out/Rehydration requirements

## Best Practice Guidelines:

- Utilize external storage shelves for dedup pool
- Max i/o limit is < 120 per disk pool
- Number of FT target ports not to exceed 2
- Number of FT pipes is less than or equal to 20 (max is 32)
- FT buffer limit of 322 (SuSE linux buffer limitation)
- Tape out/Rehydration requirement is < 450 MB/sec

# vision

## NetBackup 7.6 Performance Tuning – Best Practices

- Tuning is more than playing with buffers
  - It is about making sure that the path – end to end – is adequate
- What works for you may not work for someone else

The bottom line?  
It is all about making use of the available bandwidth

- What if You Don't Tune Correctly?
  - Performance can actually be reduced from NBU defaults
  - Performance issues where the speeds do not match the expectations
  - Incorrect hardware purchases to solve problems resulting additional TCO
  - Unpredictable performance resulting in missed SLAs/RPOs/RTOs

- Setting up separate file systems/disk spindles for the following components will improve the performance on large master servers
  - Catalog flat file components (in particular the image database)
  - Catalog relational database data files
  - Catalog relational database index files
  - Catalog relational database transaction logs
  - Unified logs
  - <http://www.symantec.com/docs/TECH144969>
- Use `ln -s` on UNIX and `mklink` command with Windows 2008
- Put databases and log files on a RAID protected file system with the right balance of performance and redundancy
- Consider block size as well as keeping disk access times as low as possible
- To curb catalog growth consider compression and archiving
- Consider SSD for relational databases which are relatively small

- The NetBackup Resource Broker handles granting resources to backup, restore and duplications
- If not tuned correctly, long delays in jobs going from queued to active can occur
- “nbrbutil –listSettings” is used to view them
- These settings should be reviewed after upgrading to 7.6, paying special attention to RESPECT\_REQUEST\_PRIORITY and DO\_INTERMITTENT\_UNLOADS
- Good technote to review changes in nbrb from 7.1 & above <http://www.symantec.com/docs/HOWTO95440>

- NBU Catalog Tuning
  - `/usr/openssl/netbackup/MAX_FILES_PER_ADD` – affects all backups, default is 5,000 (Can be used to tune problems with backing up file systems with many files and also file adds into catalog exceeding bpbrm timeout)
  - `/usr/openssl/netbackup/FBU_MAX_FILES_PER_ADD` – affects FlashBackup, default is 95,000
  - `/usr/openssl/netbackup/CAT_BU_MAX_FILES_PER_ADD` – affects catalog backups, default is maximum allowed 100,000
  - <http://www.symantec.com/docs/HOWTO56209>



- **SIZE\_DATA\_BUFFERS**

NetBackup will dump more data into the bucket before “emptying” it to the tape/disk drive. On a fast system with faster drives, this makes streaming better

- **NUMBER\_DATA\_BUFFERS**

NetBackup will have more buffers to fill so while one is “dumping” it can be filling others. Very important when using MPX and Multi-Streaming. Tune the Size first, then work on the Number

- **NBU/MSDP/Advanced Disk**

- SIZE\_DATA\_BUFFERS = 1048576
- NUMBER\_DATA\_BUFFERS = 256
- SIZE\_DATA\_BUFFERS\_DISK = 1048576
- NUMBER\_DATA\_BUFFERS\_DISK = 512
- NET\_BUFFER\_SZ = 0 (Please review technote referenced here for more information <http://www.symantec.com/docs/TECH28339>)
- NET\_BUFFER\_SZ\_REST might need to be tuned to achieve better restore performance but depends on a lot of factors

- **FT Media Server Settings**

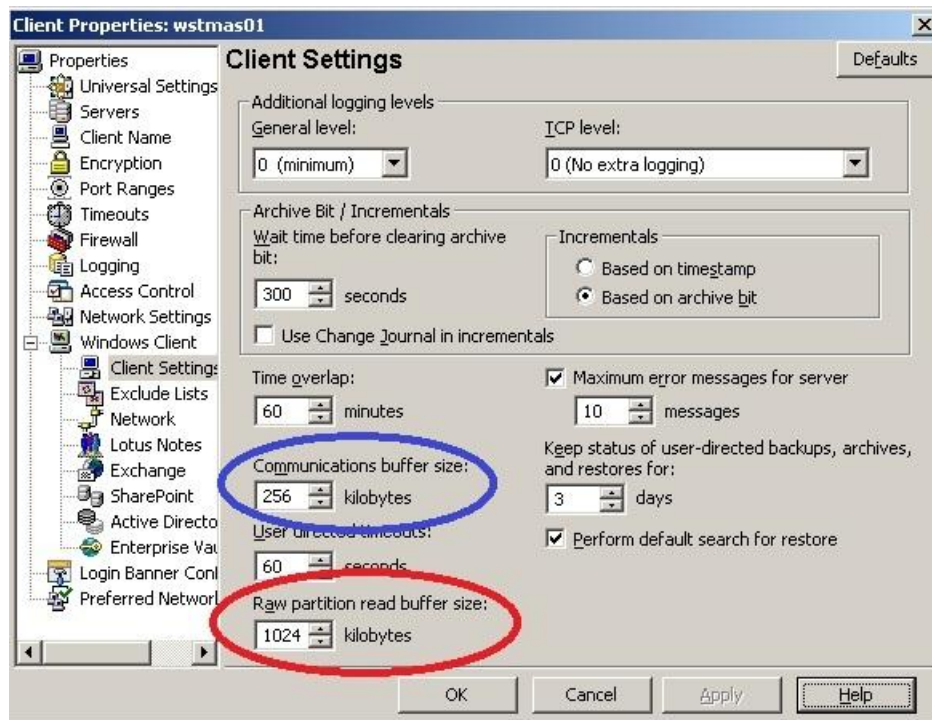
- SIZE\_DATA\_BUFFERS\_FT = 262144
- NUMBER\_DATA\_BUFFERS\_FT = 16

- **Client Direct Settings (Client based deduplication)**

- CD\_NUMBER\_DATA\_BUFFERS = 128
- CD\_SIZE\_DATA\_BUFFERS = 524288
- CD\_WHOLE\_IMAGE\_COPY (just a touch file)
- CD\_UPDATE\_INTERVAL = 180
- OST\_CD\_BUSY\_RETRY\_LIMIT = 1500

- **Disk Polling Service**

- DPS\_PROXYNOEXPIRE (just a touch file)
- DPS\_PROXYDEFAULTSENDTMO =1800
- DPS\_PROXYDEFAULTRECVTMO = 1800



- Communications buffer size is also HKLM\Software\Veritas\NetBackup\CurrentVersion\Config\Buffer\_Size
- Raw partition read buffer size is for FlashBackup as well as Raw partition backups on Windows

- NBU Accelerator feature uses synthesized full backups that create a new full backup image based on changed data and previous backup data. Utilizes change detection techniques on the client resulting in faster backups
- By default, a track log is created under netbackup directory on each client for each policy
- Client track log location:
  - UNIX: `/usr/opensv/netbackup/track/master_server/storage_server/client/policy_name/backup_selection`
  - Windows: `install_path\NetBackup\track\master_server\storage_server\client\policy_name\backup_selection`
- Client track log sizing best practices:
  - Depends on the number of files and the total amount of used space is approximated using the following formula:  
$$(\text{Number of files} * 200) + ((\text{Total used disk space}/128\text{K}) * 20)$$
  - Example of 1 TB file system with one million files = ~ 350 MB track logs

- NBU Accelerator forced rescan and Use Change Journal options cannot be combined. If Accelerator forced rescan is selected, the Use Change Journal option is ignored
- When using the Accelerator feature, exclude the following files on the root of each drive from the antivirus scan:
  - \*:\VxCJInfo.dat
  - \*:\VxCJDelete.dat
  - \*:\VxCJMon.dat
- How to redirect the NetBackup Accelerator track log to a different location (<http://www.symantec.com/docs/HOWTO77409>)
- Log messages about the Use NTFS Change Journal and Accelerator (<http://www.symantec.com/docs/HOWTO87030>)

- NBU SAN Client feature uses SCSI protocol to send backup and restore data over the FC SAN to/from a Fibre Transport (FT) Media Server – which directs backup and restore traffic to/from storage units (**NBU 5230 appliances support FT Media server**)
- By default, SAN Clients support a maximum of two Fiber Transport ports at any given time. This allows FT Media Servers to balance an I/O load fairly among multiple SAN Clients. To change this:
  - `nbftconfig -changeclient -np 4 -C <clientName>`
- By default, a Fibre Transport port can only be used by up to two different SAN Clients at any given time. This prevents oversubscribing a FT Media sever port to multiple clients. To change the default setting:
  - `nbftconfig –setconfig –ncp 4`
- Windows services don't allow enough time for SAN client service to start. Change this to 90,000 for 90 seconds rather than 30 seconds (default)
  - `\\HKLM\SYSTEM\CurrentControlSet\Control\ServicesPipeTimeout`



- FlashBackup and Windows Hyper-V do not support FT restores.
- Do not use the NetBackup master server as an FT media server. Data transfer consumes system resources and severely degrades NetBackup overall performance.
- Client-side deduplication is not supported by SAN client.
- Maximum number of FT pipes supported per appliance / media server is 32.

- FT Backup Zone should include only the Fibre Transport traffic between the SAN clients and FT media servers.
- Symantec recommends creating zones with only a **single** initiator per zone. **Multiple** targets in a single zone are acceptable, only if all of the targets are similar.
- Be aware of performance degradation when a port is configured for multiple zones.
- For fault tolerance, spread connectivity across HBA cards and not ports.
- It is recommended to perform SAN zoning based on WWN.
- To promote multistream throughput, each SAN client should detect all target mode devices of HBA port or ports in the zone.
- Whenever possible avoid using ISLs between SAN Clients and the Fibre Transport Media Servers with which they communicate.

- Best practices: NetBackup SAN Client

<http://www.symantec.com/docs/DOC6469>

- NetBackup SAN Client and Fibre Transport Troubleshooting Guide

<http://www.symantec.com/docs/TECH51454>

- SAN Client Deployment - Best Practices and Performance Metrics

<http://www.symantec.com/docs/TECH54778>

- SAN Client Deployment - Best Practices and Performance Metrics

<http://seer.entsupport.symantec.com/docs/293110.htm>

- Each data store should have a minimum of 20% available disk space even after a snapshot has been created for all the available VM guests in the data store
- Recommended number of simultaneous snapshots per data store is a minimum of 1 and a maximum of 4
  - 1 for NFS data store
  - 4 for SAN data stores
- Recommended number of concurrent backup jobs per Vcenter server not to exceed 70
- Recommended to enable Change Block Tracking and leverage NBU Accelerator based backups

- Recommended to distribute VM guests for each ESX server/ Clusters across multiple backup hosts. This can be done by introducing exclude lists in the /usr/openv/netbackup/virtualization.conf file .
- **For example :**  

```
[BACKUP] "excludeVMservers"="server1,server2,server3"
```
- Recommended to use VM Display name or VM DNS name for backup client selection
- Utilize resource thresholds with in the Master Server Properties to clearly identify & load balance the VMware Intelligent Policy automation

## IRV Requirements

- The Instant Recovery for VMware (IRV) feature provides an option for quick recovery of virtual machines in a VMware environment
- The target ESX server for the restore be at vSphere 5.0 or later
- A Windows-based proxy host (or restore host) is required. The proxy host can be implemented in a virtual machine.
- NFS Client services must be enabled on the restore host or VM proxy host.
- The Services for Network File System (NFS) must be installed on the Windows media server and restore host
- The NetBackup media server platform must support Granular Recovery Technology.
- The Client for NFS service may have to be restarted on the NetBackup restore host.
- For a restore host that is separate from the NetBackup master server or media server, that host must be added to the list of servers that can access the master server

***For example: If a NetBackup 5230 appliance was the backup host that made the backup, the restore host must run on a separate Windows host***

- If the backup host was Linux, you must use the -vmproxy option on the nbrestorevm command to specify a Windows restore host
- NetBackup requires login credentials for the vCenter server and the restore host.

# Best Practices: VMware Instant Recovery

## Performance Recommendations



- SAN storage is recommended for faster Storage vMotion of Instant Recovery of VMs (SAN connection between the NBU media server with its disk storage unit and the ESX host)
- VM instant recovery performance is dependent on the available network bandwidth and storage speeds
- A minimum of 4 Gbps SAN connection is recommended
- A minimum of 1 Gbps connection is recommended if iSCSI SAN is utilized
- Migrate one virtual machine at a time per media server while using Storage vMotion to migrate a restored virtual machine. Migration may be slow if multiple virtual machines are done simultaneously per media server.
- For disaster recovery testing, it is recommended that you restore no more than 3 or 4 virtual machines per media server. The number to restore depends on the I/O load on the media server. As a best practice, it is recommended to perform the restore of each VM one-by-one, not simultaneously.
- To test the I/O performance over the network utilize HD\_Speed ( runs only on windows) (<http://www.steelbytes.com>)
- For large-scale recovery of multiple virtual machines, use the virtual machine restore feature in the Backup, Archive, and Restore interface. Do not use Instant Recovery for VMware.
- To manually test VMware instant recovery NFS connection between media server and ESX host please follow this technote (<http://www.symantec.com/business/support/index?page=content&id=HOWTO95488>)

- When architecting the Replication Director environment, the number of Qtrees that a single DFM server can manage is limited to approximately 2500. Therefore a large filer with 10,000 Qtrees would require 4 DFM servers.
- Proper sizing of OnCommand server is very important. Utilize OnCommand sizing guide to properly size the server to manage storage servers, relationships etc..
- NetBackup must be authenticated to talk to the OnCommand Server, therefore the “root” or “administrator” password will be required for this system. The OnCommand administrator will need to either provide this to the NetBackup administrator or will need to type it in during the NetBackup configuration process. It only needs to be entered a single time unless the password changes.
- Before configuring Replication Director , please follow this technote which could be used to verify the NetApp environment readiness for replication director:  

" <http://www.symantec.com/docs/DOC5240>".
- When naming the aggregate for use as the Replication Director target it is a good idea to make the name descriptive enough to indicate its usage for NBU only



- Periodically work with NetApp admin team to check that snapshot size does not exceed snapshot reserve space. This can impact operations in various ways, such as production downtime, RPO SLA violation, etc. It is recommended to work with the NetApp admin team and application owner to determine the appropriate retention level
- It is recommended to work with the NetApp admin to check snapMirror status on a regular basis, based on your replication frequency and request them to detect queued replication processes as soon as possible, which may result in having no valid copy for DR at worst and RPO SLA violation at best.
- One of the frequently asked questions with regards to Replication Director is “how do you choose between SnapMirror and SnapVault and why are both licenses required”. This choice is based on the replication retention option chosen in the SLP. When “Mirror” is chosen, SnapMirror is used and the replicated copy expires when the snapshot expires. When “Fixed” or “Expire After Copy” is selected, SnapVault is used and the replicated copy expires independent of the snapshot.

- Set PreFetchThreadNum to 8 in contentrouter.cfg file for improved restore/tape out performance
- Configure a maximum of 4 \* LTO5 OR 3 \* LTO6 tape drives per a single NBU 5230 appliance (when configured as MSDP media server)

- Utilize SLP Windows for better load balancing of duplication/replication jobs
- Consider modifying these parameters for better overall handling of SLPs (part of the Master Server Properties in NBU 7.6)
  - MIN\_GB\_SIZE\_PER\_DUPLICATION\_JOB
  - MAX\_GB\_SIZE\_PER\_DUPLICATION\_JOB
  - MAX\_MINUTES\_TIL\_FORCE\_SMALL\_DUPLICATION\_JOB

Minimum (8 GB by default) is the size of backup images that NBU will bundle together in a single duplication job, and Max (25 GB by default) is at what point it'll stop adding images

- `DUPLICATION_SESSION_INTERVAL_MINS` (Default is 5 mins)
  - Frequency at which nbstserv looks to see if enough backups are completed and whether its time to start another DUP SESSION
- Two good settings for AIR (Auto Image Replication) :
  - `MIN_GB_SIZE_PER_DUPLICATION_JOB` 256
  - `MAX_GB_SIZE_PER_DUPLICATION_JOB` 512
- Determine the WAN bandwidth and utilize AIR for replication efficiently. It is recommended to distribute the replication evenly and tune the SLP parameters based on the amount of data that needs to be replicated with in the window & bandwidth available

- Enable jumbo frames if utilizing 10 GigE network on clients and media server/appliances to accommodate for faster data transport
  - Improves the performance depending on type of workloads
  - Reduces CPU utilization on the appliances in some cases
- Leverage VLAN tagging on the media server/appliances for enabling network backups across multiple VLANs
- Implement network bonding for better utilization of all available similar speed network ports so that multiple TCP streams can be efficiently load balanced across all of the available network ports

- Verify fragmentation of VxFS file systems on the appliances
  - `/opt/VRTS/vxfs/bin/fsadm -t vxfs -E <mount point of the VxFS file system>`
    - A highly fragmented file system will have the following characteristics:
      - Greater than 5 percent of free space in extents of less than 8 blocks in length
      - More than 50 percent of free space in extents of less than 64 blocks in length
      - Less than 5 percent of the total file system size available as free extents in lengths of 64 or more blocks
- Perform `vxfsstat` to collect statistics on VxFS file systems
  - `/opt/VRTS/bin/vxfsstat -w <output file> -t <time interval> <mount point>`
- Collect VxVM statistics for the disk groups comprising de-dup and advanced disk volumes
  - `vxstat -g <dgname hosting appliance volumes> -vps -i <time interval>`

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## NBU Performance Testing Best Practices

- Leverage nbperfchk to validate the disk read/write performance of the storage subsystem on the MSDP/NBU 5230 appliances
  - Measures a disk array's read/write performance
    - **nbperfchk -i <filepath to write data to> -o <path to the output file> -s <filesize> -syncend**
    - **Make sure that file size is greater than the physical memory of the system so that both reads/writes are not leveraging physical memory as cache and buffers**
    - **nbperfchk -i <file path to read data from> -o <path to the output file> -bs <buffer size>**

*For more information, please refer to*

[http://www.symantec.com/business/support/index?page=content&id=HOWTO72940&act=p=search&viewlocale=en\\_US&searchid=1376495686389](http://www.symantec.com/business/support/index?page=content&id=HOWTO72940&act=p=search&viewlocale=en_US&searchid=1376495686389)



- Leverage nbperfchk to validate network performance from client to media server
  - From the listener/target side on the port 5000:
    - `./nbperfchk -o null: -i tcp::5000`
  - From the sender/source side:
    - `./nbperfchk -i zero: -o tcp:<listener server name>:5000 -s 10g`

- GEN\_DATA provides a way to generate test data for tuning NBU
  - Provides a way to tune buffer settings for disk, tape and fibre transport depending on the test results
  - Helps validate testing backups, restores, duplications and tape out/rehydration from a de-duplication pool
  - Knowledgeable of de-duplicated data stream helping with validating data being backed up to de-dup storage and also duplication, restore and rehydration

*Please refer to the following tech note for more detailed information on this directive usage*

<http://www.symantec.com/business/support/index?page=content&id=TECH75213>

- Set of directives to test throughput and performance in a repeatable fashion
- Reduces impact on client but does use client's network path
- **GEN\_DATA**
- *Start of directives for generating test data. Any subsequent file list entries, other than **NEW\_STREAM** and **GEN\*** entries, will be ignored.*
  
- **GEN\_KBSIZE=1**
- *Specify the size in KB of each generated file.*
  
- **GEN\_MAXFILES=1**
- *Specify the total number of files to generate.*
  
- **GEN\_PERCENT\_RANDOM=0**
- *Specify the amount of the generated file's data that should be random. This affects the compressibility of the generated data, with a value of 0 resulting in completely compressible data, and a value of 100 resulting in uncompressible data.*
  
- **GEN\_PERCENT\_INCR=100**
- *Specify the percentage of the total files that will be generated for an incremental backup.*
- Further tunables for testing de-duplication workloads
- <http://www.symantec.com/docs/TECH75213>

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## NBU 7.6 MSDP Performance Enhancements

## Self Healing Architecture



- Data integrity now checked online
- Free space reclaimed dynamically

## Faster Backup & Restore



- New architecture protects larger workloads & scale
- Eliminates need for in memory fingerprint index
- New multithreaded & batched fingerprint lookups

## Better Housekeeping



- New database speeds up system
- Eliminates CRQ backlog (container model)
- Inline with backups
- Better meets growing SLAs

## General Improvements



- Quick restart scales with growing capacities
- Avoids maintenance blackout windows
- Memory requirement decouple from storage capacity

**Deduplication improved for the Enterprise**



- 30% Faster Peak Client Dedupe Performance
- **122% Faster Sustained Client Dedupe Performance**
- 46% Faster Peak Target Deduplication
- **63% Faster Restore Speed (4 streams)**
- 20% Faster Restore Speed (2 streams)

Description	5230 – 7.5.x	5230 – 7.6
Backup - Peak Throughput Client Deduplication @98% 144 Streams	30.8 TB/hr	39.9 TB/hr
Backup - Sustained Throughput Client Deduplication @98% 8 Streams	5.4 TB/hr	12 TB/hr
Backup – Peak Throughput Target All-In-One Deduplication @98% 366 Streams	8 TB/hr	11.7 TB/hr
Restore – 4 streams	331 MB/s	538.98 MB/s
Restore – 2 streams	284 MB/s	341 MB/s

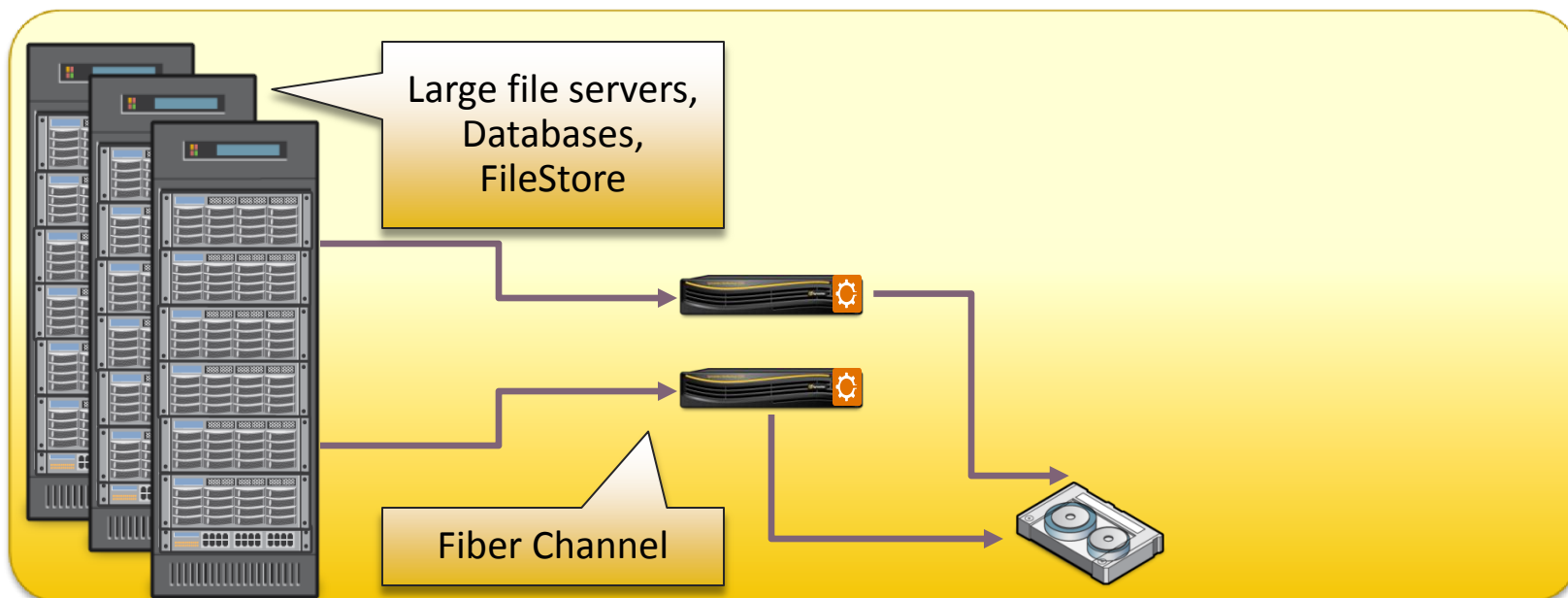
TB = 10<sup>12</sup> bytes = 1,000,000,000,000 bytes

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## NBU Appliances Use Cases/ Best Practices

# NBU 7.6 Appliance Use Case – SAN Client

## Protecting large data sets with SAN Client



### SAN Client with NetBackup 52x0

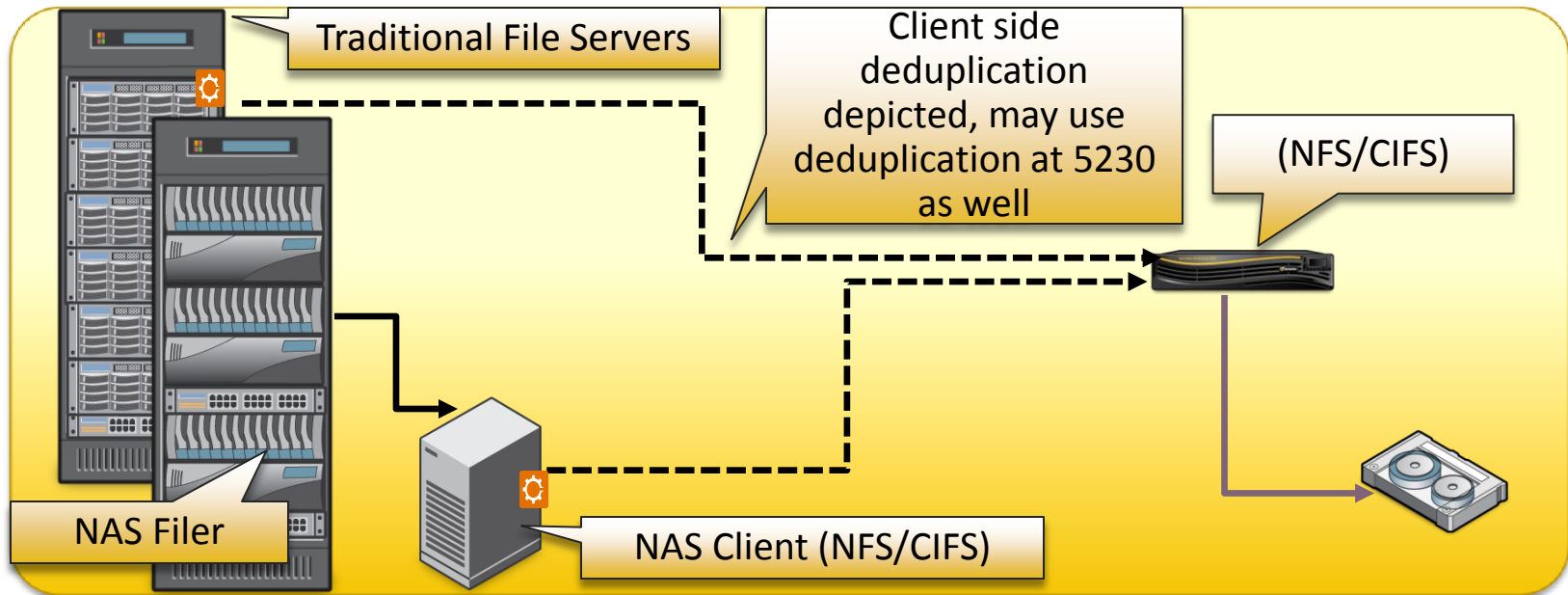
- High speed streaming through multiple Fiber Channel streams
- No need for off-host systems (low TCO)
- Use the processing power of Appliances for deduplication
- Avoid configuring clients as backup servers - conserve resources for critical applications
- Replace aging physical and virtual tape libraries

**Note: Do not configure more than 20 FT pipes per 52x0 appliance as a best practice**



# NBU 7.6 Appliance Use Case – Accelerator

## Protecting NAS , SAS and File Server data

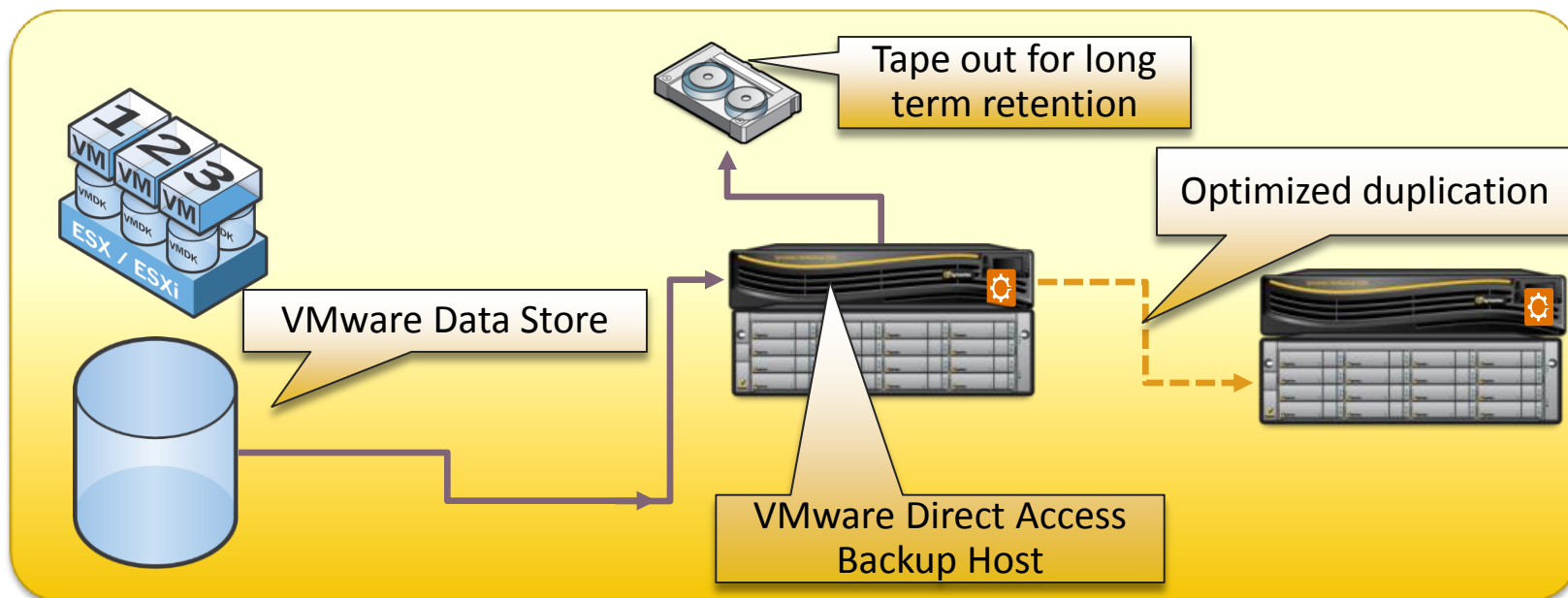


### Leveraging Accelerator & Client Side Deduplication

- Highly recommended for any file server
- Works for any NAS solution through a NAS Client (NFS/CIFS) or using NFS on 5230 appliance itself
- Works very efficiently with SAS data as well
- After the initial full, never run full backup again (leverage track log for changes)
- Lowest impact on clients, network and media server
- Deduplication may be done at source or NetBackup 5230 appliance

# NBU 7.6 Appliance Use Case – VMware

## Off-host and SAN data transfer for VMware data



### Direct vSphere Backup - VMware backup host built into NetBackup 52x0

#### 100% off-host backups for all VMs with Single Appliance

- Eliminate Windows backup host – consolidate/reduce hardware requirements!
  - All transport methods supported (SAN, nbd, nbdssl, hot-add)
  - CBT / BLIB incrementals, FullVM and Single File restores
  - VMware Accelerator enabled backups
  - Media Server Load Balancing including between Appliances and Windows Access Hosts
  - Application backup support for MS SQL, Exchange, and SharePoint



# Thank you!

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To download the app, go to <https://vision2014.quickmobile.com> or search for Vision 2014 in the iTunes or Android stores.



**NetBackup 7.6 Best Practices: Improving Recovery Times – 1726**  
**May 7<sup>th</sup> , 2:00 pm – 3:00 pm , Palace 3**

**NetBackup 7.6 Best Practices: Protecting Databases and Applications – 1727**  
**May 7<sup>th</sup> , 4:30 pm – 5:30 pm - Palace 3**



# Thank you!

Suresh Suseendran, Lead Architect  
(suresh\_suseendran@symantec.com)

Praveen Vunnava, Lead Architect  
(praveen\_vunnava@symantec.com)

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