



# Symantec NetBackup **Blueprints**

## Media Server Deduplication Storage Pool (MSDP) in NetBackup 7.6

Symantec Education Services



Please hide this slide before presenting. For Internal Use only.

To provide Feedback and Rate this document, please use the [FEEDBACK LINK](#).

**Note: You must be in Slide Show mode to make the link clickable.**

This link will redirect you to Adobe Forms.

Thank you



## Notice



This NetBackup Blueprint presentation includes example diagrams that contain objects that represent applications and platforms from other companies such as Microsoft and VMware. These diagrams may or may not match or resemble actual implementations found in end user environments. Any likeness or similarity to actual end user environments is completely by coincidence.

The goal of the diagrams included in this blueprint presentation is not to recommend specific ways in which to implement applications and platforms from other companies such as Microsoft and VMware; the purpose of these diagrams is to illustrate NetBackup best practices only.

For guidelines and best practices on installing and configuring applications and platforms from other companies, please refer to best practice documentation and other resources provided by those companies.

These **Blueprints** are designed to show customer challenges and how NetBackup solves those.

- Each Blueprint consists of:
  - **Pain Points:** Explain the current challenges a customer faces.
  - **Whiteboards & Example Diagrams:** Describe the implementation of NetBackup solution.
  - **Best Practices:** Present NetBackup best practices to avoid common pitfalls
- Use these **Blueprints** to present the NetBackup best practice implementation example



## Pain Points

Organizational data is growing enormously, causing Backup Windows to increase too. producing user and Application functional disruption.

Excessive storage consumption for traditional Backup instigates heavy Investment in Secondary Storage like tapes and external disks.

High Vaulting and replication cost is involved for offsite DR Plan.

High Utilization of Bandwidth during Backup and Restore operations.

Very Slow Backup Performance especially when Backing up Data over WAN links



## NetBackup Deduplication Advantages

Pain points discussed in the earlier slide are addressed through Deduplication, It is the process of eliminating redundant data from storage. It uses hash algorithm to provide a set of data with a unique identifier. This algorithm provides the ability to prevent the data from being stored multiple times, while still allowing the data to be restored when necessary.

What is deduplication	Where to deduplicate	Benefits
<ul style="list-style-type: none"><li>• Technology which uses a hash (fingerprint) algorithm to determine data uniqueness and Store only unique data</li></ul>	<ul style="list-style-type: none"><li>• While backing up the data, Deduplication can be done<ul style="list-style-type: none"><li>- At the target (media servers and appliances)</li><li>- At the source (clients)</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Backs up less data, much faster speed.</li><li>• Dramatically reduced storage costs and backup load.</li></ul>

*Backups and Archive data are ideal for deduplication due to its redundant nature.*

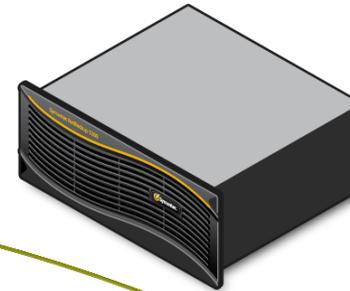
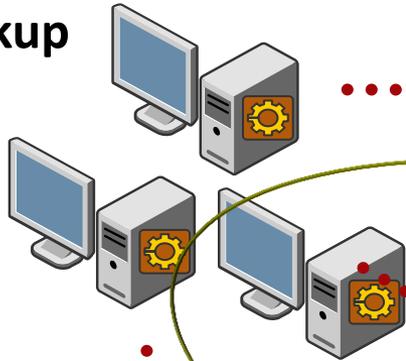
# Symantec NetBackup Blueprint

## NetBackup deduplication options



NetBackup offers deduplication on:

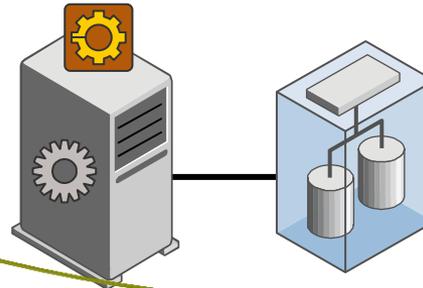
**NetBackup clients**



**NetBackup /PureDisk appliances**



**Appliances supporting OpenStorage Technology (OST)**



**NetBackup Media Server Deduplication Pools (MSDP)**

Media Server Deduplication Storage Pool (MSDP) is an embedded deduplication technology that ships and is installed with base NetBackup 7.6 software, and that is provided on NetBackup appliances running version 2.6 software.

The discussion in this blueprint is in context to Media Server Deduplication Storage Pool (MSDP), unless specifically mentioned otherwise.



### Next Generation Deduplication Architecture

#### 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
- Inline with backups
- Better meets growing SLAs

#### General Improvements



- Quick restart scales with growing capacities
- Avoids maintenance blackout windows

**Deduplication improved for the Enterprise**

Enhancements to MSDP in NetBackup 7.6	Benefits
<p>Replacement of the PostgreSQL database engine used in previous releases with a flat-file reference database (RefDB).</p>	<ul style="list-style-type: none"><li>• Greatly improves the performance of MSDP operations.</li><li>• Increases the scalability of MSDP operations. More backup images can be processed and more jobs can run concurrently.</li><li>• Database corruption does not affect backups, restores, or database housekeeping processes, and no longer prevents the Deduplication Engine from starting.</li><li>• The deduplication database is self-healing. NetBackup detects corruption and reconstructs corrupted database automatically.</li></ul>

Enhancements to MSDP in NetBackup 7.6	Benefits
Implementation of a multi-threaded agent – used by the Deduplication plug-in	<ul style="list-style-type: none"><li>• Improves backup performance for client-side and media server deduplication</li><li>• Improved startup time and performance of the Deduplication Engine (spool) achieved by a new approach to loading spool main fingerprint index cache.</li><li>• Improved WAN backup resiliency.</li></ul>
MSDP Queue Processing Enhancements	<ul style="list-style-type: none"><li>• Backup changes are committed to the database in real time, and Tlogs are generated only for Data Removal (image expiration) and Online (data integrity) Check operations, this changes boosts the performance up and bound, and also reduces the CPU Utilization required for processing large number of Tlogs.</li></ul>

Enhancements to MSDP in NetBackup 7.6	Benefits
Data integrity enhancements	<ul style="list-style-type: none"><li>• Data loss and corruption are automatically contained to ensure new backups are intact.</li><li>• CRC checking of data containers is performed automatically with the results reported to NetBackup.</li><li>• Continuous data integrity checking to detect issues earlier and avoid the fault spread.</li><li>• Self-healing database make 24x7x365 system availability possible .</li></ul>
Deduplication plug-in enhancements	<ul style="list-style-type: none"><li>• A multi-threaded communication pipeline between the Deduplication plug-in and the MSDP storage server enables improved backup performance.</li><li>• Plug-in enhancements for WAN/high-latency networks, to address the connection timeout issue, in 7.6 the Deduplication plug-in uses a plugin-to-spooled keep alive</li></ul>



## Whiteboards and Diagrams

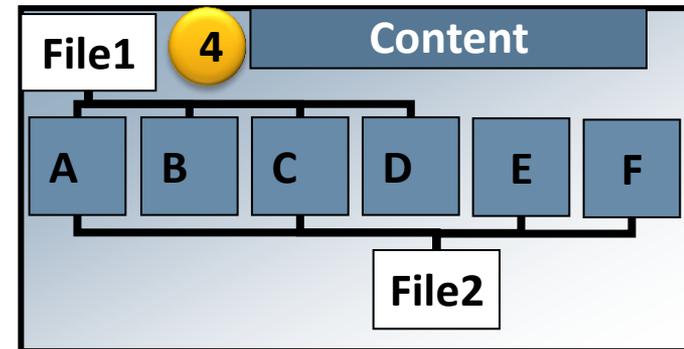
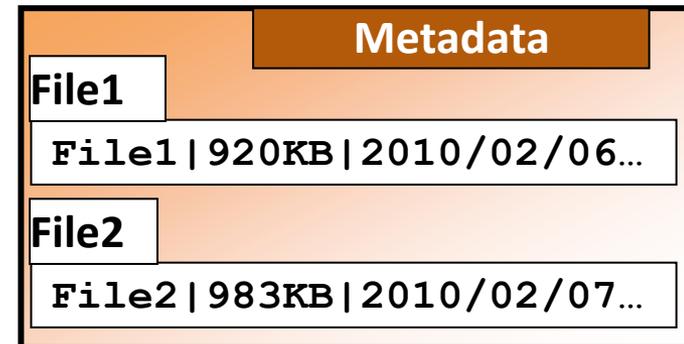
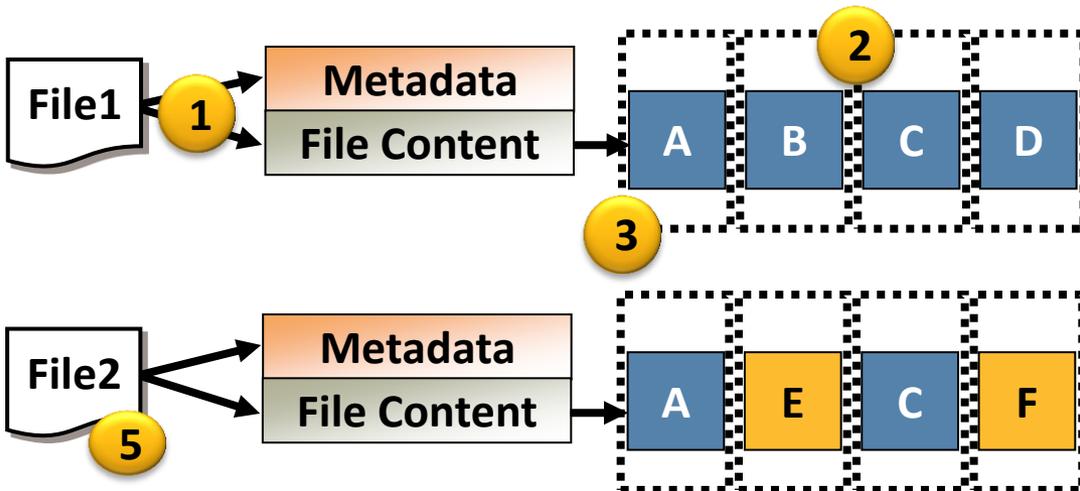
For all files to be de-duplicated:

1. De-duplication plugin Separates file metadata and contents.
2. The file contents are then Logically separated into segments.
3. hash fingerprint of segments are taken.
4. Finger prints are identified for unique segments and then store all unique segments.
5. Process the data stream.

**IMPORTANT:** Uniqueness of data segments is maintained across all clients – not just for individual client backup data.

### Backup storage:

#### Data

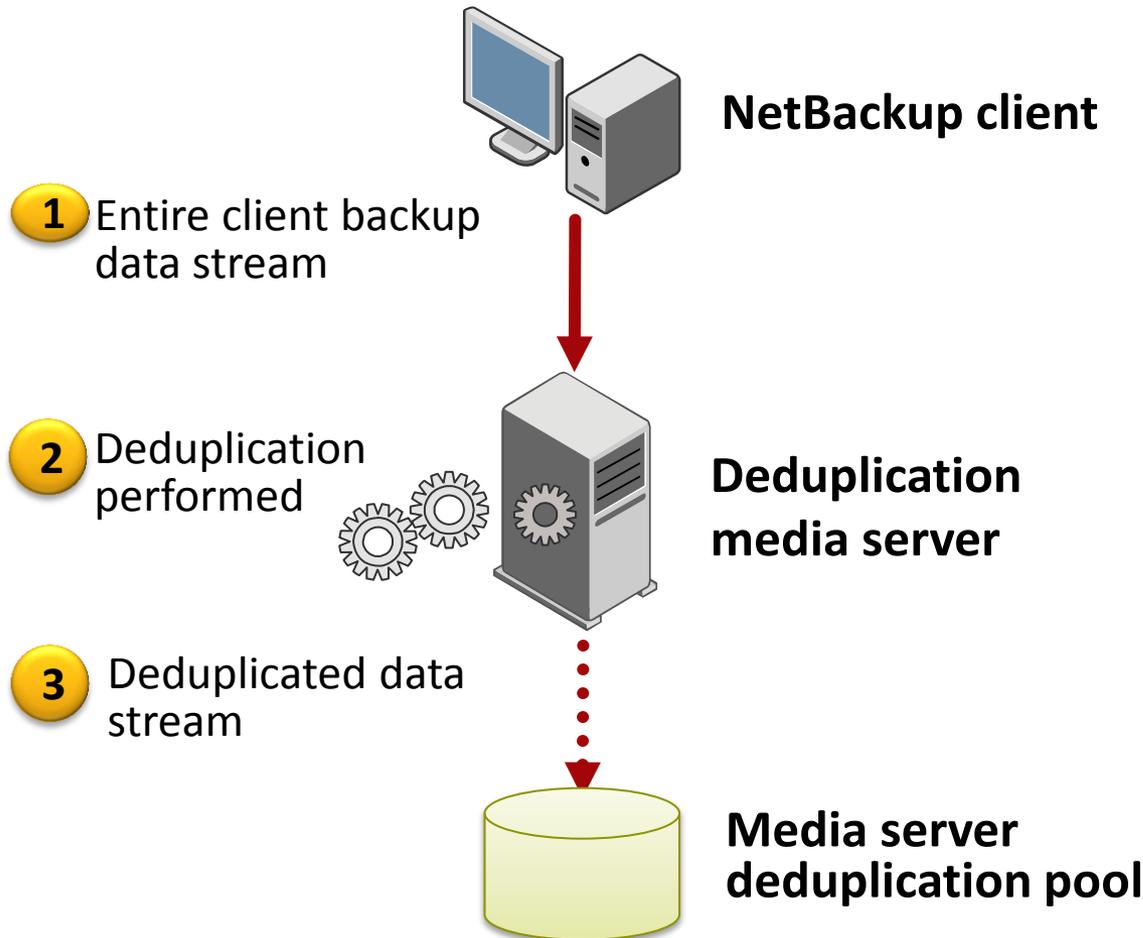


# Symantec NetBackup Blueprint

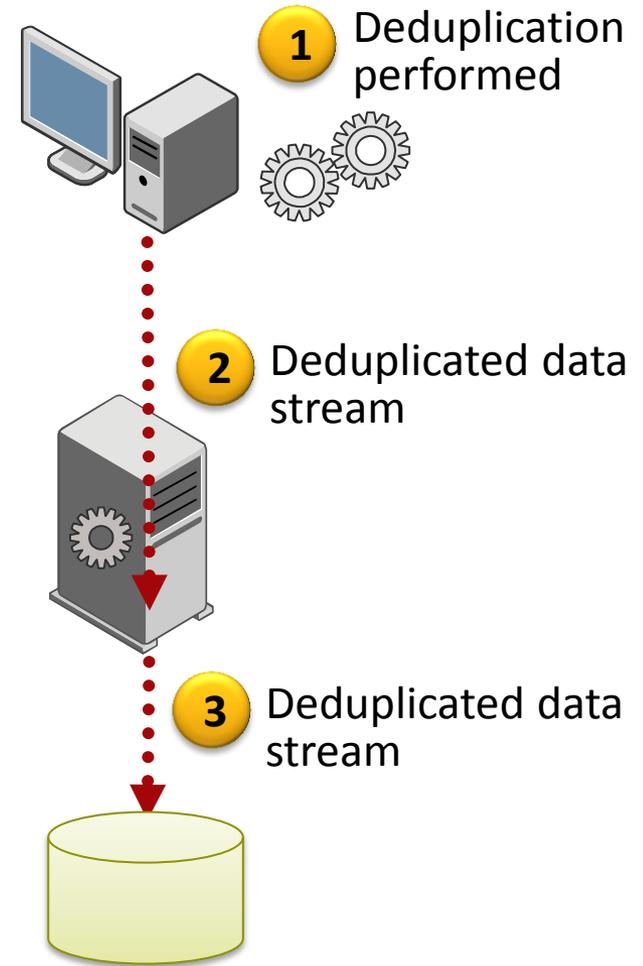
## Comparing media server and client side deduplication



### Media server deduplication



### Client side deduplication



### *Checklist for Configuring the Deduplication Media Server*

- ✓ Verify the deduplication media server requirements are met as per suggested guidelines in Administrators guide for 7.6.
- ✓ Confirm that the license key is present for the MSDP option to be used.
- ✓ Install the NetBackup media server software (if it is not already installed).
- ✓ Configure the media server as a deduplication storage server.
- ✓ Create a media server deduplication disk pool.

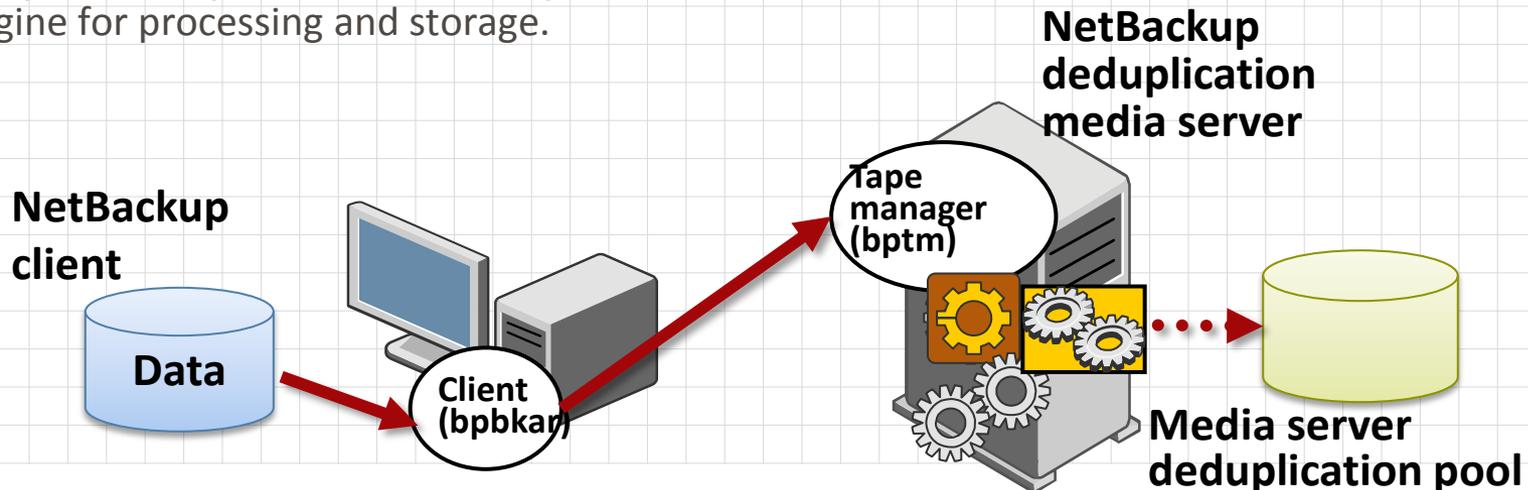
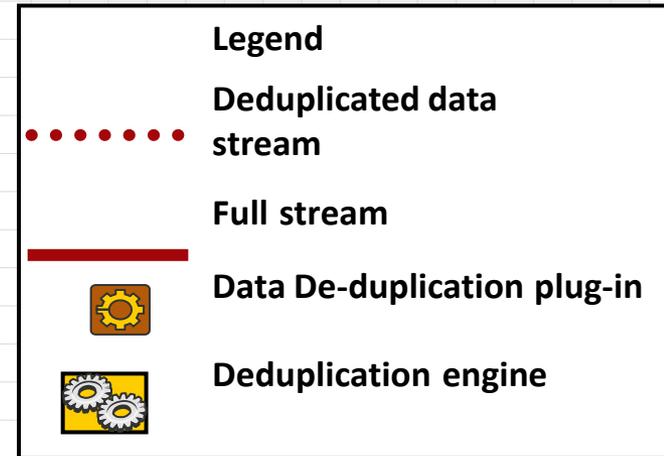
*For detailed steps on configuration, please refer the following article:  
**Configuring MSDP deduplication**  
<http://www.symantec.com/docs/HOWTO88955>*

# Symantec NetBackup Blueprint

## How media server deduplication works



1. The NetBackup client (bpbkar) reads and sends data to the media server's tape manager (bptm).
2. The backup data is passed to the deduplication plug-in on the media server.
3. The deduplication plug-in separates file metadata and data, divides the files into data segments, and performs fingerprinting. The plug-in works with the deduplication engine to identify unique data segments.
4. Unique data is passed to the deduplication engine for processing and storage.



### *Checklist for Configuring the Client Side Deduplication*

- ✓ Verify the client-side deduplication requirements are fulfilled as per guidelines in Administrators guide for 7.6.
- ✓ Install the NetBackup client software (if it is not already installed) on the Client system intended to be Backed up with Client Side Deduplication.
- ✓ Configure the deduplication storage destination in the Policy.
- ✓ Configure client-side deduplication options in the Client Attributes in the host properties of the Master server.

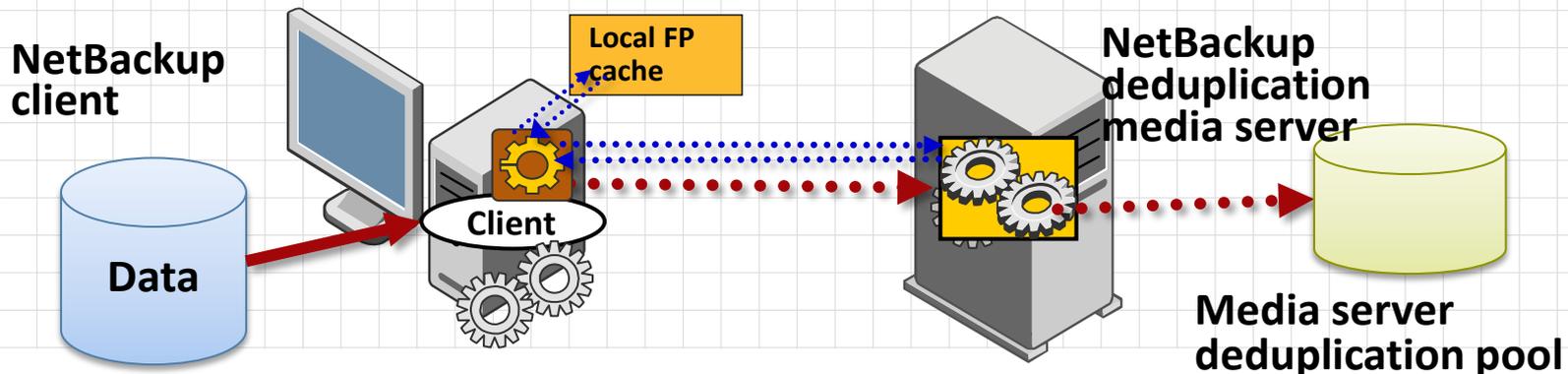
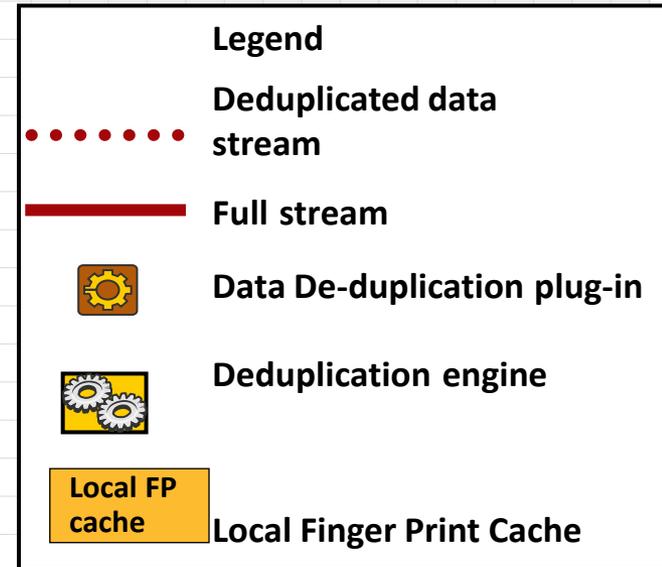
*For detailed steps on configuration, please refer the following article:*

***Configuring MSDP client-side deduplication***

***<http://www.symantec.com/docs/HOWTO89132>***

### How Client side deduplication works

1. The NetBackup client backup reads and sends data to the local deduplication plug-in.
2. The deduplication plug-in on the client divides the client data into segments and calculates a fingerprint for each segment.
3. To identify unique data segments, the plug-in queries a local fingerprint cache and the main fingerprint index that is maintained by the deduplication engine.
4. The Deduplication plug-in sends only unique data segments over the network to the deduplication engine on the media server to be written to storage.

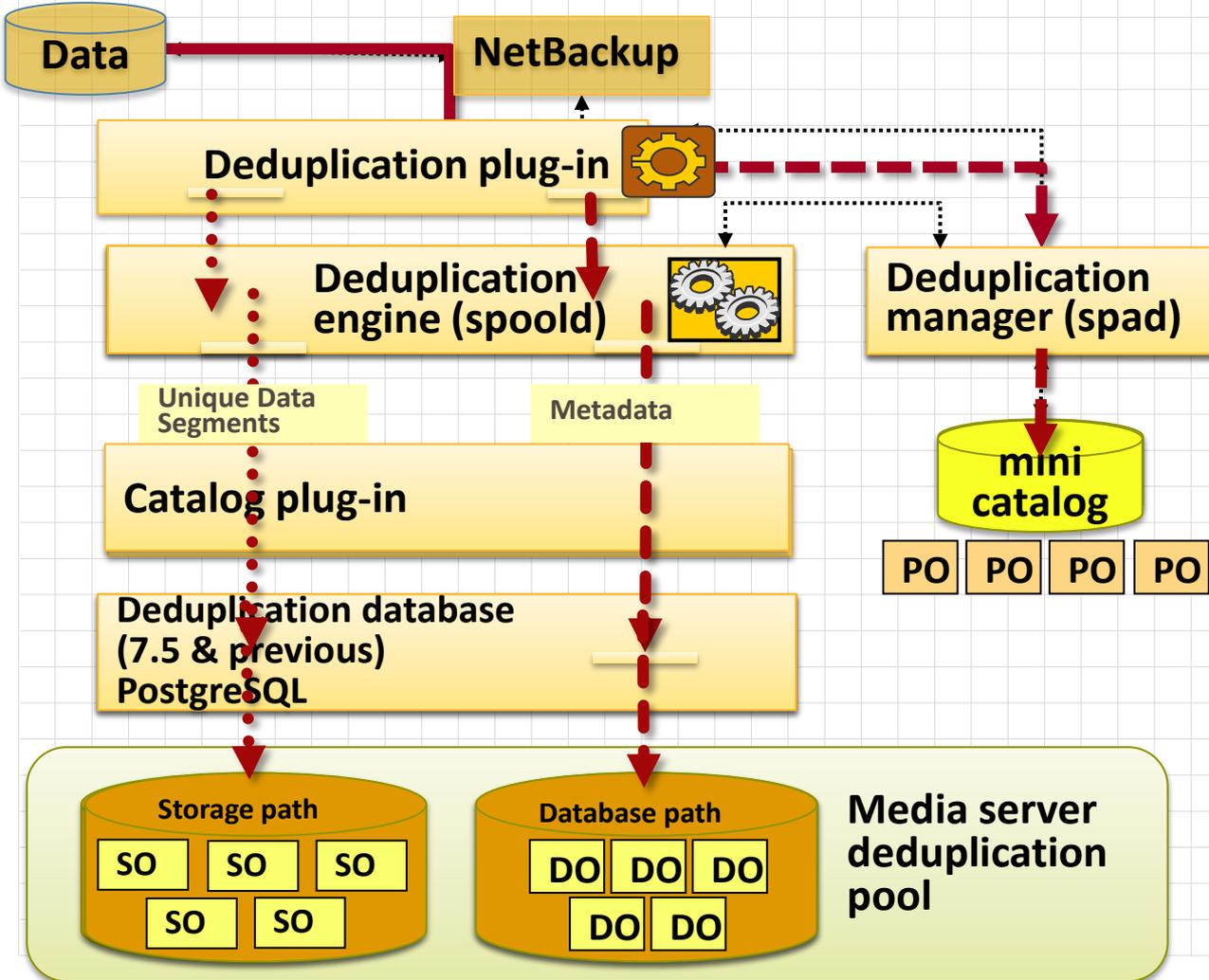


# Symantec NetBackup Blueprint

## Media Server Deduplication (MSDP) architecture



### NetBackup MSDP components – 7.5 and previous



**Legend**

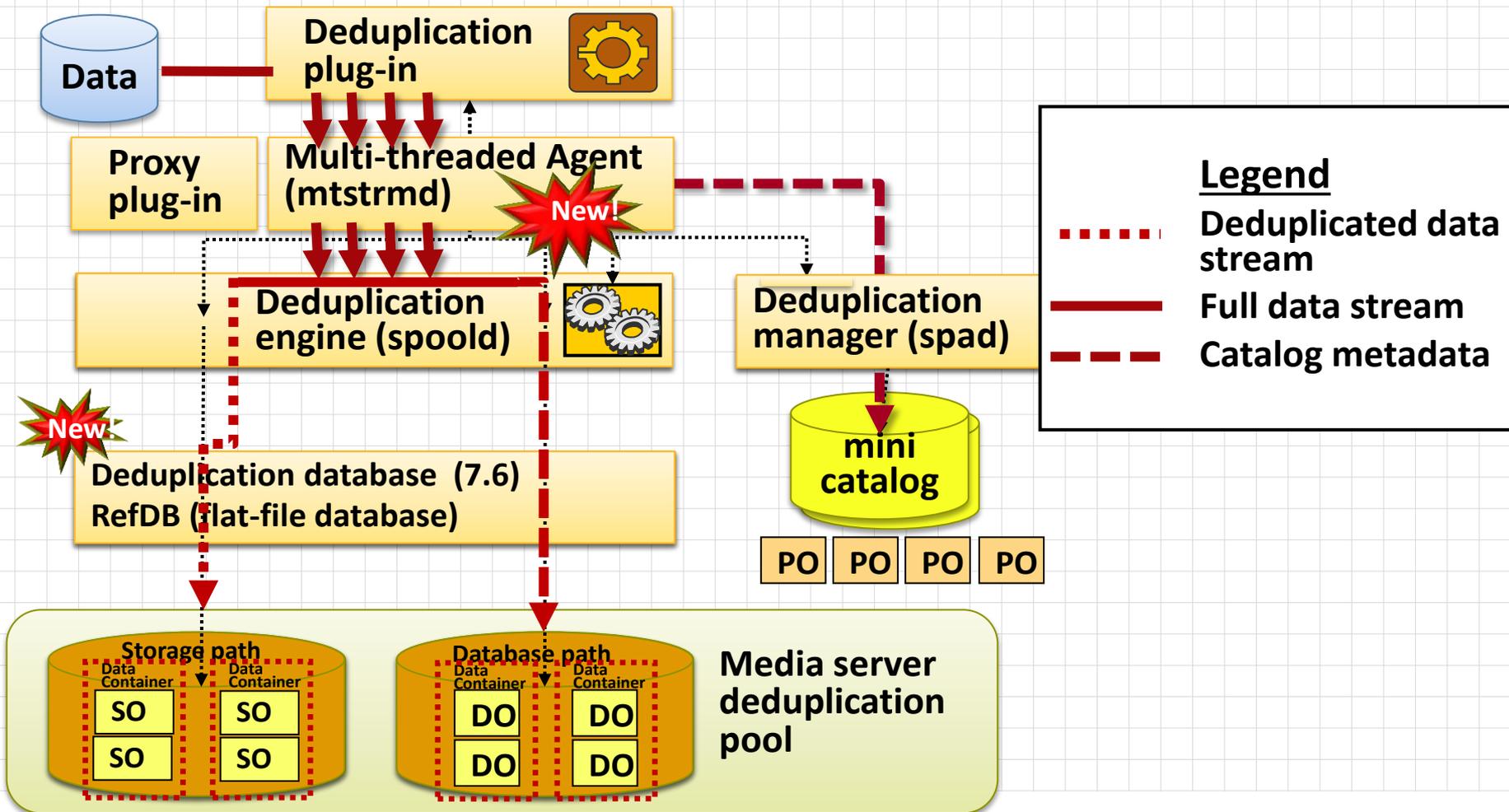
- Full data stream
- Deduplicated data stream
- Catalog metadata

# Symantec NetBackup Blueprint

## Media Server Deduplication (MSDP) architecture



### NetBackup MSDP components – in 7.6



The new deduplication multi-threaded agent provides multiple communications pipelines between the MSDP deduplication plug-in and the MSDP storage server, and enables improved backup performance.

Capabilities provided by the multi-threaded agent are:

- performs multiple MD5 fingerprint calculations in parallel, rather than serially.
- overlaps I/O and CPU operations, making better use of system resources
- Uses batch fingerprint queries to determine if data segments are unique
- Transmit data concurrently to the Deduplication Engine over multiple streams

Runs as mtstrmd process, used in association with the Deduplication plug-in and there is one instance of the process per system – the process runs on NetBackup MSDP storage servers, load balancing media servers, and on supported NetBackup clients.

# Symantec NetBackup Blueprint

## Multi-threaded agent support for MSDP plugin



Name	Description	Status	Startup Type	Log On As
NetBackup BMR PXE Service	Provides P...		Manual	Local System
NetBackup Client Service	Client Service	Started	Automatic	Local System
NetBackup CloudStore Service Container	Provides c...	Started	Automatic	Local System
NetBackup Compatibility Service	This servic...	Started	Automatic	Local System
NetBackup Database Manager	Manages t...	Started	Automatic	Local System
NetBackup Deduplication Engine	Processes ...	Started	Automatic	Local System
NetBackup Deduplication Manager	Manages t...	Started	Automatic	Local System
<b>NetBackup Deduplication Multi-Threaded Agent</b>	Provides a ...	Started	Automatic	Local System
NetBackup Device Manager	Starts the ...	Started	Automatic	Local System
NetBackup Discovery Framework	Discovers s...	Started	Automatic	Local System
NetBackup Enterprise Media Manager	Keeps trac...	Started	Automatic	Local System
NetBackup Event Manager	Creates an...	Started	Automatic	Local System
NetBackup Indexing Manager	Manages I...	Started	Automatic	Local System
NetBackup Job Manager	Starts jobs...	Started	Automatic	Local System
NetBackup Key Management Service	The NetBa...		Automatic	Local System

On Windows-based systems, the multi-threaded agent runs as the NetBackup Deduplication Multi-Threaded Agent, that is visible in the Windows' Services Manager. The process name associated with the service is mtstrmd.

# Symantec NetBackup Blueprint

## Multi-threaded agent support for MSDP plugin



```
root@lnxmaster:/usr/opencv/var/global/telemetry/scheduling
File Edit View Search Terminal Help
[root@lnxmaster scheduling]# bpps -a
NB Processes
-----
root    10563 14440 11 17:51 ?          00:00:00 /usr/opencv/netbackup/bin/admincmd/bpstsinfo -DPSPROXY
root    10564 14440 11 17:51 ?          00:00:00 /usr/opencv/netbackup/bin/admincmd/bpstsinfo -DPSPROXY
root    10565 14440 12 17:51 ?          00:00:00 /usr/opencv/netbackup/bin/admincmd/bpstsinfo -DPSPROXY
root    13482   1  0 Apr30 ?          00:00:06 /usr/opencv/netbackup/bin/private/nbatd -c /usr/opencv/var/global
eab/data
root    13501   1  0 Apr30 ?          00:00:01 /usr/opencv/netbackup/bin/vnetd -standalone
root    13504   1  0 Apr30 ?          00:00:03 /usr/opencv/netbackup/bin/bpcd -standalone
root    13536   1  0 Apr30 ?          00:00:02 /usr/opencv/netbackup/bin/nbdisco
root    13626   1  1 Apr30 ?          01:48:17 /usr/opencv/db/bin/NB_dbsrv @/usr/opencv/var/global/server.conf
opencv/var/global/databases.conf -hn 5
root    13657   1  0 Apr30 ?          00:01:10 /usr/opencv/netbackup/bin/nbevtmgr
root    13677   1  0 Apr30 ?          00:00:58 /usr/opencv/netbackup/bin/nbaudit
root    13806   1  0 Apr30 ?          00:03:18 /usr/opencv/pdde/pdcr/bin/spad
root    13987   1  0 Apr30 ?          00:03:10 /usr/opencv/pdde/pdcr/bin/spoold
root    13993   1  0 Apr30 ?          00:00:00 /usr/opencv/pdde/pdaq/bin/mtstrmd
root    14077   1  0 Apr30 ?          00:07:45 /usr/opencv/netbackup/bin/nbemm
root    14099   1  0 Apr30 ?          00:00:52 /usr/opencv/netbackup/bin/nbrb
root    14138   1  0 Apr30 pts/0        00:00:52 /usr/opencv/netbackup/bin/bprd
root    14158   1  0 Apr30 ?          00:00:02 /usr/opencv/netbackup/bin/bpcompatd
root    14184   1  0 Apr30 ?          00:00:16 /usr/opencv/netbackup/bin/bpccompatd
root
root
root
root
root    14371   1  0 Apr30 ?          00:01:05 /usr/opencv/netbackup/bin/nbstserv
root    14433 14194  0 Apr30 ?          00:00:00 /usr/opencv/netbackup/bin/nbproxy dblink nbim
```

On UNIX and Linux-based NetBackup systems, the multi-threaded agent is visible in the output of the bpps command as mtstrmd, as illustrated here.

### System requirements

Windows, Linux, and Solaris

Multiple cores recommended

Multi-threaded agent *not available* on HP-UX and AIX platforms.

### Application

NetBackup 7.6 server installations

NetBackup 7.6 client installations that include Client-Direct (the multi-threaded agent is not available for AIX or HP-UX platforms).

### Licenses

No additional licensing required

Multi-threaded option is Configured in two files:

New options added to pd.conf to control when the Deduplication plug-in uses the multi-threaded agent.

New mtstrm.conf file added to define the resources used by the multi-threaded agent, and logging that is performed by the agent

For more detailed information on the parameters and the file location, please refer the following articles:

***Configuring the Deduplication Multi-Threaded Agent behavior***

<http://www.symantec.com/docs/HOWTO89169>

***MSDP mtstrm.conf file parameters***

<http://www.symantec.com/docs/HOWTO89170>

***MSDP pd.conf file parameters***

<http://www.symantec.com/docs/HOWTO89038>

### *Data Loss*

Data loss in Deduplication exists when a data segment in data storage is corrupt or missing. It has multiple causes like **disk failures, I/O errors, backup and data removal bugs, reference database corruption, and human errors**. In deduplication products, a corrupted data segment can affect an increasing number of backup images, because duplicate data segments in new backups may refer to a corrupted data segment in deduplication storage.



### *Storage Leak*

In MSDP terms, a storage leak exists when a data segment in data storage contains a reference to a PO-DO, but the data segment is not referenced by any PO or DO. This results in wasted disk space, as data segments for which there is storage leak are not removed by normal image expiration and removal activities.

How does NBU 7.6 MSDP handles the issue of Data loss and storage leaks ?

Data loss and corruption are automatically contained to ensure new backups are intact.

CRC checking of data containers is performed automatically with the results reported to NetBackup.

Storage leaks are automatically detected and repaired.

Reference database entries are automatically recovered if they are corrupt or missing.

Storage garbage collection is automatically performed.

Benefits:

Improved robustness of MSDP data integrity.

Continuous data integrity checking to detect issues earlier and avoid the fault spread.

Self-healing database make 24x7x365 system availability possible.

- Each data container (DCID) is associated with a specific refDB file, they are not reused instead new data containers, with higher-numbered DCIDs, are created as needed.
- In a usual circumstances, space is reclaimed automatically by deleting the unused data container, once all the references to the container have expired and been deleted.
- Garbage collection identifies data containers that are no longer in use as the refDB file contains no references to the container these are deleted and disk space can be reclaimed.
- **GarbageCheckRemainDCCount** parameter in **contentrouter.cfg** file can be modified to change the number of data containers that are skipped during garbage collection (starting from the highest numbered DCID), this is usually done to tune the performance. Ref. **Symantec NetBackup Deduplication Guide, Release 7.6 for more details**

### Deduplication Engine queue processing in 7.5

In NetBackup 7.5, MSDP uses a centralized PostgreSQL reference database of Segment Objects (SOs) and Data Object (DOs)..

Transaction log (Tlog) files are generated during backups, data removal, and compaction and as queue processing occurred at 12 hour interval, the reference database is not up-to-date with backups

Missing or corrupted transaction log files related to backups are not discovered until post-processing.

### Enhancement to queue processing in 7.6

In 7.6, PostgreSQL database is removed, the segment-based database reference model is replaced by a flat-file, container-based reference model – called RefDB. The reference database is organized into multiple reference files

No transaction log (Tlog) file entries are created for backups, this significantly reduced the number of Tlog entries, so during a given backup, updates to the reference database are real time, called as inline updates

Missing or corrupted transaction log files related to backups are not discovered until post-processing.

In NetBackup 7.5 and earlier, MSDP took longer time to startup, depending on number of fingerprints and number of tlogs to be processed. This delayed the capability to run timely backups and restores following a restart of MSDP services.

With the changed architecture in 7.6, the Deduplication Engine no longer has dependency on the postgres database and starts up in minutes, providing improved availability of the system

Deduplication Engine fault tolerance is dramatically improved because it does not rely upon the integrity of the reference database for successful startup, or to perform backup and restore operations.

Deduplication now maintain a lock pool for accessing the mini-catalog for each path stream, this enables other operations such as Backup, restore, image deletions etc. to concurrently access the mini-catalog. thereby enhancing the performance in 7.6

When deleting images, MSDP 7.6 achieves better performance than in previous versions.

Client-side rebasing is a new process introduced in 7.6, it is used by MSDP to improve performance by reducing the number of Data Containers in MSDP data storage in which Segment Objects that comprise a particular backup image (PO) reside. SOs in data containers with small quantities of image data are re-written to a different data container. As a result, the SOs for a backup image are consolidated into a smaller number of data containers.

The Deduplication plug-in keeps persistent connections to the Deduplication Manager (spad).

The plug-in tracks usage of the spad connections and performs keep alive only on connections that have been idle for a configurable keep alive interval (configured in the pd.conf file).

- The spad connection keep alive interval is configured via a new parameter `FILE_KEEP_ALIVE_INTERVAL`, in `pd.conf`. located in:
  - UNIX/Linux: `/usr/opensv/lib/ost-plugins`
  - Windows: `install_path\Veritas\NetBackup\bin\ost-plugins`

Term	Description
data	The contents of client files. Data is split from its metadata by the Deduplication plug-in, and files are broken into data segments. After using fingerprints to identify unique segments, only the unique segments are sent to the Deduplication Engine (spool) for storage.
metadata	Information about a file, such as the filename, permissions, file location, ACLs of the file. Metadata is split from its data and sent to the Deduplication database for indexing. The Deduplication database contains a database record for each file that is backed up. This record contains the file metadata and pointers to the actual data.
Deduplication plug-in	The component of NetBackup's deduplication architecture that separates file data from its metadata, divides client files into data segments, calculates fingerprints for file segments, and then determines which data segments are unique, by comparing fingerprints of data segments to fingerprints that are already stored in the Deduplication Storage Server's database. Only unique data segments are forwarded to the Deduplication Engine for storage in the Deduplication database.
Multi-threaded Agent (mtstrmd)	<b>New in NetBackup 7.6</b> , MSDP deduplication can use a <b>multi-threaded agent</b> for most data sources. The <b>multi-threaded agent</b> runs alongside the Deduplication plug-in on NetBackup clients and media servers. The agent uses multiple threads for asynchronous network I/O and CPU core calculations. During a backup, the agent receives data from the Deduplication plug-in through shared memory and processes it using multiple threads to improve throughput and performance. When inactive, the agent uses minimal resources. The <b>multi-threaded agent</b> improves backup performance for both client-side deduplication and media server deduplication. Supported on Linux, Solaris, and Windows operating systems.

Term	Description
Data Object (DO) (in 7.5 and previous)	A list of the segments that together constitute the original file content is stored in a <b>Data Object</b> . A <b>Data Object</b> does not contain physical data. It is an ordered list of the <b>Segment Objects</b> from which the physical data can be reconstructed. <b>Data Objects</b> are stored in the Deduplication Engine's reference database. Each <b>Data Object</b> also has a unique fingerprint.
Data Object (DO) (in 7.6)	In 7.6, the Data Object contains a Data Container list, or DCID list, that identifies all data containers that house data segments that are required to reconstruct the file or image.
Path Object (PO)	A <b>Path Object</b> is an object containing a reference to a data item (a file, directory, email message) and the attributes of that data item. In 7.6, the Path Object identifies the Data Container that contains the Data Object, or DO, for the file or image. <b>Path Objects</b> are constructed by the Deduplication plug-in and stored by the Deduplication Manager (spad) in the mini catalog.
Transaction Logs (Tlogs) in 7.5 and previous versions	Transaction logs, or Tlogs, contains entries for updates to Deduplication database records. In NetBackup 7.5, tlog entries were created during backup jobs, image deletion, and data integrity online checks. In 7.5, the tlog file entries are post-processed, placing a significant load on storage server resources and impacting the performance of backups and other jobs.
Transaction Logs (Tlogs) in 7.6	<b>In 7.6</b> , during MSDP backups, changes to the reference database are made in-line. No backup transactions are post-processed. Only two types of Tlog entries are used: DO removal (SPOOL_TYPE_REF_DEL) and DO online check (SPOOL_TYPE_REF_CHECK). These transactions are post-processed as in previous versions of MSDP.

Term	Description
Proxy plug-in	The <b>proxy plug-in</b> runs on the MSDP storage server and manages the control communications that is required with NetBackup clients that back up their own data (use client-side deduplication). The <b>proxy plug-in</b> communicates with the OpenStorage proxy server (nbostpxy) on the client which, in turn, communicates with the Deduplication plug-in and multi-threaded agent on the client system.
Proxy server	The OpenStorage proxy server (nbostpxy) on the client manages control communication with the proxy plug-in on the storage server. nbostpxy receives backup data from bpbkar on the client and passes it to the Deduplication plug-in (also on the client).



## Best Practices

- An MSDP comprises of two storages The large MSDP Metabase (dedupe database) & and the large Single Instance Data Repository (actual stored data blocks) NetBackup provides the ability to isolate the MSDP Metabase and Single Instance Repository, so take advantage of this capability. By putting the Metabase on a separate file system, partition, and disks, the MSDP IO performance will be increased dramatically compared to putting the Metabase and Single Instance Repository in the same disks, partition, and file system.
- The IO performance of the MSDP metabase is a critical consideration that needs attention when deciding on the storage architecture (from hardware, lun/disk size, and volume management). The more IOPS performance you can give the MSDP metabase, the higher the performance you will get out of your deduplication pool.

- Refrain from using large luns/disk for the Metabase volume. Instead, use many smaller luns that are striped (not concatenated) together to form the volume. More stripes in the volume will provide the MSDP more capacity for parallel IOPS operations in and out of the physical disk system.
- Use hardware RAID controllers ideally within the storage sub-system, do not use software based RAID as part of the volume management software as it steals compute and IO cycles from the MSDP deduplication engine.
- The MSDP Metabase volume generates a very high quantity of random read and writes traffic, which is best suited by RAID10 disk parity. The Single Instance Repository volume can reside on RAID5 or 6 as this is where 90% of the MSDP data resides but only generates 10% of the IO load of the pool.



“Regarding my monthly weekend full backup of a Linux client that mounts 13 TB SAN storage that backs up to MSDP and then duplicates to tape. **Before the upgrade the duplication to tape process would not complete till mid week. After the upgrade it completed over the weekend! Very satisfied with v7.6 duplication improvement.**” -- Pierce County, WA

“I was just noticing **a dramatic change in how queue processing runs, down from 36-48 hours, now running in 20-30 minutes?** As long as this is by design and the system is functioning properly, then that’s awesome, I just wasn’t aware that there was going to be that big of a difference.” -- FBL Financial Group

### Reference Material:

- Symantec NetBackup 7.6 Deduplication Guide:

<http://www.symantec.com/docs/DOC6466>

This guide explains how to configure and use NetBackup media server deduplication and NetBackup client deduplication.

### 7.6 Documentation:

This article provides NetBackup 7.6 release notes, administration, installation, configuration, getting started, and solutions guides for viewing and downloading.

<http://www.symantec.com/docs/DOC6488>

Symantec NetBackup 7.6 Administrator's Guide, Volume I

<http://www.symantec.com/docs/DOC6452>

# Thank You!

Symantec Technical Services