



## **esXpress 3.6**

Data DeDuplication Appliance

Installation and Configuration Guide

March, 2010

[www.phdvirtual.com](http://www.phdvirtual.com)



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## Documentation Changes

Table 1 Document Changes

Chapter	Version	Date	Changes
All	3.6		Updated guide: formatting and editing.
2	3.6		Added note about adding multiple DNS servers.
2	3.6		Page 10, System Requirements: added note about DeDup configuration for optimal performance.
2	3.6	Oct 2009	Page 17, VMDK Attached Storage: added caution about /.data directory.
3	3.6-3		Page 23, added Summary Page information.
3	3.6-4		Page 32, updated Stats section to reflect new functionality on the Stats page.
3	3.6-8	Oct 2009	Page 24, Summary Page Buttons: added Check for Updates button.
3	3.6-8	Oct 2009	Page 31, System Options: added options for automatic check for updates process.
3	3.6-10	Nov 2009	Page 29, Delete options: added option Thin Special.
3	3.6-12	Jan 2010	Page 29, Delete options: added KEEP_MINIMUM_UNIQUE and KEEP_MAXIMUM_WEEKS option descriptions. Removed old purge options that are no longer needed with updated delete process.
3	3.6	Nov 2009	Page 31, System Options: updated the default values for SAMBA settings.
3	3.6	Feb 2010	Page 28, File Level Restore limitations: added notes about ReiserFS limitations – ReiserFS is experimentally supported only for FLR.

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Note: A valid support agreement is necessary to receive new esXpress release and software updates.

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# 1 Introduction

Data DeDuplication technology (DeDup) enables the capturing of Virtual Full backups, which capture unique data blocks across all virtual machines. Data DeDuplication will eventually replace the creation of separate full and delta backups for virtual machines.

The DeDup feature of esXpress aims to change the prevalent Virtual Machine backup paradigm by implementing cutting edge DeDuplication technology to provide immediate and visible cost savings to IT budgets by dramatically reducing disk space requirements. Reduction of network traffic will also result in an improvement of backup speeds and reduce stress on the existing network infrastructure.

PHD Virtual's esXpress DeDuplication technology creates backups of VMDKs (virtual disks) using the Virtual Backup Appliance, but as opposed to traditional Full and Delta backups, a *Virtual Full backup* is created.

During the first backup, the entire virtual disk is compressed and stored on the DeDup appliance (which is a VM running on the virtual infrastructure). Subsequent backups of any VM whose targets are the same pre-existing Virtual Backups on the DeDup appliance provide significant storage savings. Data that exists on the DeDup appliance target, matching the data on the VM being backed up is not written to the appliance. This ensures only unique data blocks are stored, creating *Virtual Full backup*.

Additional storage can easily be added to the DeDup appliance to accommodate varied usage scenarios. Storage can be in the form of a VMDK, SMB share or NFS.

PHD Virtual's DeDup feature requires the installation of the newest version of the Virtual DeDuplication appliance. The appliance will run on the existing VI3 ESX infrastructure and become a backup target for esXpress 3.6.

## DeDup Backup Speeds

The initial DeDup backups of your Virtual Machines may be slow as the DeDup appliance is seeded with the new backup blocks. In addition, each block is verified after writing to ensure they are valid. This validation takes a little extra time but is important in ensuring proper backups.

In testing, the initial backup of a VM may only get around 5 to 8 MB/sec. However, the more backups that are run, the DeDup technology will start to show benefits as much less blocks are written to the appliance. Speeds can range from 25 to 40 MB/sec to upwards of 75 MB/sec depending on the VM size, the number of blocks being written, and the underlying infrastructure.

The following example is an actual test case of a DeDup backup.

In this initial DeDup backup for a 55GB VMDK, almost the entire disk was written to the DeDup appliance, 53 GB, which is 97% of the data. With compression, 25 GB of data was sent to the target. This backup took 3 hours to complete and averaged 5 MB/sec.

### Initial Backup

```
2009-05-22 23:28:18.387a PHDD Blocks: 56331 Total, 54761 Wrote, 14 Skipped, 1556 Zero for: test1, 01-test1_1.vmdk
```

```
2009-05-22 23:28:18.391a PHDD Stats : 25866 sent meg (47%/45.92%) / 54761 written meg (97.21%) / 56331 total meg for: test1, 01-test1_1.vmdk
```

---

```
2009-05-22 23:28:22.469a OK PHDD 'test1' - '01-test1_1.vmdk' - 2/2 disks, (97%) 53g/55g (97% Data), 3:00:10s, 5mb/s (17gb/hr) NET1
```

Now let's look at a DeDup backup of this same VM run a few days later. Because of the DeDup, only 294 blocks (81 MB compressed) were written to the DeDup appliance. The backup of the 55GB VM completed in just 12 minutes and 28 seconds and averaged 75 MB/sec.

#### **Subsequent Backup**

```
2009-05-26 19:59:53.129d PHDD Blocks: 56331 Total, 294 Wrote, 54481 Skipped, 1556 Zero for: test1, 01-test1_1.vmdk
```

```
2009-05-26 19:59:53.136d PHDD Stats : 81 sent meg (28%/0.14%) / 294 written meg (0.52%) / 56331 total meg for: test1, 01-test1_1.vmdk
```

```
2009-05-26 19:59:59.193d OK PHDD 'test1' - '01-test1_1.vmdk' - 2/2 disks, (0.5%) 294m/55g (97% Data), 12:28s, 75mb/s (263gb/hr) NET1
```

The above example shows the considerable savings you can expect from esXpress DeDup backups in relation to time to create a backup and also in disk space savings for the storage needed for those backups. The more backups you take the greater the benefit will realized.

## 2 Installing and Configuring the DeDup Appliance

Review the system requirements and pre-installation information in this section before installing and configuring the esXpress Data DeDuplication appliance.

### System Requirements

The following are the minimum system requirements for running the GUI appliance.

Table 2 esXpress System Requirements

VMware version	ESX Server Version 3.x, vSphere (ESX4)
Memory	1GB of memory allocated to the target VM
Storage Requirements	<p>A Minimum of 8GB of disk space is required on the VMFS partition of the ESX host to import the compressed DeDup VMDK file. <i>It is recommended to expand the system disk to 16GB when you initially set up the appliance</i></p> <p>Storage space for backups must be available either on VMFS partition, a NFS share or a SMB share.</p> <p>The space requirement depends on the actual data that will be sent to the appliance.</p> <p>A good rule of thumb is to assume you will get a 10:1 compression ratio. So calculate storage by dividing the total size of your VMDKs by 10, and then multiply by the number of backups you plan to keep stored on disk.</p>
Supported browsers	Internet Explorer 7, Firefox 3.0.7
Other Requirements	VMware Virtual Infrastructure Client 3 (V13)

*Note* The DeDup appliance is designed to work optimally on your best hardware and best storage equipment. If you attach older or slower hardware to the DeDup appliance you may experience performance degradation on backups.

**The suggested optimal performance configuration for DeDup is to use an NFS or SMB share with by-pass mode.**

*Using the attached VMDK storage or using NFS or SMB without by-pass mode is not preferred and may result in performance degradation.*

## Pre-Installation Steps

Please ensure the following pre-requisites are met prior to installing the DeDup Appliance.

- 1 Download the latest esXpress zip file from PHD Virtual's web site ([www.phdvirtual.com](http://www.phdvirtual.com)).
- 2 The following files contained within the zip file will be imported to the ESX server:
  - phd-3.6-x.ovf
  - phd-3.6-x-disk1.vmdk

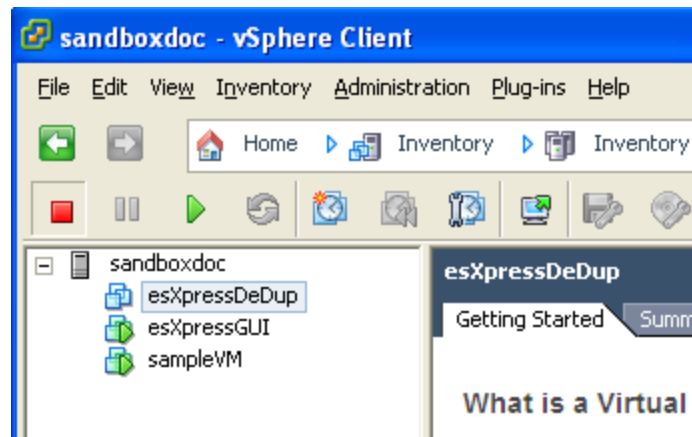
These files can be imported by downloading them to a local machine and then imported to the ESX Server using a VMware client (Virtual Infrastructure 3 (VI3) or vSphere).
- 3 The client must be logged on to your ESX 3.x Host.
- 4 If an NFS share is to be used for storing backup data, please verify that NFS service is running on the NFS server and there is sufficient storage space available.
- 5 Make sure NFS share has been added as storage to the ESX host
- 6 If VMFS storage is to be used for storing backup data, after the installation of the appliance please create a new virtual hard drive and assign it to the imported Virtual Machine. Also, make sure sufficient storage space is available
- 7 Before you begin with the installation, you must have the required network information, including an IP Address, DNS, Default Gateway, etc.
- 8 If the Host is a Dual CPU host, make sure to allocate only 1 virtual CPU to the appliance VM.
- 9 Ensure that esXpress 3.6 is configured to use PHDD as a backup target

## Installing the Data DeDuplication Appliance

The following sections describe how to install the DeDup appliance using a vSphere or VI3 client. Be sure to follow the steps for the VMware client you are using.

### *To install the DeDup appliance*

- 1 Unzip the esXpress zip files you downloaded.
- 2 Using a VMware client, log in to your ESX host.
- 3 Import the GUI appliance OVF:
  - If you are using a VI3 client, select **File > Virtual Appliance > Import**
  - If you are using a vSphere client, select **File > Deploy OVF Template...**
- 4 Browse to the location you stored the extracted OVF, select the file and click **Next**.
- 5 Follow the remaining steps to import the file and accept the End User License Agreement.
  - When you are finished, a progress indicator opens and the appliance is added to your ESX host.
- 6 When the process completes, click **Close** in the progress indicator.
- 7 The new appliance is displayed in the client window.



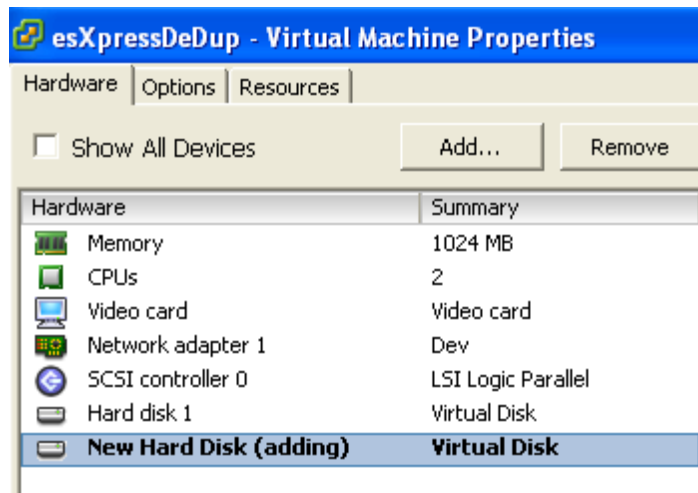
When you are finished installing the appliance, follow the steps in the next section to complete the required post-installation configuration tasks.

## Assigning Storage Space for Backup

*Note* Only one type of backup storage can be assigned per appliance. The storage may be in the form of either VMFS or an external NFS mount. If VMFS storage is to be used for backup data, it is **essential** to create a new virtual hard drive for the imported DeDup appliance VM. Skip this section if you intend to use NFS or SMB

*To assign storage space*

- 1 In the VMware client, right-click the newly added VM and select **Edit Settings**. Note: the VM must be powered off before you can change hardware settings.
- 2 Click **Add**.
- 3 Select **Hard Disk** and click **Next**.
- 4 Select **Create a new virtual disk** and click **Next**.
- 5 Enter the **Disk Capacity** and choose a location then click **Next**. The disk capacity is the space required for subsequent backups.
- 6 Select the **SCSI ID**. This can be either left as default or customized. Click **Next**.
- 7 Review the summary information and click **Finish**. The new hard disk is added.



- 8 Click **OK** to complete the hard disk installation.

## esXpress Backup Target Configuration

When the DeDup appliance is configured, it will become a new Backup Target for esXpress and is configured like any other esXpress target. The DeDup appliance is a PHDD target.

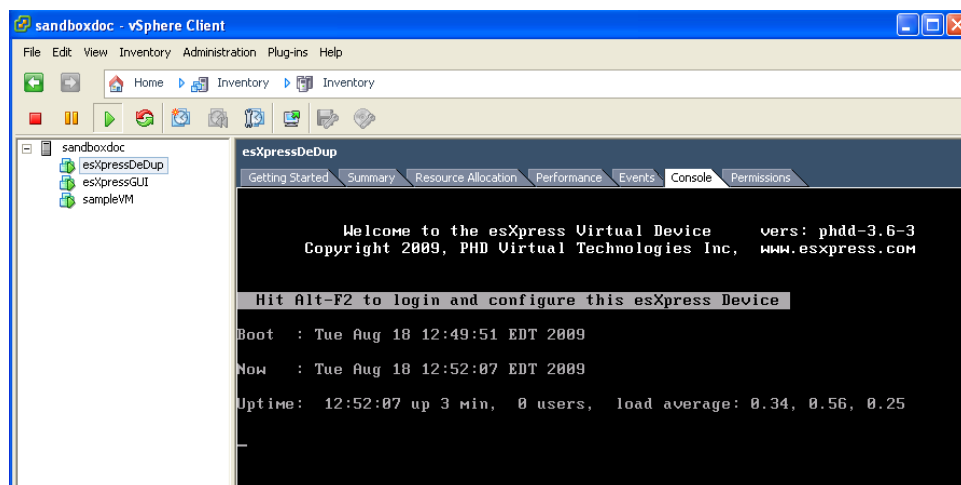
- This configuration is done outside of the DeDup appliance and performed when configuring esXpress, either from the PHD menu or the esXpress GUI appliance. Refer to the GUI Appliance guide for details.

## Configuring the DeDup Appliance

This section details the configuration steps required to complete set up of the DeDup appliance.

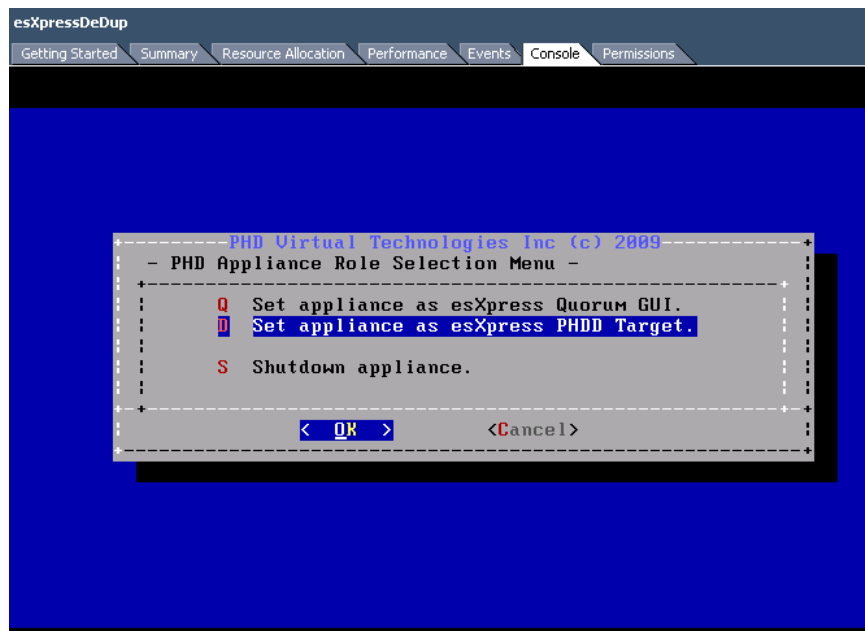
*To configure the DeDup appliance*

- 1 From the VMware client, start the newly installed DeDup appliance virtual machine.
- 2 Click the **Console** tab. When the machine is finished booting, you will see the main menu for the appliance.

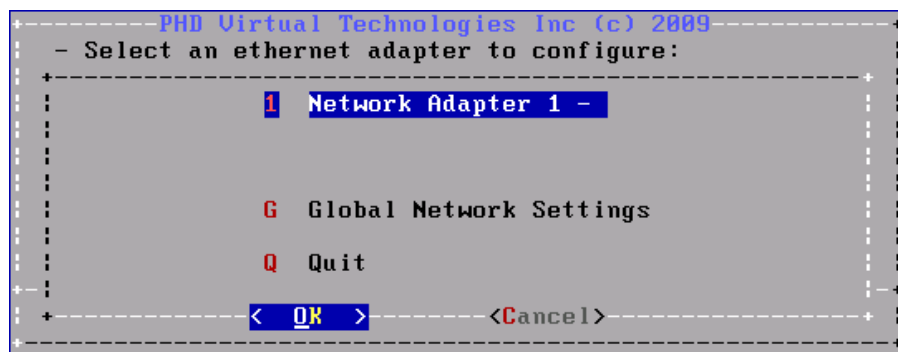


- 3 Hit **Alt+F2** to enter the console login prompt.
- 4 Login as **root** with password **espress**.
- 5 At the command prompt, type **phd** and hit **Enter**.

The PHD menu opens



- 6 Select **D, Set appliance as esXpress PHDD Target**.
- 7 Select **Yes** to confirm.
- 8 Select **OK** to open the appliance menu.
- 9 Select **C, Configure De-Dupe Appliance settings**.
- 10 Select **C, Configure Appliance Networking**.



- 11 You can configure more than one **Network Adapter** if you have defined more than one to the appliance. Select the adaptor number to configure the IP address. Additional Network Adapters will not show as available unless you have added them to the DeDup appliance from the VMware client.

*Note* Ensure that the IP Address configured is **unique** i.e. is not the IP Address of either the ESX server or the NFS share (if configured). This IP will be used to access the DeDup menu through a web browser.

- 12 Select **OK**.

- 13 Select **Yes** to confirm the changes.
- 14 A window will open alerting you that you must define a hostname and default gateway. Select **OK**.  
The DeDup Target Global Network Configuration menu opens.

The following information is required:

- **Hostname (must be a fully qualified domain name, do not use localhost)**
  - **Default Gateway**
  - **DNS Server** (If required, enter multiple DNS Servers separated by a comma)
- 15 If required, also define the value for your proxy server. The appliance must be able to connect to the internet to receive updates. You must define server name and port for the proxy server, for example, <http://proxy.example.com:8080/>. If your proxy server requires authentication, use the following syntax: <http://username:password@proxy.example.com:8080/>
  - 16 When finished defining network settings, select **OK**.
  - 17 Select **Yes** to confirm the changes.
  - 18 Select **OK** to configure the network settings.
  - 19 When complete, select **OK** again.
  - 20 Select **Quit** to return to the main menu.  
Now that the appliance has been configured, you can check for any software updates. Note that if you've downloaded and installed the latest esXpress files, you can skip this step.
  - 21 Select **U, Check for Updates**. And follow the steps to download the latest software. When the updates are complete, you are prompted to restart the appliance.  
The DeDuplication Appliance is now configured.

## Checking for Updates

If you installed the appliance from the latest esXpress OVF you do not need to initially check for update to download the host rpms.

To apply future esXpress updates, you will need to check for updates using the **Check for Updates** option on the DeDup Target Setup Quick Menu. The updates will be downloaded from an esXpress server using HTTP using wget, so the appliance must be able to access the internet. Follow the instructions to apply the updates to the appliance.

As new updates and versions are released, the Check for Updates process will be the method for obtaining those updates and applying them.

If you are using a proxy server make sure you have configured the HTTP\_PROXY option in the Network Settings as described earlier.

---

**Note**     *If you are running **esXpress 3.5-4** or above, the Check for Updates option will **automatically prompt** you to run and install the updates.*

*After applying updates, it is recommended that you reboot the appliance. The update process will provide an option to reboot the appliance.*

*If you do not reboot, you will need to manually run the update command to apply the updates to the appliance.*

*To install this update, go to:*

*/home/phd/updates/phdq-20090508-3.5-4*

*(The folder name shown is just an example. As new updates are released, the folder will always start with phdq followed by the date and version of the update)*

*Run './run\_update'*

---

## Configuring Storage for the DeDup Target

Only one storage type can be used per appliance, VMDK, SMB, or NFS. This section describes how to configure each of these storage types.

### NFS External Storage

*To configure NFS storage*

- 1 From the Setup Quick menu select **C Configure De-Dupe Appliance Settings**
- 2 Select **N Connect to external NFS share**
- 3 Set NFS Export Path, NFS server's IP and share path, for example xxx.xxx.xxx.xxx:/mnt/Backup.
- 4 Set **Direct VBA Connection** = Yes

---

**Note**     *Set Direct VBA Connection allows the VBA to connect directly to the NFS share and avoids sending the data through the D-Duplication appliance. This lowers the I/O load on the DeDuplication appliance. If you wish to not allow this, **Set Direct VBA Connection = No***

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- 5 When finished defining settings, select **OK**.
- 6 Select **Yes** to confirm the changes.

After configuring your NFS storage attached to the DeDup appliance, verify if the Daemon has started successfully by viewing the PHDD node log.

Additionally, you can view the mounted share using the main PHDD menu. From the PHD menu, press ALT+F1 to open the main PHDD menu.

## SMB External Storage

*To configure SMB storage*

- 1 From the Setup Quick menu select **C Configure De-Dupe Appliance Settings**.
- 2 Select **S Connect to external SMB share**.
- 3 Set SMB Export Path, SMB server's IP and share path, for example //xxx.xxx.xxx.xxx/Share.
- 4 Set the SMB username and password
- 5 When finished defining settings, select **OK**.
- 6 Select **Yes** to confirm the changes.

After configuring your SMB storage attached to the DeDup appliance, verify if the Daemon has started successfully by viewing the PHDD node log.

Additionally, you can view the mounted share using the main PHDD menu. From the PHD menu, press ALT+F1 to open the main PHDD menu.

## VMDK Attached Storage

*To configure VMDK storage*

- 1 From the Setup Quick menu select **C Configure De-Dupe Appliance Settings**.
- 2 Select **V Use attached VMDK**.
- 3 Select Yes to begin the VMDK configuration, which will format the VMDK volume and create its file system. This process may take several minutes  
  
When the disk is configured, a **Configuration Successful** message displays.
- 4 Start PHDD service.
- 5 Before proceeding with backups, check if the three directories **Backups**, **Blocks** and **Config** have been created in **/.data** folder. If not, refer to Remaking Block Folders on page 18.

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*Caution* Do not change, delete, or move any files or directories within **/.data** without the assistance of support as this may result in corruption or loss of backup data.

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*Note* Please refer to the esXpress GUI appliance guide to configure esXpress to use PHDD as a backup target. It is **essential** to configure esXpress prior to taking backups.

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## Remaking Block Folders

After the storage has been mounted, three directories **Backups**, **Blocks** and **Config**, are created in **/.data**. Also, in the Blocks folder, 0-255 blocks are created.

If these directories are not being created and the blocks are not present in the **Blocks** directory, create the three directories in the **/.data** folder and remake the blocks manually.

- To remake blocks go to DeDup target configuration menu and select Remake Block Folders

## Appliance Maintenance

### Extending Appliance disks

You can extend the disks for the DeDup appliance, both the system VMDK and your data disk. Initially, the system VMDK ships as an 8GB disk. This can be extended using the VMware client as you would for any other VM. After extending the disk, reboot the DeDup appliance. The reboot will take care of what is needed in the appliance for extending the disk. It will reboot a second time automatically.

When the appliance boots the second time, the additional space should be visible to the appliance.

---

*Note*      *The DeDup appliance only allows one disk to be added to it for the DeDup backups. You cannot add a second disk to the appliance.*

*It is recommended to extend the system VMDK to at least 16GB before deploying the DeDup appliance. Over time, as backups are written to the appliance database, /var will grow.*

*If your /var partition has a space issue the recommended solution is to extend the system VMDK.*

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### Appliance Logs

There are a number of log files written on the appliance to view the status and activity of the esXpress daemon processing. All of the logs can be found in **/var/log/messages** on the DeDup appliance.

- **phd\_daemon.log** - the main DeDup appliance daemon log.
- **phd\_delete.log** – logging of the appliance auto delete processing ‘Trim the Herd’
- **phd\_smb.log** – samba logs used with the exporting backups functionality.
- **phd\_update.log** – Log of the ‘Check for Update’s and run\_update process which run to apply new esXpress code to the appliance.
- **phd\_verify.log** – the log of the daemon process that checks the appliance blocks and verifies there aren’t any bad blocks existing.

The various logs can be viewed from the DeDup web page using the **Logs** tab. The logs can be viewed as a static page which will show the logs as they existed when you launched the page or they can be viewed in real time by checking the **Live Log View**.

The screenshot shows the esXpress PHDD Appliance web interface. At the top, there is a navigation bar with the esXpress logo and the text 'esXpress PHDD Appliance'. To the right of the logo, there is a user information section showing 'admin@docdedup.esxpress.local' and a 'Logout' link. Below the navigation bar, there is a status bar with the text 'Disk Space is OK, Var: 5%, Data: 1%' and several menu items: Summary, VMs, FLR, Stats, Options, Users, and Logs. The Logs page is currently selected, and it displays a list of system events with timestamps and descriptions. The events include: 'Starting ttty status program', 'Starting PHDD\_DAEMON LOOP', 'Starting Export file system driver', 'Starting Restore file system driver', 'SMB values changed, rerunning SMB export setup', 'Running SMB export setup', 'Creating Block folders, (0 to 255)', 'Running unfsd', 'Starting phdd\_verify program', 'Looking for and deleting unsuccessful imports', 'Complete', 'Disk Space is OK, Var: 5%, Data: 1%', 'LOCK: Lock is SET, exiting', 'Starting ttty status program', 'Starting PHDD\_DAEMON LOOP', 'Folders created', and 'SMB values changed, rerunning SMB export setup'.

## Backing up the DeDup Appliance

It is possible to backup the DeDup appliance's system VMDK as well as the data disk (if using VMDK attached storage) using Delta/Full Backups. To do this you will need to create a Delta/Full target (FTP server, SMB target, ssh target) and follow your normal procedures for creating and running Delta or Full backups.

Alternatively, you can exclude the DeDup appliance from being backed up by adding the [x0] command to the VM Display Name or by using a skip file.

## DeDup Target Setup Quick Menu Options

```

PHD Technologies Inc (c) 2009
- esXpress De-Dupe Target Setup Quick Menu -
vers: phdd-3.6-3      Tue Aug 18 16:36:51 EDT 2009
+-----+
:  D  Daemon Status - Running
:  A  Lock Status - Clear
:  S  Show Storage Status - Free Space: 8.0G (VMDK)
:  T  Show Status from TTY1
:  1  Show Status from TTY11
:  2  Show Status from TTY12
:
:  C  Configure De-Dupe Appliance settings
:  O  System Config Settings
:  L  View Node Logs
:  U  Check for Updates
:  V  Verify/Repair Appliance database
:  P  Shutdown/Reboot PHDD Appliance
:  R  Please change the ROOT Password
:  Q  Quit
+-----+
< OK >      <Cancel>

```

Table 1 DeDup Target Quick Menu Options

Menu Option	Description
Daemon Status (D)	Shows the status of the Daemon running in the background. This must be running to accept backups.
Lock Status (A)	<b>Set</b> = To reset the lock status <b>Clear</b> = The appliance is free to take backups or in progress
Show Storage Status (S)	View the Free Space in the Backup Storage
Show status from TTY1, TTY10, TTY11 (T,0,1)	TTY1 – shows gui appliance main screen TTY10 – shows outbound daemon messages TTY11 – shows inbound daemon messages
Configure De-Dupe Appliance settings (C)	To configure the DeDup VM Networking and the target storage.
System Config Settings (O)	Maintain the various DeDup appliance settings. For example how stats are run and trim settings.
View Logs (L)	View the event logs on the machine.
Check for Updates (U)	Check for the esXpress DeDup updates and Install any new updates.
Verify Repair Appliance Database	Use this function is you are experiencing Database corruption or crashed errors.
Please change the ROOT Password (R)	Change the ROOT Password.
Quit (Q)	Quit the menu



# 3 DeDup Appliance Administration

The DeDup appliance web page contains configuration options and statistics you can use to manage the appliance.

*To log in to the DeDup appliance web page*

- 1 Open a web browser and enter the IP address you assigned to the DeDup appliance.
- 2 Enter the log in credentials, by default these are user **admin** and password **admin**.

The following sections describe the available pages on the DeDup appliance web interface:

- Summary Page on page 23
- VMs on page 24
- File Level Restores (FLR) on page 27
- Stats on page 32
- Options on page 28
- Users on page 34
- Logs on page 36

## Summary Page

When you first log in to the DeDup appliance you are presented with a Summary page that shows versioning, disk usage, and configuration information. You can use the buttons at the top of the page to control Locks, restart, or shutdown the appliance.

The screenshot shows the 'Summary' page of the esXpress PHDD Appliance. At the top, there's a header with the esXpress logo, the title 'esXpress PHDD Appliance', and the user 'admin@DEDUP-216 | Logout'. Below the header, it says 'Disk Space is OK, Var: 16%, Data: 37%' and has navigation tabs for 'Summary', 'VMs', 'FLR', 'Stats', 'Options', 'Users', and 'Logs'. The 'Summary' section is active and contains several sub-sections: 'Summary for this VM: DEDUP-216' with buttons for 'SetLock', 'ClearLock', 'Reboot', and 'Shutdown'; 'esXpress Version' showing 'Version: phdd-3.6-3'; 'Uptime' showing '16:26:48 up 6 days, 14 min, 1 user, load average: 0.38, 0.18, 0.18' and a user list; 'Disk Usage' showing a table of filesystems with columns for Filesystem, Size, Used, Avail, Use%, and Mounted; and 'Disk Usage more Detail' showing a list of directories and their sizes.

The Summary page sections are defined in the following table.

Table 3 Summary Page sections

Section	Description
esXpress Version	The current version of esXpress.
Uptime	Time the DeDup appliance has been running, since last boot.
Disk Usage	List of disks and available space on each.
Disk Usage more Detail	Additional disk details including directory sizes.
Top	A snapshot of current users and processes.
Stats Summary	Table that displays the main overall DeDup stats values for all backups. For additional details see Stats on page 32.
Backup Counts	Table that shows the detail for all backups, including total backups, unique dates, total VMs, unique VMDKs and all VM blocks. For additional details see Stats on page 32.
Other Counts	Table indicating if there are bad blocks, number of deleted backups and blocks waiting to purge. For additional details see Stats on page 32.
IFCONFIG -A	Displays the network interface parameters.
TAIL -25 PHDD_LOGS	Displays the last 25 lines of each PHD log.
BAD BLOCKS FROM VERIFY	Details of all bad blocks.

## Summary Page Buttons

From the Summary page, you can set or clear a lock, reboot, or shutdown the DeDup appliance. The following table describes the Summary Page buttons.

*Table 4 Summary Page buttons*

<b>Button</b>	<b>Description</b>
Check for Updates	Check for DeDup Appliance updates. If an update is available, it will be downloaded. A message will display the downloaded file name (you may have to refresh the page). Once downloaded, a new button, <b>Run Update</b> , is available. Click this button to apply the latest update.  Updates are also automatically checked for based on the settings defined on the Options page. See System Options on page 31.
Set Lock	Click to lock the DeDup appliance and prevent backups from occurring.
Clear Lock	Clear locks and allow the appliance to continue taking backup.
Reboot	Reboot the DeDup appliance.
Shutdown	Shutdown the DeDup appliance.

## VMs

The VMs page allows you to manage the backups stored on the DeDup appliance. Use the tree view to display all of the stored backups and to view the individual VMDK files.

*To modify the backup tree view*

- Use the view options, **Display**, **Type**, and **Filter**, to change the backups that are displayed in the tree view.
- After selecting your options, click **Go** to update the view. Only the backup files that meet the criteria you entered are displayed.

**Virtual Machine Backup Management**

Display:    
 Type:    
 Filter:

- [-] Virtual Machines (8)
  - [-] bugzilla\_host1 (8d/1v/8b)
    - [-] 2009-08
      - [-] 2009-08-10 18:54:00
      - [-] 2009-08-09 00:01:00
      - [-] 2009-08-08 00:01:00
      - [-] 2009-08-07 00:01:00
      - [-] 2009-08-06 18:33:00
      - [-] 2009-08-05 00:01:00
      - [-] 2009-08-04 11:58:00
      - [-] 2009-08-03 00:01:00
        - 00-bugzilla\_host1.vmdk (8 GB)
    - [-] gui-restore (6d/1v/6b)
    - [-] gui\_host1 (12d/1v/12b)
    - [-] phd-3.5-9-GUI (9d/1v/9b)
    - [-] phd-3.6-2-GUI .63 (18d/1v/20b)

- To display all files again, remove any **Filter** values and set the **Type** dropdown to **All**, then click **Go**.

## Managing Backups

By drilling in to a particular backup file, you can display the individual VMDK files that are backed up and stored on the DeDup appliance.

Click on a section of the tree to display the available management options for the stored VMDK files on the right side of the page.

**esXpress PHDD Appliance** [ admin@DEDUP-64 | Logout ]

Disk Space is OK, Var: 6%, Data: 61%

Summary **VMs** FLR Stats Options Users

**Virtual Machine Backup Management**

Display:    
 Type:    
 Filter:

- [-] Virtual Machines (8)
  - [-] bugzilla\_host1 (8d/1v/8b)
    - [-] 2009-08
      - [-] 2009-08-10 18:54:00
      - [-] 2009-08-09 00:01:00
      - [-] 2009-08-08 00:01:00
      - [-] 2009-08-07 00:01:00
      - [-] 2009-08-06 18:33:00
      - [-] 2009-08-05 00:01:00
      - [-] 2009-08-04 11:58:00
      - [-] 2009-08-03 00:01:00
        - 00-bugzilla\_host1.vmdk (8 GB)

**Selection: bugzilla\_host1 -> 2009-08 -> 2009-08-03 00:01:00 -> 00-bugzilla\_host1.vmdk**

Archive	Special	Delete	Bad Date/Time	Display Name	VMDK
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2009-08-03 00:01:00 bugzilla_host1	00-bugzilla_host1.vmdk
<input type="checkbox"/> Select All					

Row 1 - 1 of 1

You can use this page to apply the following flags to each VMDK file, individually:

- **Archive** – Setting the Archive flag will preserve the backup file indefinitely—it will not be deleted according to the Auto Delete/Trim the Herd rules you’ve defined.
- **Special** – Use the Special flag to indicate a backup was not part of the normal daily backups.
- **Delete** – Flags the backup for deletion the next time the purge process runs.
- **Bad** – Designates a bad backup. Set automatically by esXpress and cannot be changed.

After applying a flag to any backup file, click **Save** to commit your changes.

When saved, you can modify the tree view to display only the files you’ve flagged.

## File Level Restores (FLR)

esXpress's DeDup appliance offers a File Level Restore (FLR) capability through the web interface. This permits a view into Windows and Linux backups, allowing immediate retrieval of individual files or whole directories.

*To restore individual files with FLR*

- 1 Using a web browser, log in to the DeDup appliance.
- 2 At the top of the page, click **FLR**.
- 3 From the list of backups, expand the tree view and select the VM that contains the files you want to restore (Identified by the time stamp when the backup was taken).

The screenshot shows the esXpress PHDD web interface. The top navigation bar includes 'VMs', 'FLR', 'Stats', 'Options', 'Users', and 'Logout'. The main content area is titled 'File Level Restore'. On the left, a tree view shows the hierarchy of virtual machines, with 'XP-Test-VM [x4] (10d/1v/12b)' selected. The right pane shows a file list for the selected VMDK file, with columns for 'Name', 'Size', and 'Last Modified Date'. The file list includes files like AUTOEXEC.BAT, CONFIG.SYS, IO.SYS, MSDOS.SYS, NTDETECT.COM, WINDOWS, boot.ini, ntlr, and pagefile.sys. Below the file list, a 'File Restoration Package Contents' table is displayed, showing the files that will be restored.

Name	Size	Last Modified Date
/AUTOEXEC.BAT	0	2008-09-09 17:26:28
/NTDETECT.COM	45K	2001-08-23 08:00:00

- 4 Click the VMDK file to expand the directory structure for the disk.
- 5 Continue to click each directory until you find the folder that contains the files you want to restore. Individual files are displayed in the file list to the right.
- 6 From the file list, select the individual files that you wish to restore and click **Save as ZIP**.
- 7 Specify the location to save the file.
- 8 When the file is downloaded, double-click on the restore\*.zip file to view the contents.

### Supported File-level Restore File Systems:

- NTFS
- FAT16
- FAT32
- EXT3
- EXT2
- XFS
- ReiserFS (experimental support only)
- JFS

## File Level Restore limitations

- File-level restore does not support NTFS encrypted files/folders.
- File-level restore does not support multi-drive dynamic disks; however, single drive dynamic disks (simple dynamic disks) ARE supported.
- File-level restore does not support multi-drive Linux LVM; however, single drive LVM (such as Red Hat's installation defaults) IS supported.
- File-level restore does not allow you to create a single restore archive from multiple VMs. You must restore from each VM individually.
- ReiserFS is experimentally supported, only. FLR on Reiserfs volumes may work in some cases but may also cause issues with the DeDup appliance (DeDup appliance may crash). This is especially prevalent in SLES10 VMs



*Note*      *Creating a file-level restore zip archive that is larger than 4GB will fail (though restoring single files larger than 4GB is fine). This is a limitation of the zip file format.*

## Options


Use the Options page to edit the attributes associated with your backups.

Group	Sub	Name	Value
DELETE	DEFAULT	ENABLE	<input checked="" type="checkbox"/>
DELETE	WINDOW	START	10 [ 0 - 23 ]
DELETE	WINDOW	END	20 [ 0 - 23 ]
DELETE	PURGE	PURGE_ENABLE	<input checked="" type="checkbox"/>
DELETE	PURGE	PURGE_AFTER_X_HOURS	72 [ 1 - 9999 ]
DELETE	DAY	THIN_PER_DAY	1 [ 1 - 99999 ]
DELETE	DAY	THIN_AFTER_DAYS	7 [ 1 - 99999 ]
DELETE	DAY	THIN_KEEP_WHICH_DAY	LAST
DELETE	WEEK	THIN_PER_WEEK	1 [ 1 - 99999 ]
DELETE	WEEK	THIN_AFTER_WEEKS	4 [ 1 - 99999 ]
DELETE	WEEK	THIN_KEEP_WHICH_WEEK	LAST
DELETE	MONTH	THIN_PER_MONTH	1 [ 1 - 99999 ]
DELETE	MONTH	THIN_AFTER_MONTHS	3 [ 1 - 99999 ]
DELETE	MONTH	THIN_KEEP_WHICH_MONTH	LAST
STATS	GLOBAL	RERUN_AFTER_X_HOURS	12 [ 1 - 99 ]
STATS	DETAILED	RUN_STATS	DAILY

*To edit options*

- 1 Using a web browser, log in to the DeDup appliance.
- 2 At the top of the page, click **Options**.
- 3 When you change an attribute value, the Save  and Cancel  buttons will appear at the end of the attribute row.

Group	Sub	Name	Value
DELETE	DEFAULT	ENABLE	<input type="checkbox"/>
DELETE	WINDOW	START	10

- 4 Change the values using the options in the table and click  to commit your changes.

## Auto Delete/Trim the Herd

With esXpress 3.6, the auto delete functionality for DeDup backups now occurs at the DeDup Appliance level and not at the host level. The auto delete approach for the DeDup Appliance is called *Trim the Herd*. Over time, you can trim down the number of backups kept on the appliance by determining how many backups to keep per week, per month, and per year, keeping only the number of backups you define and deleting the others (thinning them).

### Minimum Unique and Maximum Weeks

Based on the auto delete/trim settings, over time, backups older than a certain date should be purged from disk. The esXpress KEEP\_MAXIMUM\_WEEKS setting allows you to set the maximum age of a stored backup. When a backup exceeds this maximum age, esXpress first checks if this backup is set as Archived (do not delete), and then checks the KEEP\_MINIMUM\_UNIQUE setting. This setting ensures that esXpress will not delete all backups for a VM. If, for example, you stop backing up a specific VM, given enough time, the MAX\_WEEKS setting will allow all backups of this VM to be deleted, unless MIN\_UNIQUE is set to greater than 0. In this event, esXpress will always keep a minimum number of unique backups of a VM, overriding the Maximum Weeks setting.

Delete options are configured on the Options page. See the following table for details.

Table 5 Delete options

Delete Option	Description
ENABLE (Yes/No)	<b>Yes</b> - This will enable deletion of the backup from the appliance database (Soft Delete). <b>No</b> - Auto Delete will not run on the DeDup appliance.
KEEP_MINIMUM_UNIQUE	The minimum number of unique backups to keep for a VM. This setting will ensure the trim process never deletes all backups of a VM. This can be set to 0, if desired.
KEEP_MAXIMUM_WEEKS	The maximum number of weeks of backups to keep for each VM. Note that backups set to Archive are not deleted. Also, if the total number of remaining backups is less than the MIN_UNIQUE value, no backups will be deleted.
THIN_SPECIAL	Select this option to also include Special backups in the 'Thin the

Delete Option	Description
	Herd' logic. By default, Special backups are not removed.
THIN_PER_DAY ( 1 - 99999 )	This indicates how many backups you wish to keep per day.
THIN_AFTER_DAYS ( 1 - 99999 )	This indicates in days when to start the 'Thin the Herd' logic. Before this time no deletes will occur.
THIN_KEEP_WHICH_DAY ( first/last )	If you have more than one daily backup, this indicates which one to keep, either the first or the last backup taken for the day.
THIN_PER_WEEK ( 1 to 99999 )	Indicates how many backups you want to keep per week.
THIN_AFTER_WEEKS ( 1 to 99999 )	This indicates the number of weeks to wait before starting the weekly 'Trim the Herd' Logic. Until this time is reached, the daily 'Trim the Herd' logic will run.
THIN_KEEP_WHICH_WEEK ( first/last )	When the weekly 'Trim the Herd' logic runs, this indicates which backup to keep, either the first or the last backup for the week.
THIN_PER_MONTH ( 1 - 99999 )	Indicates how many backups you want to keep per month. These are sequential days from either the last or the first of the month depending on your setting.
THIN_AFTER_MONTHS ( 1 to 99999 )	This indicates the number of months to wait before starting the monthly 'Trim the Herd' Logic. Until this time is reached, the weekly 'Trim the Herd' logic will run.
THIN_KEEP_WHICH_MONTH ( first/last )	When the monthly 'Trim the Herd' logic runs, this indicates which backup to keep, either the first or the last backup of the month.

## Planning for Auto Deletes/Trim the Herd

When planning delete/trim settings, it is a good idea to look at it from the inside out; starting with your daily delete rules, then weekly rules if required, and then finally, the monthly rules. With this approach, you can slowly trim backups over time while retaining robust archive requirements. When planning how to set these values, consider the following:

### Global Trim Settings

- 1 In order to ensure older backups are always removed and backup storage is available, define the value for KEEP\_MAXIMUM\_WEEKS to set the age per VM backup. Backups older than this setting will be trimmed.
- 2 If you would like to ensure at least one backup is kept for every VM (especially for VMs that may not be backed up any longer) use the KEEP\_MINIMUM\_UNIQUE setting. This will ensure a certain number of backups are retained for each VM, regardless of your other trim settings.

### Daily, Weekly, and Monthly Trim Settings

- 1 Set the value for the option THIN\_AFTER\_DAYS to control how many days of backups to retain before backups are trimmed. For example, if you wanted to keep all backups for 14 days, set this value to 14; the trim process would then begin after 14 days had passed.
- 2 If you are running multiple backups per day, use the option TRIM\_PER\_DAY to determine how many you want to keep each day. If you run backups only once per day, this value will not apply.
- 3 Use the THIN\_AFTER\_WEEKS option to decide when to start trimming backups on a weekly basis. For example, if you decide that after one month (4 weeks) you would like to start trimming backups into weekly buckets, you would set this value to 4. With this value, the daily trim options would apply for the first four weeks.

- 4 Next, use the option THIN\_PER\_WEEK to determine how many backups to keep each week. In most situations, one backup per week is sufficient, but if you do decide to keep multiple backups per week, they will be sequential days. Use the option THIN\_KEEP\_WHICH\_DAYS to determine which day of the week to keep.
- 5 Use the option THIN\_AFTER\_MONTHS to determine after how many months backups should be trimmed into monthly buckets. For example, if you determine that after 6 months you will start monthly trimming, then set this value to 6.
- 6 There are two additional considerations for the monthly trim. The first is how many monthly backups to keep. In most situations, one backup per month is sufficient, but if you wish to keep additional backups each month, then adjust the THIN\_PER\_MONTH value. When set to greater than one, this option refers to sequential days of backups. Also decide which backup to keep each month by setting THIN\_KEEP\_WHICH\_MONTH to either last for the last of first.

## Statistics Options

On the Options Page, there are a number of values which control when and what type of esXpress statistics are generated. Refer to the following table for details about each attribute.

Table 6 Stats options

Stats Option	Description
RERUN_AFTER_X_HOURS ( 1 to 99 hours )	This option indicates how often the global DeDup statistics will run. Set this value to a number indicating after how many hours the global stats will be generated. For example, if this is set to 12 the statistics will run every 12 hours.
RUN_STATS (DAILY / ALWAYS)	This indicates when detailed statistics are run. <b>Daily</b> – run the detailed statics daily. <b>Always</b> – run the detailed statistics after every backup is imported.
START_TIME ( 0 to 23 hours )	This defines the start time for the window when detailed statistics are allowed to run.
END_TIME ( 0 to 23 hours )	This defines the end time for the window when detailed statistics are allowed to run.

## System Options

The Options page includes SYSTEM settings which can be used to modify the appearance of the DeDup appliance web page as well as configure SAMBA settings.

Table 7 System options

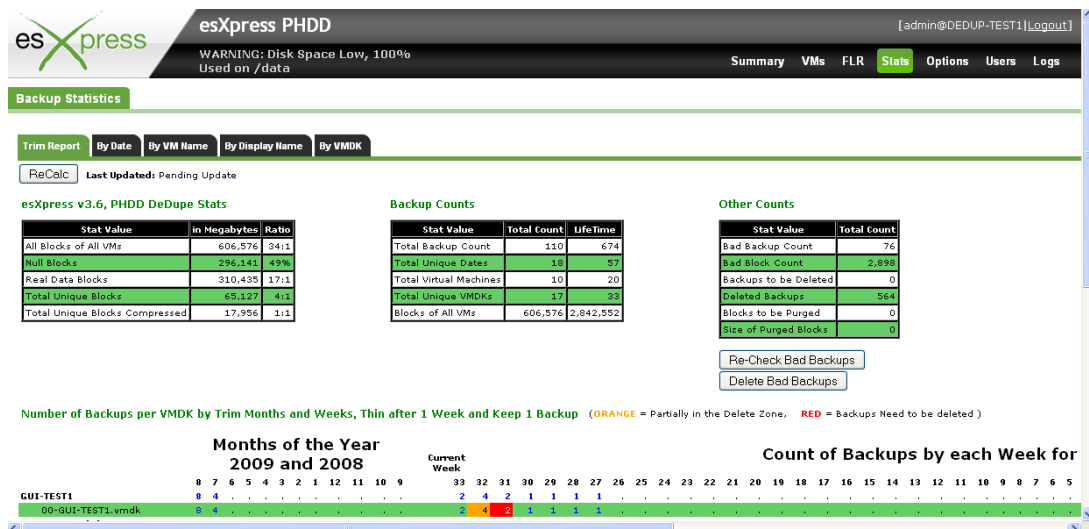
System Option	Sub Category	Description
MOTD	LOGIN	Define the message displayed at the web login screen for the DeDup appliance.
TITLE	DEFAULT	Use this option to change the DeDup web page title.
ENABLED	CHECK_FOR_UPDATE	Enable automatic check for updates process.
START_TIME	CHECK_FOR_UPDATE	Enter the start time (0-23 in 24 hour notation) for the automatic check for updates process to run. The default is 4 (4AM).

System Option	Sub Category	Description
WORKGROUP	SAMBA	This defines the workgroup that the server indicates it is a member of when servicing client requests. The default is <b>ESXPRESS</b> .
SERVER_STRING	SAMBA	This is the text string displayed with the machine's NetBIOS name when viewing through network browsing. The default is <b>esXpress_Backups</b> .
UNCOMPRESSED_SHARE_NAME	SAMBA	This sets the samba share name. The default is <b>esxpress_uncompressed</b> .
UNCOMPRESSED_COMMENT	SAMBA	Comment field for the SMB share. The default is <b>esXpress_Backups</b> .
UNCOMPRESSED_BROWSEABLE	SAMBA	You must set this option to <b>Yes</b> in order for the share to be browse able.
ENABLED	SAMBA	Use this option to enable backup exports using SAMBA.

## Stats

To view a summary of the DeDup backup data, click **Stats** at the top right corner of the page.

The Stats page of the DeDup web interface shows the summary of the backup data. Statistics are not dynamically updated each time you view this page—the frequency of updates is determined by your STATS options settings. Stats can also be recalculated using the **ReCalc** button on this page.



Statistics can be displayed by date, by VM name, display name, or by VMDK using the tabs on the page. The **Trim Report** tab also contains a calendar table showing the total backups for each VM by month and by week.

You can drill in to the report by clicking any backup link in the calendar table.

<b>phd-3.5-8-GUI .215</b>	<b>8</b>	<b>3</b>	<b>1</b>	.	.	.	.	.	.
00-phd-3.5-8-GUI .215.vmd	8	3	1	.	.	.	.	.	.
<b>quantum-esxpress-rosco</b>	<b>8</b>	<b>3</b>	<b>1</b>	.	.	.	.	.	.
00-quantum-esxpress-rosco	8	3	1	.	.	.	.	.	.
<b>Test</b>	.	<b>1</b>	.	.	.	.	.	.	.
00-Test.vmdk	.	1	.	.	.	.	.	.	.

A new table is displayed which shows statistics for that set of backups.

Showing Backups where month = '200907' and scsi = '00' and vmdk = 'GUI-TEST1.vmdk'

All Numbers in Blocks / Megabytes

Hostname	Backup ID	Week	Date	Time	VM Name	SCSI ID	VMDK Name	Size in Meg	Real Data	NULL Blocks	Sent Meg	OS Type
phddev0.esxpress.local	463	200928	2009-07-18	01:01	GUI-TEST1	00	GUI-TEST1.vmdk	8,192	4,625	3,567	83	rhel5
phddev0.esxpress.local	590	200929	2009-07-25	01:01	GUI-TEST1	00	GUI-TEST1.vmdk	8,192	4,809	3,383	244	rhel5
phddev0.esxpress.local	602	200930	2009-07-29	01:01	GUI-TEST1	00	GUI-TEST1.vmdk	8,192	4,832	3,360	271	rhel5
phddev0.esxpress.local	319	200927	2009-07-11	00:01	GUI-TEST1	00	GUI-TEST1.vmdk	8,192	4,452	3,740	34	rhel5
phddev1.esxpress.local	407	200928	2009-07-15	00:01	GUI-TEST1	00	GUI-TEST1.vmdk	8,192	4,356	3,836	0	rhel5

You can continue to drill in to the table by clicking any of the links available within each column, filtering the backup information based on the information you click. The table header displays what data is currently represented in the table.

## DeDup Stats

The first table on the Stats page shows the main overall DeDup stat values for all of your DeDup backups. Each value is listed along with the total size in MB and the overall ratio.

### esXpress v3.6, PHDD DeDupe Stats

Stat Value	in Megabytes	Ratio
All Blocks of All VMS	606,576	34:1
Null Blocks	296,141	49%
Real Data Blocks	310,435	17:1
Total Unique Blocks	65,127	4:1
Total Unique Blocks Compressed	17,956	1:1

- **All Blocks of all VMS** – This is the total number of blocks for the backups sent to the DeDup appliance. In the figure above, the total was 606,576. The ratio is the overall DeDuplication ratio. Note that the ratio 34:1 is a test host in a lab with many similar Virtual Machines. Normal user environments usually return about 25:1
- **Null Blocks** – This is the number of Null Blocks. In the example above, 49% of all blocks from the backups are Nulls.
- **Real Data Blocks** – This is the total amount of actual data blocks in the backups.
- **Total Unique Blocks** – The total amount of actual unique blocks sent to the DeDup appliance for your backups. The Ratio is the unique blocks against the total data.
- **Total Unique Blocks Compressed** – This is the total unique blocks compressed.

To learn more about the Stats page, view the Knowledge Center web site:

<http://support.esxpress.com/boards/read.php?5,11801,11808#msg-11808>

## Backup Counts

The Backup Counts table shows totals for all backups and virtual disks for the DeDup appliance.

## Other Counts

The Other Counts table indicates if there are bad blocks, number of deleted backups and blocks waiting to purge. The **Size of Purged Blocks** is a key size as that displays the space waiting to be reclaimed from the Trim process.

Click **Re-Check Bad Backups** to update the Other Counts table or you can initiate a delete of bad backups directly from this page by clicking **Delete Bad Backups**.

### Other Counts

Stat Value	Total Count
Bad Backup Count	76
Bad Block Count	2,911
Backups to be Deleted	0
Deleted Backups	564
Blocks to be Purged	0
Size of Purged Blocks	0

Re-Check Bad Backups

Delete Bad Backups

## Users

Use the Users page to add users with admin or read-only rights.

*To add a new user*

- 1 On the DeDup web page, click **Users**.
- 2 Click **New User**.
- 3 Enter the user credentials and click **OK**. Note that currently, only the Admin role is supported.

The user is added to the list.

If you are using the Export Share, you will need to indicate at least one user as the SMB user. The admin account cannot be used for SMB.

User Management						
New User						
Enabled	UserName	Role	Email	Full Name	SMB	
<input checked="" type="checkbox"/>	admin	Admin		PHD Admin	No	
<input checked="" type="checkbox"/>	smbuser	Admin	admin	SMB User	Yes	

2 Rows [Export to CSV](#)

## Exporting Backups

You can export backups from the esXpress DeDup appliance as an uncompressed VMDK in order to save them to tape or even archive them to disk. These exported backups are no longer a data-duplication backup, but simply a compressed VMDK which you can then access.

This ability is done through an SMB share to the DeDup appliance. It is not enabled by default on the install of the DeDup appliance, you must set the Option (SYSTEM-SAMBA-ENABLED) to Yes. This can be maintained from the Options page in the DeDup web page or from the PHD menu under System Options.

To access the share, map the following share *//DeDup Appliance IP/esxpress\_uncompressed*

- The samba settings are configurable and can be changed. They can be maintained in the Options page or from the PHD menu.
- The authentication for the share is defined by setting up SMB users on the Users page. When you define the user select the **SMB User** check box.
- The default **admin account cannot** be used as the SMB authentication user
- Special characters are not allowed as part of the user name for SMB users.
- When the share is mapped you will see the following folder format.
  - |-- Archived      Backups indicated as an Archived Backup
  - |-- Normal        Normal Backups
  - |-- Special        Backups indicated as a Special Backup
- Under each main folder is the following folder structure
  - | |-- ByWeek        Week 1-52
  - | |-- CurrentMonth    Current Month
  - | |-- Last32        Last 32 Days
  - | |-- Last7         Last 7 Days
  - | |-- LastMonth     Last Month
  - | |-- One\_of        One of the most recent backup of every VM
  - | |-- Today         Backup that completed today
  - | |-- Yesterday     Backup that completed yesterday
- Drilling deeper into the folders you will find the backup data. What is presented is the VMX file, the VMDK file and the –flat file. All files are uncompressed.
- The following is a sample directory structure drilled into the Archived folder:
  - |-- Archived

```
| |-- ByWeek
| |-- 47
| |-- 20081124215800--VIMA--500c6b4c-8451-8306-fb82-39ae9607c4d7
| |-- 00-VIMA-flat.vmdk
| |-- 00-VIMA.vmdk
| |--00-VIMA.vmx
```

- esXpress makes the exported backup share available. You would then need third-party tools or your own scripting to select and move these files to tape or other disk locations, as well as compression, if necessary.

There are a number of global configurations options that control setting up the SMB share for this feature. They are maintainable on the Options page and have a group of **SAMBA**.

- **WORKGROUP**  
This defines the workgroup that the server indicates it is a member of when servicing client requests.
- **ENABLED (yes / no )**  
You must set this option to 'Yes' to enable samba on the DeDup appliance which will allow the export share to be accessible. **Note: This option is set to No by default.**
- **SERVER\_STRING**  
This is the text string displayed with the machine's NetBIOS name when viewing through network browsing. The default is **esXpress\_Backups**.
- **UNCOMPRESSED\_SHARE\_NAME**  
This sets the samba share name. The default is **esxpress\_uncompressed**.
- **UNCOMPRESSED\_COMMENT**  
Comment field for the SMB share. The default is **esXpress\_Backups**.
- **UNCOMPRESSED\_BROWSEABLE (yes / no )**  
You must set this option to **Yes** in order for the share to be browse able.

## Logs

The Logs page displays DeDup logging information separated into tabbed categories. Click any tab to display the latest log information. Select **Live Log View** to display logs in real time.

With esXpress DeDup backups you will see some additional informational messages written to your backup logs.

Below is a sample portion of a DeDup backup log.

```
2009-04-29 07:42:59.393b PHDD: 67%, 5496 MB of 8192 MB at 36 (50) MB/Sec.
Dur: 02m:32s, 267M / 40M (2)

2009-04-29 07:43:15.989b PHDD: 81%, 6638 MB of 8192 MB at 39 (71) MB/Sec.
Dur: 02m:48s, 287M / 42M (2)

2009-04-29 07:43:32.620b PHDD: 92%, 7577 MB of 8192 MB at 41 (62) MB/Sec.
Dur: 03m:03s, 295M / 42M (1)

2009-04-29 07:43:49.795b
```

```
2009-04-29 07:43:49.803b PHDD Blocks: 8192 Total, 295 Wrote, 3546 Skipped,  
4351 Zero for: TEST1, 00-TEST1.vmdk
```

```
2009-04-29 07:43:49.813b PHDD Stats: 42 sent meg (14%/0.51%) / 295 written  
meg (3.60%) / 8192 total meg for: TEST1, 00-TEST1.vmdk
```

The first group of lines from the log is the running status entries of the DeDup backup. For example, the line showing PHDD: 67% indicates that the backup is 67% complete, is getting 36 MB/sec (50 MB/sec with both threads), and has been running for 2 minutes and 32 seconds.

The next key line is the PHDD Blocks entry. This shows your detailed DeDup starts for this backup.

In the example above:

- 8192 blocks were the total for this VMDK (an 8 GB disk).
- Only 295 Blocks were actually written to the DeDup appliance, these were the unique blocks in this backup.
- 3546 Blocks were skipped. These are the blocks that already existed in the DeDup appliance so are not needed to be saved again as esXpress DeDup will only write unique blocks once.
- 4351 Blocks in the VMDK were Null (Zero).

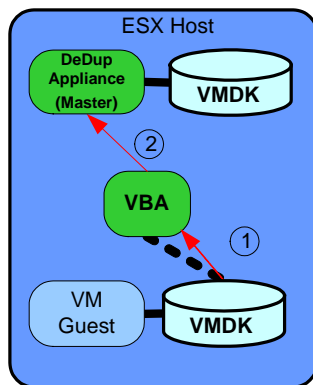
The last line is the PHDD stats log entry. This shows how much data was actually sent to the DeDup appliance for this backup.

In this example, only 42 MB compressed data out of the original 8GB VMDK was sent to the DeDup appliance for this backup. The original 295 MB of unique blocks was compressed to 42 MB

## 4 Implementation Scenarios

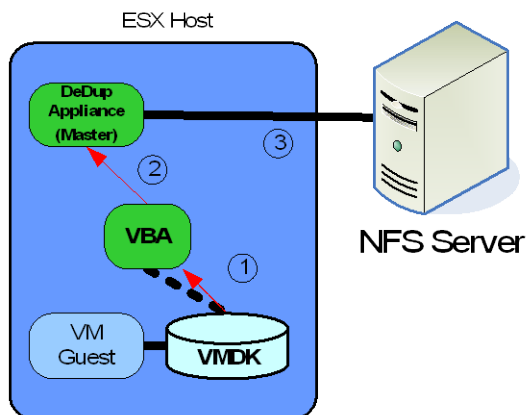
The DeDup appliance can be configured to take backups in a host of scenarios. This section describes some of the possible implementation scenarios.

### ***DeDup appliance on the same host as the VM it is backing up. Local VMFS storage***



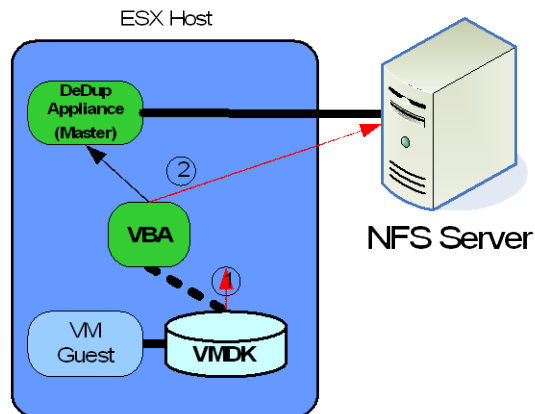
- VBA backs up the data from the VM Guest's disk.
- VBA sends data directly to the DeDuplication appliance local disk (VMDK can be on Local or SAN storage).

### ***DeDup appliance on the same host as the VM's it is backing up. Remote NFS storage***



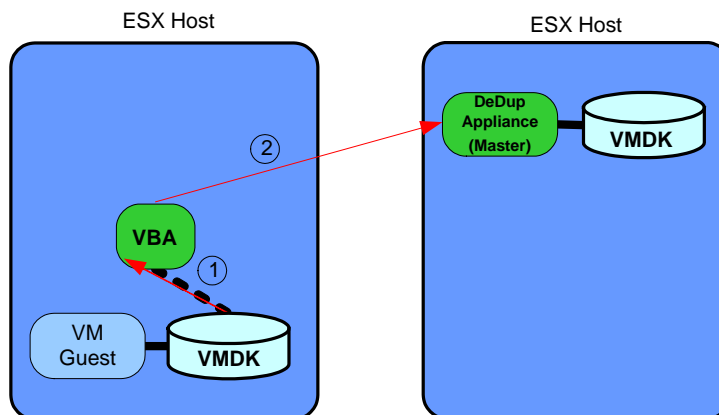
- VBA backs up data from the VM Guest's disk.
- VBA sends data directly to the DeDuplication appliance.
- Data goes through the DeDuplication appliance to a remote mounted NFS Server.

**Same as above but the VBA can bypass the DeDup appliance and write data directly to NFS storage**



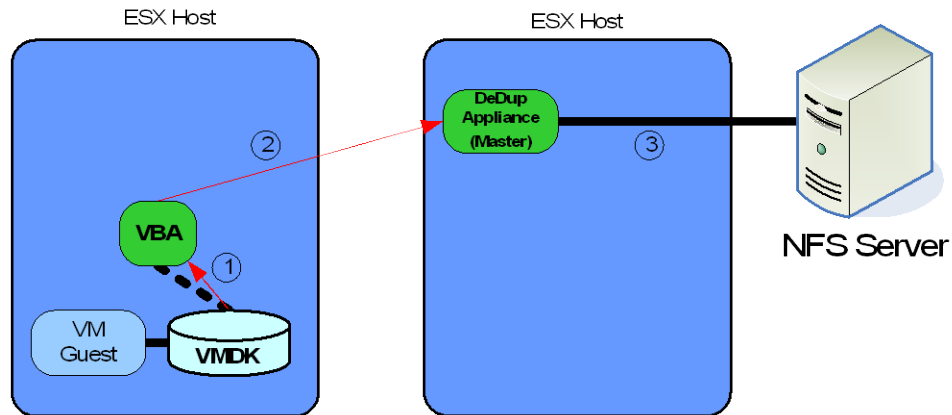
- VBA backs up data from the VM Guest's disk.
- VBA writes the backup data blocks directly to the NFS server. Other backup related data is still sent to the DeDup appliance (This lowers the I/O load on the DeDuplication appliance).

**DeDup appliance on a remote host from the VM's being backed up. Local VMFS storage**



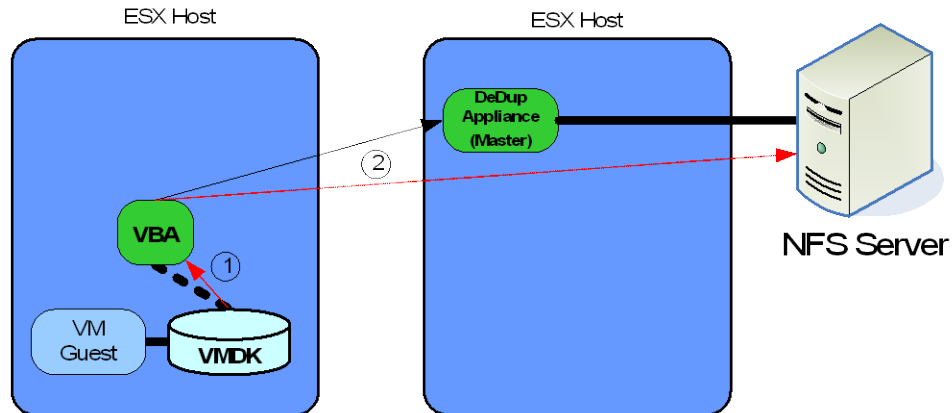
- VBA backs up data from the VM Guest's disk.
- VBA send data directly to the DeDuplication appliance on a remote host.
- Data goes through the DeDuplication appliance to a local disk (VMDK can be on Local or SAN storage)

**DeDup appliance on a remote host from the VMs being backed up. Remote NFS storage**



- VBA backs up data from the VM Guest's disk.
- VBA sends data directly to the DeDuplication appliance on a remote host.
- Data goes through the DeDuplication appliance to a remote mounted NFS server.

**Same as above but the VBA can bypass the DeDup appliance and write directly to NFS storage**



- VBA backs up data from the VM Guest's disk.
- VBA writes the backup data blocks directly to the NFS server. Other backup related data is still sent to the DeDup appliance (This lowers the I/O load on the DeDuplication appliance).

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