HP Data Protector software interaction with deduplication-enabled replication

Cartridge Management of replicated cartridges in HP D2D, VLS, and D2D NAS backup devices
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Technical white paper

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Executive summary

Data deduplication has emerged as a technology available with virtual tape libraries. It represents one of the most significant storage enhancements in recent years, promising to reshape future data protection and disaster recovery solutions.

Deduplication technology references blocks of data that have been previously stored, and only stores new backup data that is unique. Data that is not unique is replaced with a pointer to the location of the original data. Because there is often a great deal of duplicate data present from one backup session to the next, disk space is consumed by similar or identical iterations of data. Deduplication greatly improves storage efficiency by only storing an instance of data once, while still allowing backup streams to be restored as if they had been retained in their entirety.

Deduplication is the key technology enabler for low bandwidth replication on HP VLS and D2D systems (VLS systems use HP Accelerated deduplication, and D2D systems use Dynamic deduplication). The same technology that allows duplicate data to be detected and stored only once on the HP VLS or D2D system, also allows only unique data to replicate between sites. This technology is called deduplication-enabled replication. Because the volume of data being replicated between sites is much less than if the full data set was replicated, you can use lower bandwidth links at correspondingly lower price points. In addition, backup at remote offices can be automated to a local virtual tape library and then replicated back to a regional data center or primary data center allowing end-to-end management from the data center of all data in the remote offices.

Scope of white paper

This white paper describes the necessary steps and processes to import replicated cartridges into the media management database of an HP Data Protector Cell Manager for further tape/backup data handling such as restore operations or object copy operations. The scripts support importing from the following storage types:

- HP VLS
- HP D2D VTL
- HP D2D NAS

This version (January 2011) includes information with regard to HP D2D NAS storage types.
HP Data Protector interaction with replication

The replication in both the VLS and D2D systems is mirroring the source cartridge to its matching target cartridge so both cartridges have the same barcode, the same tape contents, and so on.

This represents a perfect mechanism to increase backup data resilience in terms of availability and backup data protection. By using two different Data Protector Cell Manager hosts, backup data resides at different locations and is available for further data handling. However, as the replicated cartridge represents an identical clone of the source cartridge it is a prerequisite to import the replica into a different Data Protector cell. The source and the target libraries must belong to their respective Data Protector cell.

Figure 1 shows the simplified architecture for such cartridge handling.

**Note:** With HP Data Protector, if you have a Cell Manager at each site that can share library devices across sites through a MoM/CMMDB, you still need to ensure that each Cell Manager only sees its local virtual library (that is, the source cell server must not be configured to see the target virtual library and vice-versa)

In order to be able to use replicated cartridges on Cell Manager B, it needs to be “taught” about what is on the replicated cartridges. Up to this point, Cell Manager B does not know about the:

- cartridge slot ID
- cartridge barcode
- catalog (content of a cartridge)

of the replicated cartridge.

A list of successfully replicated cartridges will be created on each target D2D or VLS device which will then be imported into the Cell Manager B using scripts that run regularly on the Cell Manager B system.
Prerequisites for Low Bandwidth Replication

To fully utilize the advantages of deduplication-enabled Low Bandwidth Replication, you are recommended to read the HP StorageWorks deduplication and replication solutions guide. It provides comprehensive technology information and design guidelines to successfully prepare and setup a backup environment for Low Bandwidth Replication.

You can download the solutions guide from the Hewlett-Packard web site at:

HP StorageWorks Deduplication and replication solutions guide
Virtual Library Systems D2D Backup System

Note: It is advisable to familiarize yourself with the technologies that are used by reading the solutions guide as the guide also covers aspects such as:

- device configuration
- migration of existing backup data
- licensing
- performance considerations
- capacity sizing considerations
and much more to successfully prepare and use deduplication and Low Bandwidth Replication in a complex backup environment.

Prerequisites for using HP tape import scripts

To effectively use the replicated media on the target side, the media needs to be imported into a media management database belonging to a backup cell server other than the source backup cell server. (See Figure 1 Cell Manager assignment.)

The current solution for such a tape import task is a script-based solution. HP provides such tape import scripts at the following location:

http://www.hp.com/go/dataprotector

1. In the section Additional resources click on Patches & Utilities.
2. On the HP Data Protector software page, click on HP OpenView Storage Data Protector V6.0 Software.
3. In Download Software and Drivers click on “Cross operating system (BIOS, Firmware, Diagnostics, etc.)”.

HP provides two versions of import scripts:

- Import scripts for Microsoft Windows operation system platforms.
- Import scripts for HP-UX and Linux operation system platforms.

On the download page that appears, find the correct entry and start downloading.

For supported HP Data Protector cell servers on the relevant operating system refer to the current support matrix at:

http://www.hp.com/go/dataprotector

The import scripts are supported on HP Data Protector version 6.0 and higher.

Requirements:

- Perl 5.10.1
- HP Data Protector graphical user interface (GUI) component
- Additional Perl modules
Note: Perl download and installation instructions can be found in the Addendum of this document.

Tape import scripts

Theory of operation

The media on the target site can be imported to a different Data Protector Cell Manager after the replication has finished and can be used there for restore and/or object copy tasks. Both D2D backup devices and VLS devices have a notification mechanism that allows applications to find if a media has been replicated successfully to the target device.

The HP VLS device provides an automatic notification mechanism that creates a report containing all the replicated media that were created successfully since the execution of the last report. This report can be scheduled and sent via e-mail attachment to any e-mail address.

The HP D2D device provides a web page containing the information about all replicated media in an XML format that can be polled frequently. The XML page is available via an SSL-encrypted connection by querying the following URL:

https://<D2D_hostname>/ReplicationStatus.xml

For example, for a D2D running on the host 'myd2d.company.com' the URL would be:

https://myd2d.company.com/ReplicationStatus.xml

The information received from a D2D device will be checked by the import script (D2D import handler) against a previously recorded import history and if there is a change recognized in the newly received status report the changes will be written into a queue file.

For a D2D NAS report, refer to:

https://myd2d.company.com/ReplicationNASStatus.xml

The VLS provides replication status information on a regular basis by e-mail. The e-mail contains information about successfully replicated cartridges. The VLS import handler will parse the provided information and will invoke the queue manager which updates the queue file with the new information.

The queue file contains:

- library name
- barcode
- slot number

for each replicated cartridge.

The D2D/VLS import handler will automatically invoke the queue manager script to update the queue file after a change has been recognized.

Finally an import task is scheduled, which invokes a Data Protector media import command that uses the information from the queue file to import the successfully replicated cartridges.

Figure 2 shows a schematic overview of the script architecture.

All scripts use a single configuration file in which the following configuration details are specified:

- E-Mail notification details (VLS device)
- XML file location (URL to D2D devices)
- Cache file (XML History) location
- Queue file name and location
- Proxy Settings
- Log file name and location
- Log level and log file truncation period
- Library name/time window for import tasks/import tape drive
Note: Cartridges which have not been replicated because of replication black out windows configured on the device or because of replication problems will not be imported. The import scripts cannot check the cartridge status on the device.

Figure 2 Schematic overview of the script architecture

Note: The scheduler to schedule the different script tasks is not part of the script package. However in the addendum of this white paper (on page 24) you will find examples of what components to use to automate this part of the script implementation.
Installation

After downloading the script package you must extract the script package to the HP Data Protector home directory using a package unzipper for your operation system platform such as unzip, 7zip or winzip. Make sure you install the scripts on the Data Protector Cell Manager or Data Protector client on which you plan to import replicated cartridges.

Examples of directories to which to unzip the package:

- **Windows**: C:\Program Files\OmniBack
- **Linux**: /opt/omni
- **HP-UX**: /opt/omni

Figure 3 depicts the installation location on a Microsoft Windows host.

---

**Note:** The client on which the import script is planned to run also requires the HP Data Protector component “HP Data Protector graphical user interface (GUI)” to be installed. For best performance you may consider to run import scripts on the HP Data Protector Cell Manager.
Configuration

Backup devices

Before starting to configure the tape import script task on the client on which you plan to import cartridges, make sure the following aspects are satisfactorily covered:

- Backup libraries on the source side are setup properly. This includes proper
  - licensing
  - deduplication is enabled
  - replication is configured

- Backup libraries on the target side are setup properly. This includes proper
  - licensing
  - replication is configured

Follow the guidelines in the *HP StorageWorks deduplication and replication solutions guide* to make sure backup data is deduplicated and replicated properly:

*HP StorageWorks deduplication and replication solutions guide*
Virtual Library Systems D2D Backup System

**Note:** Consider the following aspects before using the import scripts:

- Migration of existing backup data
- Replication initialization process

This is well described in the solutions guide.

All libraries involved in the replication and tape import process must be configured properly, the source device into the source Data Protector cell server and the target device into the target Data Protector cell server.

It is advisable to create individual media pools first, which are associated with the backup devices during the configuration process. You may also use the **Autoconfigure Devices** function in the **Devices & Media** context window of the Data Protector graphical user interface (GUI) to let Data Protector discover connected backup devices. **Note:** Autoconfigure is not available for File Libraries.

Figure 4 depicts the device autoconfiguration wizard dialog in the Data Protector GUI.

After the autoconfiguration process has finished you may want to rename the devices that were discovered to match your device naming convention.

**Note:** A replication target library must not be used as a regular backup device on the target side Data Protector cell server.
Figure 4 “Autoconfigure devices” in HP Data Protector

Figure 5 depicts the source backup device with its associated media pool. Figure 6 depicts the target backup device with its associated media pool.

Figure 5 Source backup device (1) with media pool (2) and media (3)

Note: In Figure 5, notice that scheduled backup jobs have already used media from the source device media pool.
Figure 6 Target backup device (1) with media pool (2) and media (3)

Note: In Figure 6, notice that scheduled import jobs have already imported media into the target device media pool.

Script configuration file

The script package contains a configuration file, which is required to be configured for each target device you plan to import cartridges from.

Note: You must not specify multiple devices (replication target) in one configuration file. Use separate configuration files for each device you plan to import cartridges from. Prepare multiple e-mail addresses if you plan to import from multiple VLS devices.

Figure 7 depicts a potential scenario in which backup data from multiple source devices is replicated to a number of target devices from which a cartridge imported is being planned. For each target import device there exists a separate configuration file.
Figure 7 Import script configuration file assignment

The configuration file is split into two target device-specific sections and a common configuration section.

In the VLS specific section “VLS only” you can configure the e-mail notification details of the VLS device you plan to import cartridges from. Make sure the correct pop3 e-mail server FQDN and addressee is configured on the VLS device to successfully retrieve and process incoming e-mails from that device.

```plaintext
# email POP3 server used to receive VLS notifications from
vls.email.pop3.server=pop3server.yourdomain.com
# email POP3 user name
vls.email.pop3.user=vls_report_addressee
# email POP3 password
vls.email.pop3.password=addressee_password
```

Only configuration data that is needed to query the D2D device replication status web page goes into the “D2D only” section of the configuration file. This includes the URL to the XML status web page and eventual proxy details if the D2D device is behind a firewall. Cartridge import tasks from different D2D devices require separate configuration files.

```plaintext
# specify the D2D URL that has to be used to receive the replication status XML page
d2d.url=https://D2D_host_name-IP/ReplicationStatus.xml
# In case the d2d.url needs to be accessed through a proxy, the following parameters have to be used.
#d2d.https.proxy=
#d2d.https.proxy.username=
#d2d.https.proxy.password=
```

In the D2D NAS specific section, the following is needed for D2D NAS Shares.

```plaintext
# --------------- D2D NAS only ---------------
# Specify mapping from D2D NAS Share name to file library name.
# There can be only one such mapping for each file library.
# But there can be many mappings in one configuration file. One for each D2D NAS Share
# Entries are separated by |
# - <share name>: Name of D2D NAS replication target share
# - <library name>: Name of target file library
d2d.nas.share.mapping=<share name>|<library name>
```

The “ALL” section of the configuration file applies to generic settings of the import script that affect all devices configured in the configuration file. This includes the following details:

- cache.directory=C:/Program Files/OmniBack/automated_replicated_media_import/cache
  specifies the cache directory used to store the replication status xml page. Use an absolute path.
• queue.file= C:/Program Files/OmniBack/automated_replicated_media_import/queue/D2D_import.queue
defines the path and the name of the queue file. You may want to choose a queue file name that matches your naming convention. Multiple queue files might be generated that will be used to import cartridges.

• log.level=4
defines the granularity of logging. There exist five logging levels. Choose logging level two or three for troubleshooting purposes. If the setup runs successfully, you may consider switching to logging level four, which creates log files best formatted for reporting purposes.

• log.file= C:/Program Files/OmniBack/automated_replicated_media_import/D2D_VLS_rep_log.txt
defines the path and the name of the log file. You may choose a log file name that matches your naming convention. The log file is a tab-separated log file. The content can be imported into a spreadsheet application for further log file data handling such as generating cartridge import reports. You may select a common log file in all your configuration files or specify individual files to group per import devices.

• log.truncate.period=7
defines the period in days after which the log file will be truncated. The truncation will start at midnight. Specifying zero (0) will never truncate the log file. The truncation will only happen when the import script executeImportTasks.pl is running.

• report.file=C:/Program Files/OmniBack/automated_replicated_media_import/report.txt
defines the path and the file name of the (replication and import) status report.

• dp.home.directory=C:/Program Files/OmniBack
is an optional parameter you can set to specify the home directory for the import script package. Use this parameter in case the HP Data Protector install path gathering of the scripts has errors.

• specify your library settings
in the bottom section of the configuration file you have to specify:
– the names of the virtual libraries as they are configured on the target library
– the time window in which it is permitted to import cartridges
– the drive name as it is configured for the target device configuration in the Data Protector cell on which you plan to import cartridges.

For example:
WP_Library 2_Target/00:00-00:00/D2D_Target_1_tpc245
specifies a library on a D2D device as it appears on the configuration web page of the device. No time slot is specified in which to import cartridges, which means import is permitted at the next scheduled or manually triggered cartridge import task. The last entry in the configuration line specifies the name of the tape drive device as it is configured on the Data Protector Cell Manager.

References to a library configured on a VLS need to be entered similar to the following:
01Ub7cHIOn/00:00-00:00/VTL_SCSI_1_Rep_Target_tpc209/VTL_SCSI_2_Rep_Target_tpc209

Note: For the VLS device configuration you need to enter the device serial number rather than the library device name.

You may specify multiple tape drive devices to import cartridges. Multiple tape drives for the cartridge import need to be separated by |.
The following shows a fully configured configuration file for an import from a D2D device as it appears on MS Windows operating systems.

```plaintext
# ----------------- D2D only -----------------
# Specify the URL of the replication status XML page on replication target D2D. 
#d2d.url=https://<D2D hostname - IP>/ReplicationNASStatus.xml
# In case the d2d.url needs to be accessed through a proxy, the following parameters
# have to be used.
d2d.https.proxy=web-proxy.company.com:8088
d2d.https.proxy.username=proxyuser
d2d.https.proxy.password=proxyuser_password
# ----------------- ALL -----------------
# specify the cache directory used to store the replication status xml page. Use an
# absolute path.
cache.directory=C:/Program Files/OmniBack/automated_replicated_media_import/cache
# specify the queue file you want to use to queue import jobs.
# example: C:/Program
#Files/OmniBack/automated_replicated_media_import/queue/import.queue
queue.file=C:/Program
Files/OmniBack/automated_replicated_media_import/queue/D2D_rep_import.queue
# specify the granularity for logging: 0-4
# 0 - no logging
# 1 - log errors
# 2 - log errors and warnings
# 3 - log errors, warnings and status/success messages
# 4 - log errors, status/success messages - best for reporting
log.level=4
# specify the file for logging.
log.file= C:/Program Files/OmniBack/automated_replicated_media_import/D2D_import_log.txt
# specify the period of time the log file shall be truncated (in days).
# 0=no truncate
# 7=truncate log messages older than 7 days.
log.truncate.period=0
# specify the file for status of replication and import.
report.file=C:/Program Files/OmniBack/automated_replicated_media_import/report.txt
# optional parameter in case that the DP home directory detection does not work.
#dp.home.directory=C:/Program Files/OmniBack
# specify your library settings. Each line represents one setting and needs to consist
# of the following 3 items separated by /
#<virtual library>/<time window when it is allowed to run jobs for this library>/
#<drive names that can be used to import the tapes>(several drive names have to be
# separated with |)
# example:
#HP:ESL E-Series/22:00-04:00/QUANTUM:DLT8000_1|QUANTUM:DLT8000_2|QUANTUM:DLT8000_3
#WP_Library 2_Target/00:00-00:00/D2D_Target_1_tpc245

Note: If you do not access the D2D URL through a proxy server the proxy section of the configuration file must not be uncommented.
```
The following shows a fully configured configuration file for an import from a D2D NAS device as it appears on MS Windows operating systems.

```
# ----------------- D2D only -----------------
# Specify the URL of the replication status XML page on replication target D2D.
d2d.url=https://10.11.12.13/ReplicationNASStatus.xml
# In case the d2d.url needs to be accessed through a proxy, the following parameters
# have to be used.
d2d.https.proxy=
d2d.https.proxy.username=
d2d.https.proxy.password=
# --------------- D2D NAS only ---------------
# Specify mapping from D2D NAS Share name to file library name.
# There can be only one such mapping for each file library.
# But there can be many mappings in one configuration file.
# One for each D2D NAS Share
# Entries are separated by |
# - <share name>: Name of D2D NAS replication target share
# - <library name>: Name of target file library
#Entries are separated by |
# - <share name>: Name of D2D NAS replication target share
# - <library name>: Name of target file library
d2d.nas.share.mapping=TargetShare|FL_Target
# ----------------- ALL -----------------
# specify the cache directory used to store the replication status xml page. Use an
# absolute path.
cache.directory=C:/Program Files/OmniBack/automated_replicated_media_import/cache
# specify the queue file you want to use to queue import jobs.
# example: C:/Program
#Files/OmniBack/automated_replicated_media_import/queue/import.queue
queue.file=C:/Program
Files/OmniBack/automated_replicated_media_import/queue/D2D_rep_import.queue
# specify the granularity for logging: 0-4
# 0 - no logging
# 1 - log errors
# 2 - log errors and warnings
# 3 - log errors, warnings and status/success messages
# 4 - log errors, status/success messages - best for reporting
log.level=4
# specify the file for logging.
log.file= C:/Program Files/OmniBack/automated_replicated_media_import/D2D_import_log.txt
# specify the period of time the log file shall be truncated (in days).
# 0=no truncate
# 7=truncate log messages older than 7 days.
log.truncate.period=0
# specify the file for status of replication and import.
report.file=C:/Program Files/OmniBack/automated_replicated_media_import/report.txt
# optional parameter in case that the DP home directory detection does not work.
#dp.home.directory=C:/Program Files/OmniBack
# specify your library settings. Each line represents one setting and needs to consist
# of the following 3 items separated by /
# - <virtual library>
# - <time window when it is allowed to run jobs for this library>
# - <drive names that can be used to import the tapes>
#
# example:
#HP:ESL E-Series/22:00-04:00/QUANTUM:DLT8000_1|QUANTUM:DLT8000_2|QUANTUM:DLT8000_3
#FL_Target/23:00-03:00/FL_Target_Writer1
```
The following shows a fully configured configuration file for an import from a VLS device as it appears on MS Windows operating systems.

```plaintext
# ----------------- VLS only -----------------
# email POP3 server used to receive VLS notifications from
vls.email.pop3.server=vlspopserver.company.com
# email POP3 user name
vls.email.pop3.user=vls_rep_target_1
# email POP3 password
vls.email.pop3.password=topsecret
# -----------------   ALL    -----------------
# specify the cache directory used to store the replication status xml page. Use an
# absolute path.
cache.directory=C:/Program Files/OmniBack/automated_replicated_media_import/cache
# specify the queue file you want to use to queue import jobs.
queue.file=C:/Program Files/OmniBack/automated_replicated_media_import/queue/import.queue
# specify the granularity for logging: 0-4
# 0 - no logging
# 1 - log errors
# 2 - log errors and warnings
# 3 - log errors, warnings and status/success messages
# 4 - log errors, status/success messages - best for reporting
log.level=4
# specify the file for logging.
log.file= C:/Program Files/OmniBack/automated_replicated_media_import/VLS_import_log.txt
# specify the period of time the log file shall be truncated (in days).
log.truncate.period=0
# optional parameter in case that the DP home directory detection does not work.
# dp.home.directory=C:/Program Files/OmniBack
# specify your library settings. Each line represents one setting and needs to consist
# of the following 3 items separated by /
# - <virtual library>
# - <time window when it is allowed to run jobs for this library>
# e.g. 10:00-14:00, 23:00-02:00, use 00:00-00:00 for executing all the time
# - <drive names that can be used to import the tapes>(several drive names have to be
# separated with |)
# example:
# HP:ESL E-Series/22:00-04:00|QUANTUM:DLT8000_1|QUANTUM:DLT8000_2|QUANTUM:DLT8000_3
# 01Ub7cHI0k/06:00-10:00/judith_SCSI_1:Rep_Target_tpc209|judith_SCSI_2:Rep_Target_tpc209
# 01Ub7cHI0s/00:00-04:00/judith_SCSI_1:tpc209_vtl28|judith_SCSI_2:tpc209_vtl28|judith_SCSI_3:tpc209_vtl28
```
Configuration verification

You are recommended to verify the initial configuration and any changes to the configuration files. The script package provides a verification tool for this purpose.

To perform configuration file verification you have to call:

perl verifyConfiguration.pl --cfg <CONFIGFILE>

For example:

perl bin\verifyConfiguration.pl --cfg C:\Program Files\omniback\automated_replicated_media_import\cfg\VLS_tpc209_rep_import_config.cfg

Messages similar to those in Figure 8 are shown after running the verification tool.

You are strongly recommended to run the verification tool after the Perl module dependency has been resolved for the e-mail query and parsing feature of the scripts.

Note: Perl module dependency resolving is described in the Addendum of this document.

If the configuration verification of VLS e-mail settings displays an error message or the vlsHandler call displays the following message than you should install some extra Perl modules for VLS e-mail handling:

[2009/10/15 - 10:45:45] [Normal]:----------- Verifying VLS email settings -----------
Can't locate Mail/POP3Client.pm in @INC (@INC contains: ...) at bin\verifyConfiguration.pl line 143.
Import

For both device families a device specific task needs to be scheduled to retrieve information on which cartridges will be added to the import queue list.

**Note:** Scheduler examples are shown in the Addendum of this document.

**VLSHandler**

For the VLS device an e-mail with an attachment will be checked which has been sent from the VLS device to an e-mail server.

**Note:** The e-mail contains the information in the following format:

From: administrator@<VLS_hostname>
Subject: Replication Data for ISV Import
Status: <Replication_status>
Report Name: Replication Data for ISV Import
Report Generation Time: <Timestamp>
Report Frequency: <Scheduling_frequency>

Attachment:
ISV~<virtual cartridge barcode>~<virtual library>~<virtual library slot number>
ISV~<virtual cartridge barcode>~<virtual library>~<virtual library slot number>
ISV~<virtual cartridge barcode>~<virtual library>~<virtual library slot number>
ISV~<virtual cartridge barcode>~<virtual library>~<virtual library slot number>

**Example:**

```
From: administrator@devicename.test.com
Subject: Replication Data for ISV Import
Status: Successful
Report Name: Replication Data for ISV Import
Report Generation Time: Wed Mar 18 16:00:00 MDT 2009
Report Frequency: Hourly

Example Attachment:
ISV-MP0001-01YFOFAM00-1
ISV-MP0002-01YFOFAM00-2
ISV-VS1011-01YFOFAM07-48
ISV-JP0023-01YFOFAM04-23
ISV-MP0003-01YFOFAM00-3
ISV-JP0024-01YFOFAM04-24
```

The attachment information is used to gather new import jobs. The setting received as the `<virtual library>` must be configured in the configuration file.

To import the tasks from the VLS e-mail to the import queue list you have to call:

```
perl vlsHandler.pl -cfg <configuration file>
```

**Prerequisites:**

- Notification e-mail arrives at the e-mail server.
- VLS target libraries (serial number) are configured in the configuration file.

The VLSHandler is called by a scheduler or manually. The perl script vlsHandler.pl calls another perl script named VLSHandler.pm to download the notification e-mail attachments and then the parsed e-mails are deleted on the e-mail server.

The VLSHandler transforms the e-mail attachment job details into the queue format and adds the tasks to the queue.

Another possibility is to call the VLSHandler with the parameter `-notificationfile`:

```
perl vlsHandler.pl -cfg <configuration file> pl -notificationfile <notificationfile>
```

In this case only the `notificationfile` is used that contains the VLS tasks – no e-mails.

**Example:**

The file ISVImportShort.csv might contain following tasks:
perl vsHandler.pl –cfg config.cfg pl –notificationfile ISVImportShort.csv

D2DHandler
For an import from a D2D device first a cartridge status check is required and secondly the import task is triggered.

Note: The HP D2D system provides a web page containing the information about all replicated media in an XML format that can be polled regularly. The XML page is available via an SSL encrypted connection by querying the following URL (configured in the configuration file):
https://<D2D_hostname>/ReplicationStatus.xml

For example:
• For a D2D running on host myd2d.company.com the URL would be:
  https://myd2d.company.com/ReplicationStatus.xml
• For a D2D NAS Share running on host myd2d.company.com, the URL would be:
  https://myd2d.company.com/ReplicationNASStatus.xml

To import the tasks from the D2D XML replication status page to the import queue list you must call:
perl d2dHandler.pl –cfg <configuration file>

Prerequisites:
• D2D XML replication status page exists.
• D2D target libraries (serial number) are configured in the configuration file.

The D2DHandler is called by a scheduler or manually. The D2D XML replication status page is pulled from the D2D device and parsed. New tasks (slots that need to be imported because new data is on them) are identified and added to the import queue list. A copy of the XML status page is kept as a history file in the folder cache.directory= (in the configuration file). The history file will be compared against a newly retrieved XML status page to identify which new import tasks (slots) have to be added to the import queue.

QueueManager
To check or to modify the current import queue (queue.file= in the configuration file) manually you can use:
• to list all tasks of the import queue:
  perl queueManager.pl –cfg <configuration file> –list

  Example:
  perl bin\queueManager.pl –cfg config.cfg\config.cfg –list
  01Ub7ch10s/JUDY0018/18
  01Ub7ch10k/JPREP033/33
  01Ub7ch10k/JPREP037/37
  01Ub7ch10k/JPREP001/1
  01Ub7ch10s/JUDY0020/20
  01Ub7ch10k/JPREP010/10
  01Ub7ch10k/JPREP035/35
  Total tasks: 12

• to list all tasks from a single library of the import queue:
  perl queueManager.pl –cfg <configuration file> –list <library name>

  Example:
  perl bin\queueManager.pl –cfg config.cfg\config.cfg –list 01Ub7ch10s
  01Ub7ch10s/JUDY0018/18
  01Ub7ch10s/JUDY0020/20
  Total tasks: 2
• to add a task to the import queue:
  perl queueManager.pl -cfg <configuration file> -add <task>
  <task> : <library name>/<barcode of the slot>/<slot number>

  Example:
  perl bin\queueManager.pl -cfg cfg\config.cfg -add 01Ub7cHI0k/JPREP0007/7
  [2009/10/20 - 16:02:49] [Normal]: LIBRARY: 01Ub7cHI0k SLOT: 7,
  BARCODE: JPREP0007 Added task to queue successfully.

• to remove a task from the import queue:
  perl queueManager.pl -cfg <configuration file> -remove <task>
  <task> : <library name>/<barcode of the slot>/<slot number>

  Example:
  perl bin\queueManager.pl -cfg cfg\config.cfg -add 01Ub7cHI0k/JPREP0007/7
  [2009/10/20 - 16:03:34] [Normal]: LIBRARY: 01Ub7cHI0k SLOT: 7,
  BARCODE: JPREP0007 Removed task from queue successfully.

Execute ImportTasks

Once the queue list has been updated successfully, a separate task actually imports the logged
cartridges into the target Data Protector Cell Manager.

The DataProtector Import is called by a scheduler or manually. The ExecuteImportTasks job
retrieves the import tasks from the QueueManager, groups the tasks by library and uses all
configured drives to import them to the Data Protector target cell in parallel. The successfully
imported tasks are removed from the import queue.

To call the import task run or schedule the following command:

perl executeImportTasks.pl -cfg <configuration file>

Example:

perl bin\executeImportTasks.pl -cfg cfg\config.cfg

[2009/10/19 - 16:33:24] [Normal]: LIBRARY: 01Ub7cHI0s SLOT: 12,
  DRIVE: judith_SCSI_1:tpc209_vtl28 Successfully imported tape.

[2009/10/19 - 16:33:24] [Normal]: LIBRARY: 01Ub7cHI0s SLOT: 12,
  BARCODE: JUDY0012 Removed task from queue successfully.

[2009/10/19 - 16:33:26] [Normal]: Import Summary: Started with 1 Tasks,
  1 successful, 0 failed, 0 skipped. Currently are 0 open tasks available in the
  queue.

This example documents a successful cartridge import.

A problematic import will be logged as follows:

perl bin\executeImportTasks.pl -cfg cfg\config.cfg

[2009/10/19 - 16:42:41] [Error]: LIBRARY: 01Ub7cHI0s SLOT: 12,
  DRIVE: judith_SCSI_55:tpc209 Device is locked and cannot be used to import
tapes currently.

[2009/10/19 - 16:42:45] [Error]: LIBRARY: 01Ub7cHI0s SLOT: 18,
  BARCODE: JUDY0018 Task could not be executed. See error(s) above.

[2009/10/19 - 16:42:45] [Error]: LIBRARY: 01Ub7cHI0s SLOT: 19,
  BARCODE: JUDY0019 Task could not be executed. See error(s) above.

[2009/10/19 - 16:42:45] [Error]: LIBRARY: 01Ub7cHI0s SLOT: 20,
  BARCODE: JUDY0020 Task could not be executed. See error(s) above.

[2009/10/19 - 16:42:45] [Error]: LIBRARY: 01Ub7cHI0s SLOT: 12,
  BARCODE: JUDY0012 Task could not be executed. See error(s) above.

[2009/10/19 - 16:42:45] [Normal]: Import Summary: Started with 4 Tasks, 0
  successful, 4 failed, 0 skipped. Currently are 4 open tasks available in the
  queue.

Figure 9 depicts the process steps for both library families.
It is clear that a separate process needs to be started that actually starts the import task on the target Cell Manager. Typically a job scheduler delivered with the operating system on which the import task takes place will fulfill such a requirement.

In the Addendum on page 24 you will find scheduler configuration samples.
Figure 9 Cartridge import process tree
CLI summary of replication import scripts

The scripting solution has its own command line interface (CLI) completely separate from the Data Protector CLI. The Data Protector CLI itself is not modified. The CLI Perl scripts can be called without a parameter to get version and usage information.

<table>
<thead>
<tr>
<th>Module</th>
<th>CLI parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>d2dHandler.pl</td>
<td>perl &quot;d2dHandler.pl&quot; --cfg &quot;&lt;CONFIGFILE&gt;&quot;</td>
</tr>
<tr>
<td>vlsHandler.pl</td>
<td>perl &quot;vlsHandler.pl&quot; --cfg &quot;&lt;CONFIGFILE&gt;&quot;</td>
</tr>
<tr>
<td></td>
<td>The files are retrieved from the configured e-mail server using POP3.</td>
</tr>
</tbody>
</table>
|                         | perl "vlsHandler.pl" --cfg "<CONFIGFILE>" [--notificationfile "<NOTIFICATION_FILE>"
|                         | • <NOTIFICATION_FILE>: Optional. When specified, this file (VLS notification CSV file) is used to extract replicated slots. The file will be deleted afterwards. |
| queueManager.pl         | perl "queueManager.pl" --cfg "<CONFIGFILE>" { --add "<task>" | --remove "<task>" | --list ["<library serial number>"] } |
|                         | – <task>: <lib>/<barcode>/<slot>                                             |
|                         | – <lib>: library name, used to import the tape                               |
|                         | – <barcode>: barcode of the tape to import                                   |
|                         | – <slot>: slot number                                                        |
| executeImportTasks.pl   | perl "executeImportTasks.pl" --cfg "<CONFIGFILE>"                            |
| verifyConfiguration.pl  | perl "verifyConfiguration.pl" --cfg "<CONFIGFILE>"                            |

D2D NAS Share Limitations

The following limitations apply to D2D NAS shares only.

- **Only one File Library per share**: There can only be one File Library using a D2D NAS Share. Two libraries on the same share cannot be configured. If the same share is used by two libraries, it is not possible to know from the replication report to which library each slot belongs. Therefore, it is not possible to know to which library each slot should be imported.
- **Target File Library can have only one storage directory configured**: To import a media into the file library we need to know the storage directory in which the media resides. In other words this is the D2D NAS target share as it is presented to the target file library. If target library has many storage directories configured it is impossible to know which one of them is the NAS share. Therefore it is impossible to run import.
- **DFMF is not supported for File Library replication**: Use of distributed file media format (DFMF) is not supported for File Libraries.
- **Replication must be suspended when import is running**: This is because files can temporarily disappear during replication. This would prevent successful import.
Addendum

Perl

Windows

Perl for Microsoft Windows operating system platforms can be downloaded from:
http://www.activestate.com/activeperl/

or
https://www.activestate.com/activeperl/downloads/

Download the Perl version matching your HW platform to a location of your choice on the target Data Protector cell manager and run the installer package by double clicking on it.

Follow the installation instructions. A path variable to the newly installed Perl binaries should automatically be set during installation.

Verify the installation of Perl by opening a DOS box and issuing the command:
C:\>perl -version

A response similar to that in Figure 10 should appear:

![Perl Version](image)

Figure 10 Perl version on Microsoft Windows operating system

You may need to log off and log on again to use the newly set path to Perl.

Your path variable should contain a Path similar to:
Path=C:\Perl\site\bin;C:\Perl\bin;

You are recommended to specify the full path to Perl to ensure the proper Perl version is being used if you have multiple Perl versions installed on your system.
Linux

Perl for Linux operation system platforms can be downloaded from:

https://www.activestate.com/activeperl/downloads/

Download the Perl version matching your HW platform and supported Linux distribution to a location of your choice on the target Data Protector Cell Manager and run the package installer to install the Perl package:

rpm -i ActivePerl-xxxx.rpm

or with verification:

rpm -ivh ActivePerl-xxxx.rpm

Example:

```
tpc149:# rpm -ivh ActivePerl-5.10.0.1005-i686-linux-glibc-2.3.2-290470.rpm
Preparing... #!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! [100%]
   1:ActivePerl #!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! [100%]
tpc149:#
```

Verify the installation of Perl by issuing the command:

```
tpc149:# /opt/ActivePerl-5.10/bin/perl -version
```

A response similar to that in Figure 11 should appear:

![Figure 11 Perl version on Linux operating system](image)

```
tpc149:~ $ /opt/ActivePerl-5.10/bin/perl -version
This is perl, v5.10.0 built for i686-linux-thread-multi
(with 4 registered patches, see perl -V for more detail)
Copyright 1987-2007, Larry Wall
Binary build 1005 [2004070] provided by ActiveState http://www.ActiveState.com
Built Perl May 23 2009 09:05:14
Perl may be copied only under the terms of either the Artistic License or the GNU
General Public License, which may be found in the Perl 5 source kit.

Complete documentation for Perl, including FAQ lists, should be found on
this system using "man perl" or "perldoc perl". If you have access to the
Internet, point your browser at http://www.perl.org/, the Perl Home Page.
```

```
tpc149:~ $
Perl for HP-UX operating system platforms can be downloaded from:

https://hpux.connect.org.uk/hppd/hpux/Languages/perl-5.10.1/

Download the Perl version matching your HW platform and supported HP-UX distribution to a location of your choice on the target Data Protector Cell Manager and run the package installer to install the Perl package:

```
swinstall -s /<absolute path>/perl-xxxx.depot
```

**Example:**

```
swinstall -s /opt/tmp/perl-5.10.1-hppa-11.23.depot
```

![Figure 12: swinstall graphical user interface on HP-UX](image)

Verify the installation of Perl by issuing the command:

```
hpu031: # /opt/Perl5.10.1/bin/perl -version
```

**Note:** The path to Perl might differ if you have multiple versions of Perl installed.

A response similar to that in Figure 13 should appear:
Perl modules dependencies

The import scripts that are provided require Perl functionality that is not entirely covered by the standard Perl installation package as described in the previous section. Additional Perl modules are needed, depending on the OS and/or replication device (VLS/D2D).

You can download the required Perl modules from: http://search.cpan.org

General Perl module installation instructions:

1. Unpack the module that you downloaded from CPAN.
2. cd to the extracted folder of the module to install.
3. perl Makefile.PL
4. make
5. make install

Note: make is not part of the Microsoft Windows operating system.

Windows make is available through Microsoft Support:

1. Download the NMAKE.EXE package from:
   http://support.microsoft.com/default.aspx?scid=kb;en-us;Q132084
2. Unpack NMAKE.EXE.
3. Copy NMAKE.EXE and NMAKE.ERR to a folder known in path.
4. Use NMAKE.EXE instead of make when installing modules on Windows.

Note: NMAKE does not work on 64-bit Windows 2008 servers.

Use the OpenOffice tool dmake. Download dmake (for example, dmake-4.12-20090907-SHAY.zip) from:
http://search.cpan.org/~shay/dmake-4.11-20080107-SHAY/

Unpack and install the package to a folder known in path.

Use dmake.exe instead of make when installing modules on the Windows 2008 server.

Note: Ignore C compiler warnings during the Perl module installation.

Sample compiler messages are shown in Figure 14.
Perl modules for VLS e-mail handling

The following is a list of additional Perl modules you may need to download and install. These modules only need to be installed when you use the VLS e-mail handling of the scripts.

**Note:** Follow the module installation sequence exactly as listed below as there also exist dependencies among the additional modules.

**Windows/Linux/HP-UX:**

1. Mail::POP3Client (Mail-POP3Client-2.18.tar.gz)
2. IO::Stringy (IO-stringy-2.110.tar.gz)
3. TimeDate (TimeDate-1.19.tar.gz)
4. MailTools (MailTools-2.04.tar.gz)
5. File::Temp (File-Temp-0.22.tar.gz)
6. MIME::Tools (MIME-tools-5.427.tar.gz)
7. Mail::MboxParser::Mail (Mail-MboxParser-0.55.tar.gz)

---

**Figure 14** Compiler message
Perl modules for D2D XML page handling on HP-UX

Additional Perl modules need to be installed on HP-UX in order to query the D2D status page. These modules only need to be installed when the scripts run on HP-UX and you use a D2D system to import cartridges from.

The following is the sequence of additional modules you need to download and install for HP-UX.

**Note:** C compiler is a prerequisite for the module installation on HP-UX.

**Note:** Installation of Perl XML-Parser module requires Expat [expat-2.0.1.tar.gz](http://sourceforge.net/projects/expat/), which you can download from http://sourceforge.net/projects/expat/.

```plaintext
unpack expat
cd expat-2.0.1
./configure --prefix=<PATH_TO_EXPAT> ,
e.g.: PATH_TO_EXPAT = /opt/expat
make
make install

HP-UX only:
1. HTML::Tagset (HTML-Tagset-3.20.tar.gz)
2. HTML::Parser (HTML-Parser-3.62.tar.gz)
3. URI (URI-1.40.tar.gz)
4. LWP/UserAgent.pm (libwww-perl-5.832.tar.gz)
5. XML::Parser (XML-Parser-2.36.tar.gz)
   perl Makefile.PL EXPATLIBPATH=<PATH_TO_EXPAT>/lib
   EXPATINC Path=<PATH_TO_EXPAT>/include
6. Crypt::SSLeay (Crypt-SSLeay-0.57.tar.gz)
```
Import Task Scheduler

Windows

To successfully import cartridges from a D2D device, you need to schedule `d2dHandler.pl` regularly to query the D2D status web page and to add newly identified cartridges to the queue list. In addition, you should schedule the script task `executeImportTasks.pl` regularly to actually trigger the cartridge import on the remote Data Protector Cell Manager.

Use the Microsoft Windows “Scheduled Task” to set up such tasks.

![Microsoft Windows task scheduler main window](image.png)

**Figure 16** Microsoft Windows task scheduler main window

Create the necessary number of tasks by using the Add Scheduled Task item.

For each D2D/VLS device you plan to import cartridges from, you may want to add a single task to update the queue file.

**Note:** The script `d2dHandler.pl` applies to a D2D device whereas the script `vlsHandler.pl` applies to a VLS device.

A separate task will trigger the `executeImportTasks.pl` script to start the import on the target Data Protector Cell Manager.

**Note:** Use the proper configuration file along with each script you are about to schedule.
1. Create a task by adding the appropriate Perl script along with the configuration file name into the Run field of the window.

   Example:
   
   C:\Perl\bin\perl.exe C:\Program Files\OmniBack\automated_replicated_media_import\bin\d2dHandler.pl --cfg C:\Program Files\OmniBack\automated_replicated_media_import\cfg\D2D_tpc245_rep_import_config.cfg

2. Complete the Start in field by adding the path to the script bin directory.

3. Add the user in the Run as field and make sure the Enabled checkbox is ticked before you save the task.

   Note: The user added to the Run as field must also be a user in the HP Data Protector admin group.

4. Select the Schedule tab to continue with the configuration.
5. Enter the schedule details (see Figure 18 & 19) such as the recurrence interval and start time of interval according to your import-cartridge planning schedule.

6. Click on Advanced to modify the repetition rate of the task and duration.

The example in Figure 19 will schedule a queue file update task to run every hour from 5:30pm for 24 hours every day, starting on the day you specify.

7. Save the newly created task.

**Note:** Add a task for each configuration file you have created.

Finally you may want to create the actual import task which starts the executeImportTasks.pl script.

8. Create a task by adding the appropriate Perl script along with the configuration file name into the Run field of the window.

**Example:**

```
C:\Perl\bin\perl.exe C:\Program Files\OmniBack\automated_replicated_media_import\bin\executeImportTasks.pl --cfg C:\Program Files\OmniBack\automated_replicated_media_import\cfg\D2D_tpc245_rep_import_config.cfg
```

9. Complete the Start in field by adding the path to the script bin directory.

10. Add the user in the Run as field and make sure the Enabled checkbox is ticked before you save the task.
Note: The user added to the Run as field must also be a user in the HP Data Protector admin group.

11. Select the Schedule tab to continue with the configuration.
12. Enter the schedule details (see Figure 19) such as the recurrence interval and start time of interval according to your import-cartridge planning schedule.
13. Click on Advanced to modify the repetition rate of the task and duration.
14. Save the newly created task.

Note: Add a task for each configuration file you have created.

Note: When you plan your import schedule take into consideration potential replication black-out windows on your replication devices. HP recommends that copies are scheduled on a different day and/or time window from other backup activities. Also consider import permission windows as configured in the script import configuration file. Import devices might be busy because of other scheduled jobs such as object copy jobs.

After creating all necessary jobs you are recommended to verify that they execute successfully. To do so, right-click on each job entry in the scheduler window and select Run from the context menu.

To verify the execution status of every tested job, open the log file of the scheduler and make sure all executed jobs have an exit code (0).

Select Advanced in the menu list. Select View Log.

![Windows scheduler log file](image)
**HP-UX/Linux**

To set up import schedules on HP-UX and/or Linux operating systems you may want to use the Cron job scheduler.

In principle, the job setup is the same as described in the previous section except that you use a command line interface to add your job details.

The import job configuration must contain:

- Schedule
- Path to Perl
- Path to import handler
- Path to configuration file + (ISV Import Report)
  
  or

- Path to import task
- Path to configuration file

A sample job list might look like the sample below:

```bash
# crontab: scheduler for replication import scripts
MAILTO=root
PATH=$PATH:/replication_import/automated_replicated_media_import/bin/

# import VLS tape information
05 * * * * /opt/ActivePerl-5.10/bin/perl
/replication_import/automated_replicated_media_import/bin/vlsHandler.pl -cfg
/replication_import/automated_replicated_media_import/cfg/yourVLSconfig.cfg -
notificationfile replication_import/VLS/ISVImportReport.txt

# import D2D tape information
10 * * * * /opt/ActivePerl-5.10/bin/perl
/replication_import/automated_replicated_media_import/bin/d2dHandler.pl -cfg
/replication_import/automated_replicated_media_import/cfg/yourD2Dconfig.cfg

# perform DP import from VLS
15 * * * * /opt/ActivePerl-5.10/bin/perl
/replication_import/automated_replicated_media_import/bin/executeImportTasks.pl -cfg
/replication_import/automated_replicated_media_import/cfg/yourVLSconfig.cfg

# perform DP import from D2D
20 * * * * /opt/ActivePerl-5.10/bin/perl
/replication_import/automated_replicated_media_import/bin/executeImportTasks.pl -cfg
/replication_import/automated_replicated_media_import/cfg/yourD2Dconfig.cfg
```

An example based on the schedule details shown in the “Windows” section would look like:

```bash
# crontab: scheduler for replication import scripts
MAILTO=root
PATH=$PATH:/replication_import/automated_replicated_media_import/bin/

# import D2D tape information
00 * * * * /opt/ActivePerl-5.10/bin/perl
/replication_import/automated_replicated_media_import/bin/d2dHandler.pl -cfg
/replication_import/automated_replicated_media_import/cfg/yourD2Dconfig.cfg

# perform DP import from D2D
00 21 * * * /opt/ActivePerl-5.10/bin/perl
/replication_import/automated_replicated_media_import/bin/executeImportTasks.pl -cfg
/replication_import/automated_replicated_media_import/cfg/yourD2Dconfig.cfg
```
**Crontab syntax**

A crontab file has five fields for specifying day, date, and time, followed by the command to be run at that interval.

```
* * * * * command to be executed
- - - - -
| | | | +----- day of week (0 - 6) (Sunday=0)
| | | +------- month (1 - 12)
| | +-------- day of month (1 - 31)
| +--------- hour (0 - 23)
+----------- min (0 - 59)
```
Reporting

Status report
The consolidated replication status report includes the following columns:

- Library
- Slot (slot number for Tape libraries, media file name for File libraries)
- <Not used>
- Status of replication
- Date/time of import
- Status of import
- Date/time of failed export (File Library D2D NAS only)
- Status of failed export (File Library D2D NAS only)

Entries in the report are sorted by library (the primary key) and slot (the secondary key). The report is updated immediately when replication is parsed (by vlsHandler.pl or d2dHandler.pl) or when import is executed (by executeImportTasks.pl).

The report is a normal text file. Columns are separated by tabs (\t). This makes it easy to import the report into applications, such as MS Excel, for further filtering and analysis.

File library media that are successfully exported from the target cell by the executeImportTasks.pl command are removed from the report. This is because they (the media) no longer exist in either the target or in the source cell. Only if the export operation fails, is the date/time and status of the failed export operation written to the status report.

Analysing the log file
The downloaded script package also contains a sample spreadsheet workbook which you can use to easily create your own cartridge import reports based on the information logged in the logfile:

log.file=<Path_to_logfile>/log.txt

Example:

log.file= C:/Program Files/OmniBack/automated_replicated_media_import/D2D_VLS_rep_log.txt

You are recommended to select the appropriate log level to avoid the log file being flooded with debug information that is not needed for reporting purposes.

log.level=4

defines the granularity of logging.

Note: There exist five logging levels. Choose logging level two or three for troubleshooting purposes. If setup runs successfully you may consider switching to logging level four, which creates log files formatted best for reporting purposes.

In order to create import graphs you need to import the content of the log file into a worksheet of a workbook.

Follow these steps to create a new workbook.

1. Open your preferred spreadsheet application (such as Microsoft Excel).
2. Create a new blank workbook.
3. Open a data connection Get data from external text file.
4. Select the script log file from which you plan to import data.
5. Follow the Import wizard steps 1,2 and 3 by clicking Next.
6. Click Finish to start importing data. Select location (=A$1) to start import to cell A1 of the first worksheet.
7. Data import will start immediately and will fill columns with the appropriate log data.
8. Select worksheet **Sheet 2**.
9. Insert a pivot table at location *(Sheet2!$A$1)*.
10. While the Create PivotTable wizard is active, select the Table/Range of data from worksheet one. Switch back to worksheet one and press **Control A** while a data cell is selected. This task will automatically select the entire data range.

![PivotTable Wizard](image1.png)

**Figure 21** PivotTable Wizard

11. Click **OK** and switch back to worksheet two.
12. Choose the fields from the list from which you plan to create reports.

![Field chooser](image2.png)

**Figure 22** Field chooser
13. Arrange the fields to create a reporting table on worksheet. To arrange field labels simply drag and drop them on the section shown in Figure 23.

![Field arrangement](image)

**Figure 23** Field arrangement

14. The wizard will create a reporting table on worksheet 2.
15. In the newly created reporting table, use the pull-down menus to select data on which you would like to report. You are recommended to select meaningful report data.
16. Select the time frame you like to report on using the Time/Date menu. Usually all reported data is selected. This is probably not what you want. Check Select multiple items to be able to select individual items from the lists.
17. Make your selection for the remaining data fields.
18. Make sure you have deselected “blank”, “Import summary” items from the lists.
19. When you have finished your selection, select the entire reporting pivot table.
20. Insert Pie Chart using the table selected in the previous step.
21. Fine tune the pie chart creation to get the desired view. An example is shown in Figure 24.
Figure 24 Sample import report
Working with backup data on replicated cartridges

Once replicated cartridges have successfully been imported you can use the data for:

- restore tasks
- object copy tasks

**Note:** Replicated cartridges contain data of hosts not belonging to the cell into which those cartridges have been imported!

You can browse for data to restore in two possible ways: either from the list of the backed-up objects or from the list of sessions. The difference is in the scope of directories and files presented for restore:

- Restore Objects with a list of backed-up objects classified by the client systems of the foreign cell and by different data types (such as File System, Disk Image, Internal Database, and so on). You can browse all the directories, files, and versions that were backed up and are still available for restore.

- Restore Sessions with a list of file system sessions with all objects backed up in these sessions. You can choose to view only sessions from the last year, last month, or last week. You can browse all objects that were backed up in this session (like any drives from all clients named in the backup specification of the foreign cell), and all versions of this restore chain.

By default, the entire restore chain of the selected directories or files is restored, but you can also restore data from a single session only. You cannot perform restore of the online database integrations from a specific backup session.

---

**Figure 25** Restore context
Restore

Note: Make sure the device that you use for the restore operation is not used by another running or scheduled task such as media import.

To perform a restore:

Selecting the data from the list of the backed-up objects
1. In the Context List, click Restore.
2. In the Scoping Pane, under Restore Objects, expand the appropriate data type (for example, Filesystem).
3. Expand the client system with the data you want to restore and then click the object (mountpoint on UNIX, drive on Windows systems) that has the data.
4. In the Source property page, expand the object and then select directories or files that you want to restore.
5. By default, when you select a whole directory, only directories and/or files from the last backup session are selected for restore. Directories and files in the same tree structure that have not been backed up in the same backup session are shaded. If you want to restore the data from any other backup session, right-click the selected directory and click Restore Version. In the Backup version drop-down list, select the backup version that you want to restore from.

Selecting the data from the list of the backup sessions
Limitation:
You cannot perform restore of the online database integrations from a specific backup session.
1. In the Context List, click Restore.
2. In the Scoping Pane, expand Restore Sessions to display clients and then objects backed up on a particular client. Click an object to open the object’s property pages.
3. In the Source page, select directories and files to be restored.
4. By default, the entire restore chain is restored (Show full chain is selected). To restore only data from this session, select Show this session only.
5. Specify the restore destination and set the restore options.
   Note: Specify a new target client and a new target location as the data you are about to restore belongs to a client host that does not belong to this cell.
Figure 26 Specify a new restore target

6. Click Restore to start the restore session.

Note: The data will be restored to the host and location you have specified in the “Default Destination” tab of the restore task.

Object Copy (replicated cartridges)

Note: Make sure the device which you use for the object copy operation is not used by another running or scheduled task such as media import.

The Data Protector object copy (replicated cartridges) functionality enables you to copy object versions to a specific media set. During the object copy session, Data Protector reads the backed-up data from the source media (imported cartridge on target library), transfers the data, and writes it to the new target media.

The result of an object copy session is a media set that contains copies of the object you specified. The following characterize the object copy (replicated cartridges) functionality:

• Start of session
  An object copy session can be started interactively or scheduled automatically.

• Selection of media
  As source media, you can use replicated media sets containing backups.

• Media type
You can copy objects to media of a different type. Furthermore, the block size of the destination device can be the same or larger than the block size of the source device.

- Media policy
  You can append data to media already containing backups or object copies.

- Protection policy
  You can set the protection periods of the object copies.

**Automated object copying (replicated cartridges)**

In an automated object copy specification, you can specify one or more criteria for the selection of object versions that will be copied:

- Backup specifications - to copy only object versions backed up using specific backup specifications.
- Data protection - to copy only protected object versions.
- Number of existing copies - to copy only object versions that do not have more than the specified number of successful copies.
- Libraries - to copy only object versions located on the media in the specified libraries.
- Time frame (only in a scheduled object copy specification) - to copy only object versions backed up in the specified period of time.

**Configuring Scheduled Object Copying**

1. In the Context List, click **Object Operations**.
2. In the Scoping Pane, expand **Copy**, and then **Object copy**, and then **Automated**.
3. Right-click **Scheduled** and click **Add** to open the wizard.
4. Select the backup that contain the objects you want to copy.
   
   **Note:** You must select “All Specifications” in the backup specifications tab as a filter prerequisite. Imported cartridges will not provide a list of backup specifications you could select from as this information is not part of the information stored on the backup media.

5. Select the **Objects** tab.

![Figure 27 Select source objects](image)
6. Specify the object filter for the object copy operation. Only objects that match the specified criteria will be copied.

   **Note:** Make sure you select “1” in the **Include only objects with number of copies less than:** field.

7. Select the **Libraries** tab.
8. Specify the library filter for the object copy operation. Only objects residing on media in the specified libraries will be copied.

9. Select the Source tab.

The devices used for import are used as source devices in the object copy operation by default.

10. Select the Destination tab.
11. Select the destination devices for the object copy operation.
12. Select the Options tab.
13. Specify the target object options as desired.

**Note:** In the “Target object options” section of the menu you may want to specify a new, higher retention period for the copied objects and let the source objects expire. This process is saving space on the tape libraries and moves older backup data to inexpensive physical tape.

Do not make modifications in the “Source object options” section of the menu as this will attempt to make changes to the replication target media which is not supported. If you want backup data to expire sooner on the replication target adjust the backup data retention period on the “source side” accordingly.

14. Select the **Schedule** tab.
15. Right-click a date and click **Schedule** to display the Schedule Copy dialog box. Specify the options as desired and click **OK**. Click **Next**.

16. Click **Save as...**, enter a specification name and click **OK** to save the scheduled object copy specification.

**Configuring Interactive Object Copying**
1. In the Context List, click **Object Operations**.
2. In the Scoping Pane, expand **Copy**, then **Object copy**, and then **Interactive**.
3. Select **Objects** and start configuring the task using the configuration wizard.
Figure 34 Interactive object copy wizard
For more information

- www.hp.com/go/VLS
- www.hp.com/go/D2D
- www.hp.com/go/storageworks/sizer
- HP StorageWorks Deduplication and replication solutions guide for D2D & VLS
- HP D2D Replication Primer
  (http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA2-4142ENW.pdf)
- Understanding HP Deduplication strategy
- Advanced Backup to Disk Integration with Virtual Tape Libraries
- Integrating HP Data Protector software with HP Data Deduplication solutions
- Disk-Assisted Backup Whitepaper
- HP Data Protector software object consolidation: “Best Practices”
- ROBO and regional data centre data protection solution scenarios using HP Data Protector,
  HP VTL systems and Low Bandwidth replication

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