Quantum

User's Guide

StorNext Timecode-Based Partial File Retrieval 1.0.1

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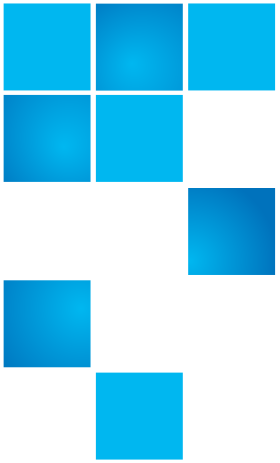


Chapter 1

Introduction to Timecode-Based Partial File Retrieval

Quantum Timecode-Based Partial File Retrieval (PFR) allows you to quickly retrieve and utilize segments of large media files—rather than the entire file— based on timecode parameters.

Segments of large media files that have been archived to tape using Quantum StorNext Storage Manager can be requested using a simple XML request file. Quantum Partial File Retrieval instructs StorNext to retrieve only the necessary portion from tape, and then presents that segment as a complete MXF or QuickTime file.

If the file has not yet been truncated by StorNext Storage Manager, the result will still be the same. However, in this case the Partial File will be generated directly from the complete media file on disk.

The Quantum Partial File Retrieval feature requires a dedicated Windows-based server on which to run. For larger scale installations, the Quantum Partial File Retrieval functionality can be distributed across multiple Windows server machines.

Note: Partial File Retrieval is designed to work exclusively with QuickTime and MXF video files, which makes PFR suitable for applications which reference video by timecode.

The QuickTime or MXF wrapper for a retrieved file will be re-constructed during the Partial File Retrieval process, and as such retrieved files will not be byte-for-byte replicas of the original. However, the video frames and audio samples in the retrieved files are not transcoded and therefore there is no generation loss from the retrieval process. The only exception to this is for retrieving MPEG Long GOP video (for example Sony XDCAM HD 50), where a small number of frames are transcoded at the start and end of the retrieval in order to reconstruct a coherent GOP structure.

Chapter 2

How Timecode-Based Partial File Retrieval Works

Quantum Timecode-Based Partial File Retrieval consists of two primary components: an indexer which indexes media files before they are archived to tape and truncated, and a Partial File Retrieval service that performs the requested retrievals.

Partial File Retrieval Indexer

The Partial File Retrieval Indexer looks for new media to appear in StorNext Storage Manager. When it finds a new media file it generates an index for it, in effect mapping timecode values in the original media file to byte offsets. This allows subsequent timecode- based requests to retrieve only the necessary portions of a large media file from tape.

The index files, which are written as QuickTime reference files, are generated in a parallel folder structure on the managed storage. The two file locations below represent a MXF based media file and its associated index file.

```
//StorNext/snfs1/Media/Project/Movie.mxf
```

```
//StorNext/snfs1/PFR-INDEX/Media/Project/Movie.mov
```

Note: The index files do not contain any content themselves, and are therefore very small in comparison with the files they index.

It is important that the indexed files themselves are never truncated.

The Indexer does not attempt to index files that it thinks might be currently in-record. Therefore, the first time the indexer encounters the file, there may be some delay before a particular file is indexed while the indexer is trying to establish if the file is currently being written to.

Partial File Retrieval Service

Folder Structure

Within the Quantum Partial File Retrieval Configuration Tool, it is possible to set up multiple sets of folders for different request types. For example, a set of folders for news requests might look like this:

```
//StorNext/snfs1/Requests/News
```

```
//StorNext/snfs1/Requests/News/PFR-REQUEST
```

```
//StorNext/snfs1/Requests/News/success
```

```
//StorNext/snfs1/Requests/News/fail
```

The configuration tool creates these folders for you and allows you to set an output format: QuickTime Movie or MXF.

The four folders shown in the example are used in the following manner:

1. The parent folder (in this case *News*) is where the resultant file extract will be placed once retrieved and created;
2. The *PFR-REQUEST* folder is the location to place the XML-formatted request file;
3. Once the request has been completed, the XML request file will be moved to the *success* folder;

4 If an error occurred in retrieving the partial file, the XML request file will be moved to the *fail* folder.

Issuing a Request

A Partial File Retrieval request is issued in the form of a small XML file, the format of which can be seen in the example later in this User Guide. The XML file simply describes a movie (via a full UNC path) with an in and out timecode value.

Quantum PFR will handle a number of the requests simultaneously with the overall retrieval performance dependant upon the quantity of tape drives available.

The number of tape drives limits how many requests can be processed simultaneously. Once all tape drives are busy, additional requests will be queued until a tape drive becomes available.

Monitoring Requests

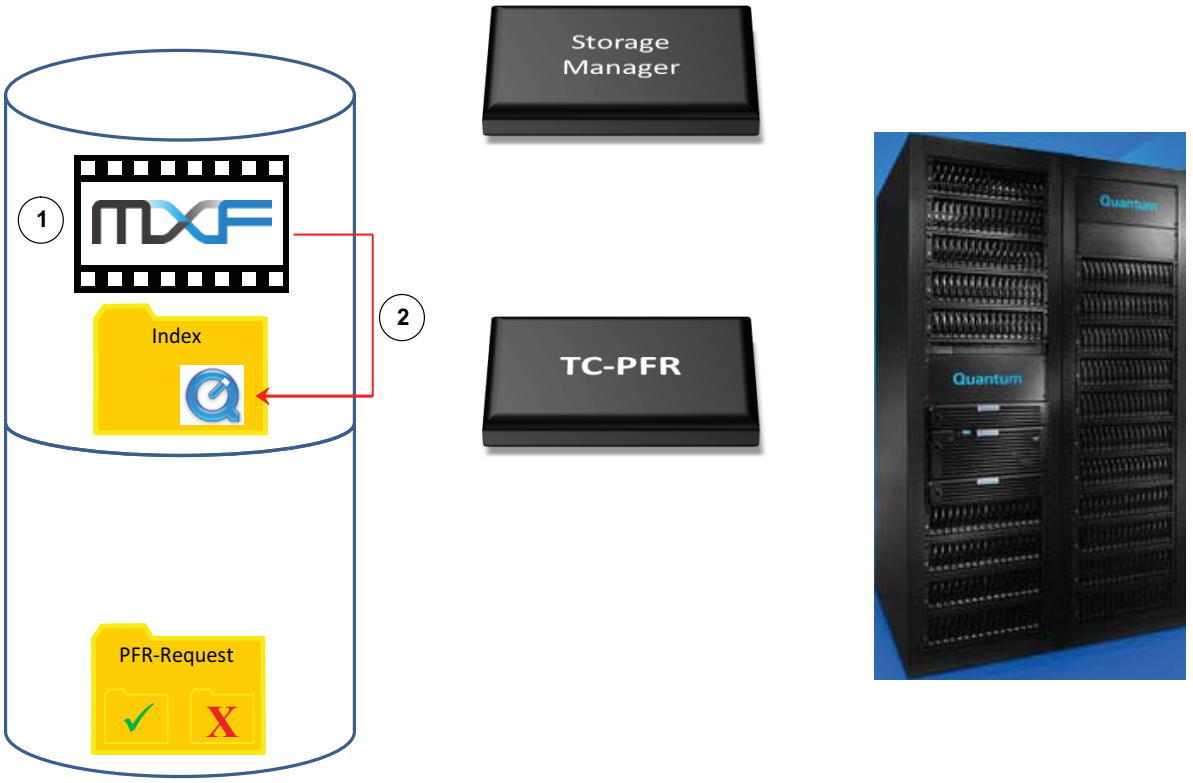
Requests will be processed automatically once the request file is detected. The Partial File Retrieval service automatically detects the XML request file, appends the processed request to the queue of pending requests, and processes them in the order received. XML request files are moved to the *success* or *fail* folder as appropriate based on the status of the request.

Use the PFR status GUI to monitor requests, cancel pending or active requests or change the priority of the pending requests.

PFR Workflow

This section illustrates the steps involved in the retrieval process. Circled numbers in the illustrations correspond to the step number.

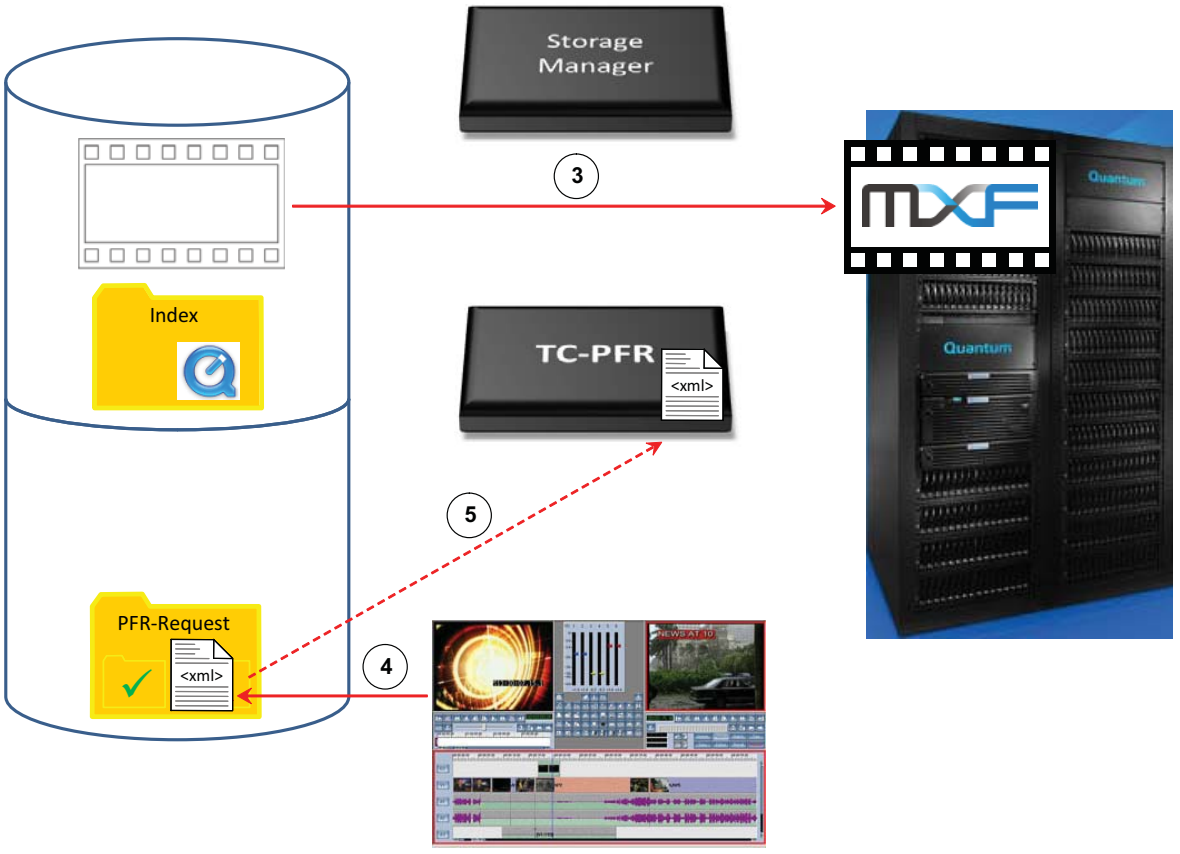
Figure 1 PFR Steps 1 - 2



Step 1: An MXF (or QuickTime) file is written into the managed file system.

Step 2: Frames are read from this new file and converted into a QuickTime reference index file.

Figure 2 PFR Steps 3 - 5

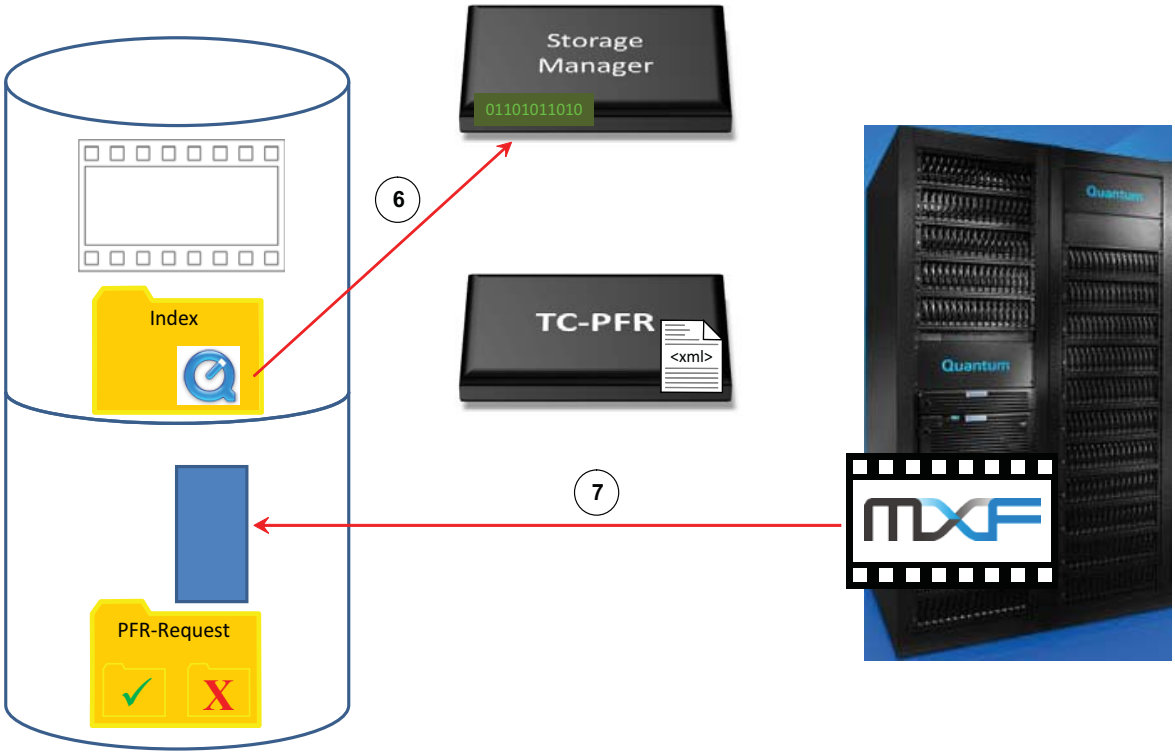


Step 3: Some time later, according to the policies that have been configured, the Storage Manager copies the file to the tape archive and truncates the file on disk.

Step 4: A third-party media asset management (MAM) system generates an XML request for a partial file and writes it into the request folder.

Step 5: PFR picks up the request XML and starts to parse it.

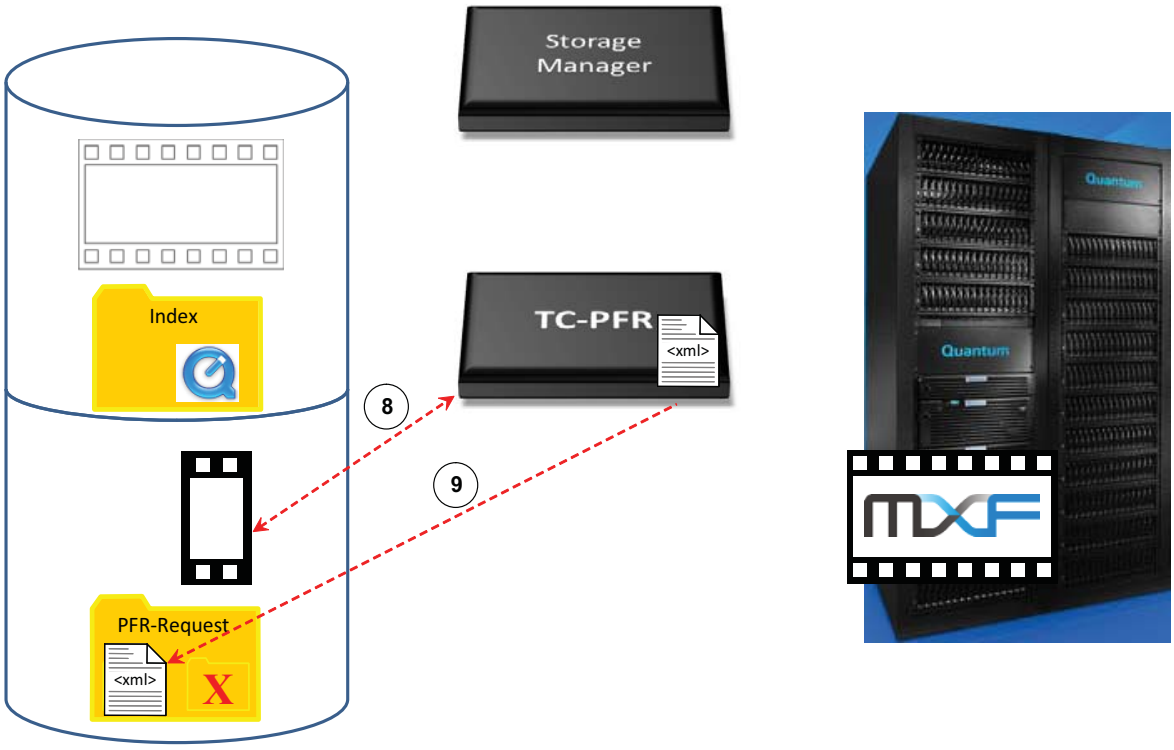
Figure 3 PFR Steps 6 - 7



Step 6: PFR locates the required frames in the index file and converts these to byte offset data for Storage Manager.

Step 7: Storage Manager performs a partial restore from tape, and writes a temporary file to the destination directory.

Figure 4 PFR Steps 8 - 9



Step 8: PFR then immediately rewraps this temporary file back into a valid MXF or QuickTime file.

Step 9: The request XML is dropped into the success folder to indicate that a successful restore has occurred.

Chapter 3

Installation

Installation Components and Install Options

Quantum Partial File Retrieval consists of the following software components:

- **PFR Control Server and Configuration GUI**: This is the core of the system and the tool that configures it
- **PFR Transfer Engine**: This is the engine that retrieves and creates the partial file
- **PFR Status GUI**: This is the user application which allows monitoring and modifying the queue of pending and in-progress retrievals
- **Index Engine and Configuration / Status GUI**: This is the service that indexes media files before they are truncated
- **Virtual Machine (VM) with SNAPI and PFR Linux Component**: This is the interface to the StorNext API (SNAPI)

A typical installation of Quantum Partial File Retrieval installs all of the above components on a single Windows-based server machine. This is fine for most installations, but for larger installations the components can be distributed as follows:

- **PFR Server**: Includes "PFR Control Server and Configuration GUI" and "VM w/ SNAPI and PFR Linux Component"

- **PFR Client (aka Status GUI)**: Allows the PFR queues to be remotely managed
- **PFR Indexer**: Includes "Index Engine and Configuration / Status GUI". Would most likely be installed on its own on a separate machine when additional performance is required.
- **PFR Transfer Engine**: Again, would most likely be installed on its own on a separate machine when additional performance is required.

Upgrading from an Earlier Version

Uninstalling a Previous Version

Prior to installing Quantum Partial File Retrieval v1.0.1, any v1.0.0 version must be uninstalled.

Note: Uninstalling PFR does not remove any of the index files that were generated with an earlier version, nor does it remove the existing PFR configuration.

To uninstall v1.0.0, find the PFR Components to uninstall:

- On Windows Server 2003 SP2, from the Control Panel select **Add or Remove Programs**
- On Windows Server 2008 R2, from the Control Panel select **Uninstall a Program**

In either case, select the PFR Component(s) and uninstall them. If the original installation was a Full install, there will be only one item to uninstall, labeled “PFR”. If the original installation was performed by installing the component parts, uninstall any instances of “PFR Client”, “PFR Server”, “PFR Engine” and “PFR Indexer”.

Once the component(s) have been uninstalled, it is recommended that the Server is re-booted to remove any temporary files, before installing v1.0.1 (see below).

Note: The prerequisites for v1.0.1 are the same as those for v1.0.0. All component parts of Quantum PFR must be upgraded to the same version.

Installing v1.0.1

Installing v1.0.1 should be performed as detailed below. Once installation is complete, it is important to run the PFR Configuration Tool right through to re-save the Configuration.

Be sure to check the **Maximum Simultaneous Transfers** value. This value may need to be re-entered with the newer version of the software.

Prerequisites

Supported Platforms

At this time Timecode-based Partial File Retrieval is supported only on the following platforms.

The PFR server and transfer engine can be installed on the following platforms:

- Windows 2003 Server R2 SP2 32-bit and 64-bit
- Windows 2008 Server R2 64-bit

PFR clients (Status GUI) can be installed and run on the the following platforms:

- Windows 2003 Server R2 SP2 32-bit and 64-bit
- Windows 2008 Server R2 64-bit
- Windows XP
- Windows Vista
- Windows 7

StorNext

The StorNext metadata controller must have Storage Manager and StorNext API (SNAPI) installed.

The PFR server must have the StorNext client software installed, and the client must be at the same StorNext revision level as the metadata controller (MDC).

File systems containing PFR video data must be mounted Read/Write as drive letters on the PFR Server. For details about installing and configuring the Windows client, see the *StorNext Installation Guide*.

Sharing the StorNext File System

Each StorNext file system that will be used by PFR must be “shared” via Standard Windows server message block (SMB) protocol.

In Windows Explorer, right-click on each StorNext file system drive letter and share the drive. The permissions of each share must be explicitly set to “Full Control” since the default value is Read-Only.

VMWare

The "VM w/ SNAPI and PFR Linux Component" is actually a small piece of Linux software that provides the communications link between the PFR Server and the StorNext API. This is hosted in VMWare Server on the PFR Server machine.

VMWare Server should be installed and running prior to installing the Quantum PFR Components. You can find VMWare Server here:

http://www.vmware.com/products/server/

Note: When installing separate components on separate machines for performance reasons, VMWare Server is required only on the Server machine onto which the PFR Server is installed.

Note: The VMware server configuration may have to be changed after installation to make sure the “standard” virtual machine store is pointing to “C:\Virtual Machines.” By default, the VMWare installer chooses the biggest drive for the “standard” virtual machine store, which is often the StorNext system. If this is not changed, the PFR Installer cannot automate registering and starting the “VM w/ SNAPI and PFR Linux Component”.

Note: On some systems that already have an instance of Apache web server already installed, the VMware web service may fail to start. For this reason we recommend installing on a machine that has no web server software already running.

Bonjour

Bonjour, also known as zero-configuration networking, enables automatic discovery of computers, devices, and services on IP networks. Bonjour uses industry-standard IP protocols to allow devices to automatically discover each other without needing to enter IP addresses or configure DNS servers.

Quantum Partial File Retrieval uses Bonjour in order to discover the "VM w/ SNAPI and PFR Linux Component". Bonjour should be installed prior to installing Quantum Partial File Retrieval components. You can find Bonjour here:

http://support.apple.com/downloads/Bonjour_for_Windows

Note: When installing separate components on separate machines for performance reasons, Bonjour is required only on the machine(s) onto which the PFR Server and PFR Transfer Engine are installed.

User Accounts

The PFR Control Server and the PFR Transfer Engine both require a specific user to be specified to run the Services. This user must have full read and write access to the StorNext storage in order to perform partial file retrievals. The same user is used for both components.

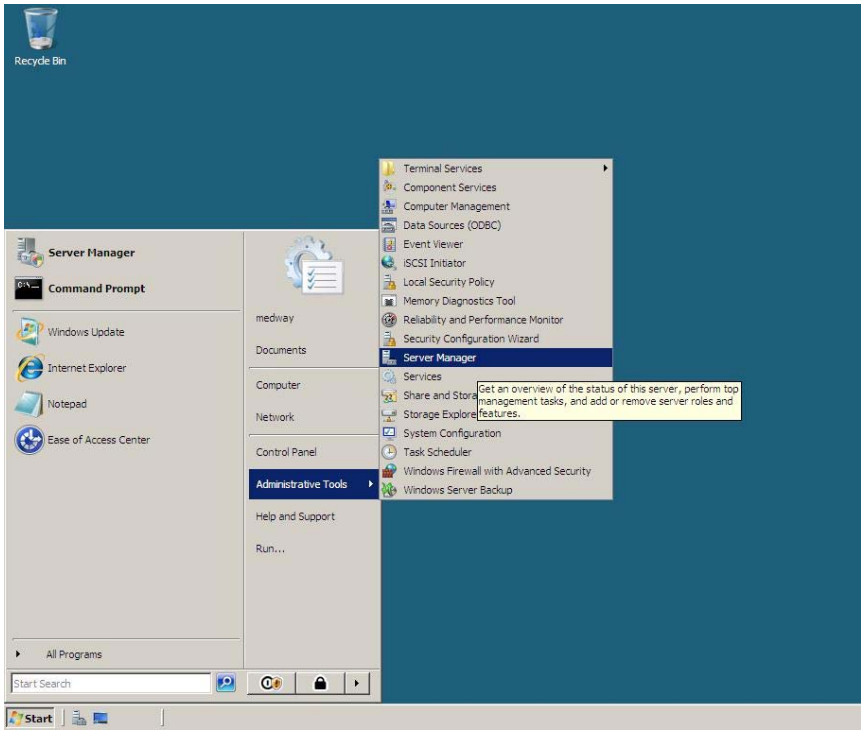
If you are performing an installation where some components are installed onto separate server machines, the user must be available on both the machine which has PFR Control Server and the machine which has the PFR Transfer Engine installed onto it.

.NET

This installation step is necessary only on Windows Server 2008. (This operating system comes with .NET installed but disabled.) Before beginning the PFR installation, you must enable the .NET feature.

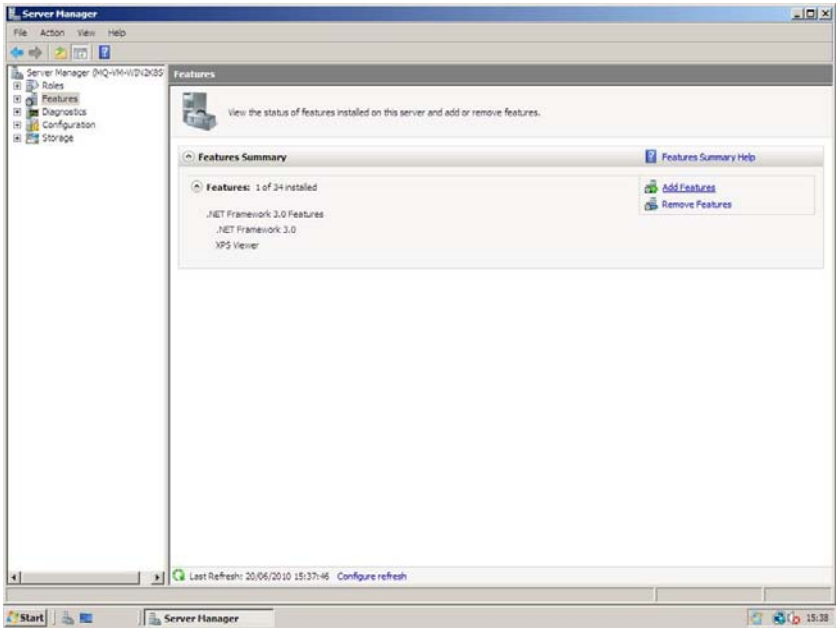
1 Launch the Windows Server Manager.

Figure 5 Server Manager



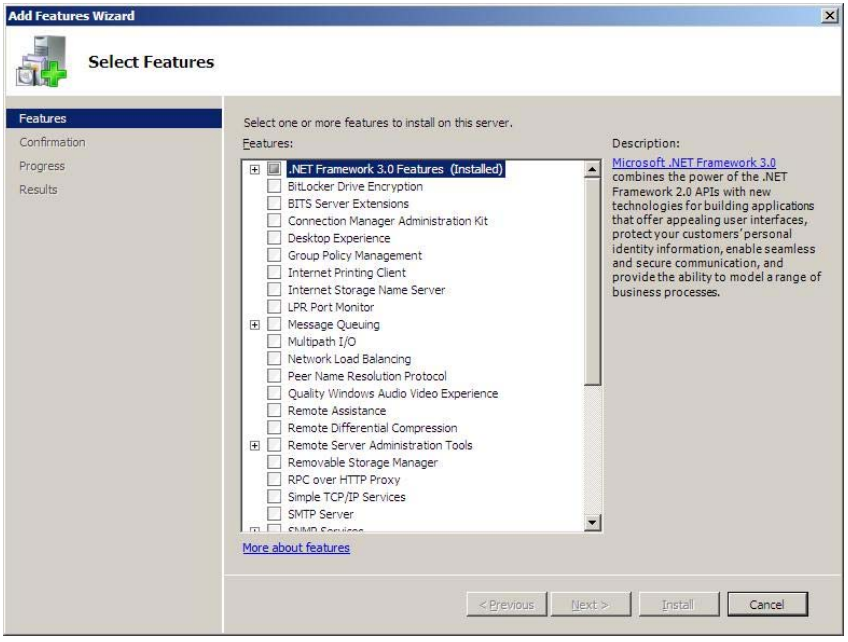
2 Go to Features and then click **Add Features**.

Figure 6 Add Features



3 Select **.NET Framework** and then click **Install**.

Figure 7 Install .NET Framework



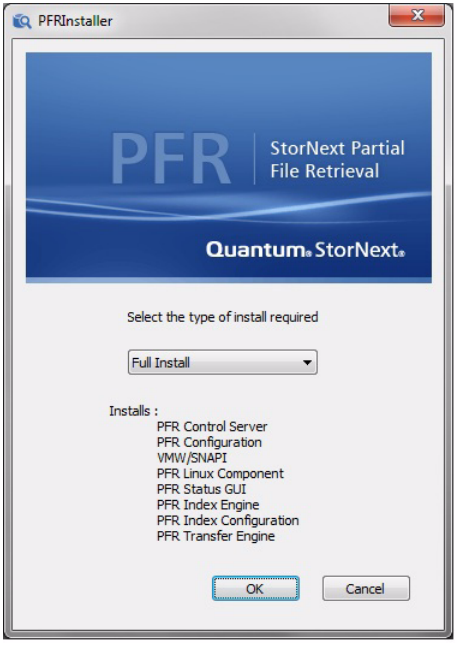
Sharing the StorNext File System

The StorNext file system should be shared via SMB (standard Windows share). The security attributes of the Windows share on the file system must be set to "Full Control."

Installation

The installation starts with an options screen that allows either a "Full Install" or any of the individual components to be installed:

Figure 8 PFR Installer



Select any of the options and press the **Install** button, and then follow the installation instructions to complete the installation. The "normal" installation will be completely performed by selecting "Full Install".

Note: During the installation process you will be asked for a PFR User Name and password: once for the PFR Server installation and once for the PFR Engine installation. Enter the User Account information that was created during the prerequisites stage.

During the PFR Server installation the installer copies, registers and starts the "VM w/ SNAPI and PFR Linux Component". Since this Virtual Machine image is very large, this can take quite a long time to complete. This is completely normal.

Chapter 4
Configuration

Most of the Quantum Partial File Retrieval configuration is handled via a single configuration tool (the Primary Configuration). However, an initial manual configuration step is required before this is run.

In addition, since the PFR Indexer can be installed on a separate machine, this element is also configured separately (although it can be called from the main configuration application if both are installed on the same machine).

SNAPI / PFR Linux Component Configuration

The connection between the PFR Server and the StorNext API (SNAPI) is accomplished via a small Linux application that resides in a Virtual Machine, hosted on the same machine that runs the PFR Server. This requires configuration before it can be used for the first time.

Ensuring that the VM is running

The Virtual Machine will be installed and launched by the PFR Server installer. To launch the Virtual Machine Manager and to ensure that the VM is running, launch the VMWare Server Home Page. There should be

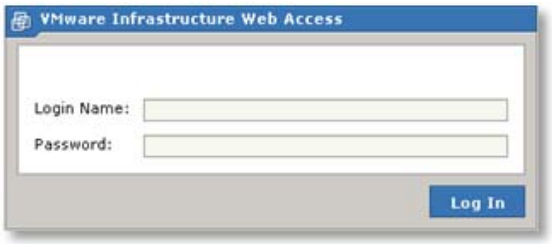
a shortcut to this on the desktop (created when VMWare Server was installed). Alternatively, point your web browser at the following URL:

https://localhost:8333

This will request the following login screen from within your web browser.

Note: You may be warned by your web browser that this site does not have a valid certificate. You should ignore this warning and continue to the site.

Figure 9 VMWare Login



Type the username and password for an account on the current machine which has Administrative privileges.

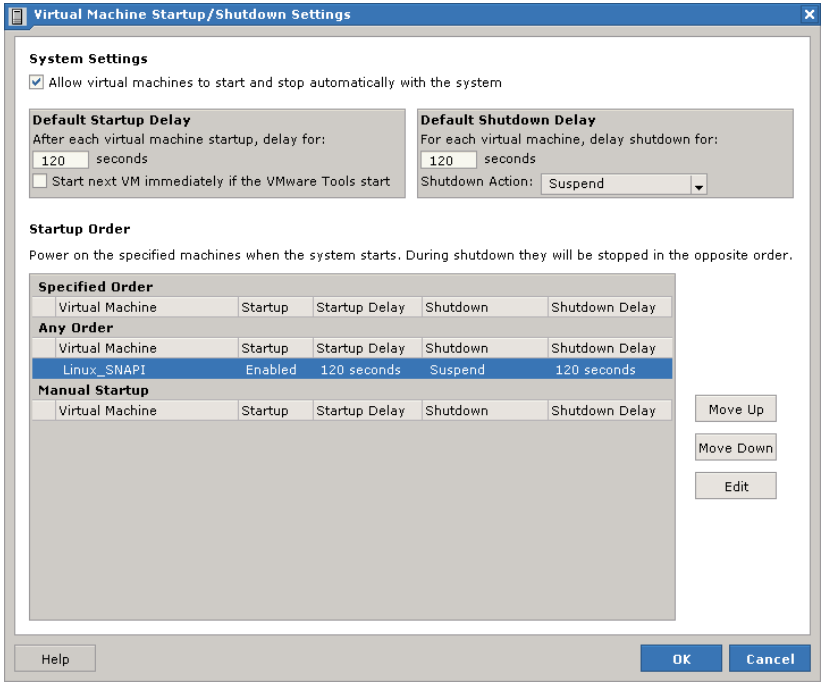
It is necessary to manually configure VMWare Server to automatically start/stop the virtual machines when the Windows host OS starts/shuts down.

To do this:

1 Click the computer name in the **Inventory** tab (not the name of the virtual machine), and select the **Summary** tab.

2 Click **Edit Virtual Machine Startup/Shutdown Settings** (on the far right near the bottom).

Figure 10 Virtual Machine Settings



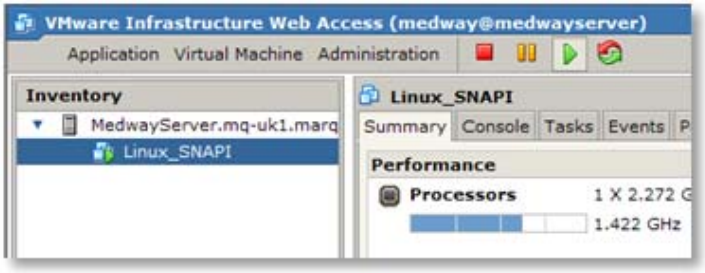
3 Check the box beside **Allow virtual machines to start and stop automatically with the system**, and in the **Default Shutdown Delay** box, select **Suspend**.

4 Highlight the virtual machine in the **Startup Order** list and click **Move Up** to put it in "Any Order".

5 Click **OK** to close the window.

In the Inventory that appears on the left, there should be an item called "Linux_SNAPI". This is the name of the Virtual Machine that runs the "VM w/ SNAPI and PFR Linux Component". It will appear as follows:

Figure 11 Virtual Machine Inventory



Select the Linux_SNAPI item and ensure that it is running. If it is not, start it using the green **Play** button at the top of the screen.

Optional Step: Advanced Network Configuration

This optional step is required only for multiple instances of PFR. If you do not perform this step, proceed to Showing the VM and its GUI on page 27.

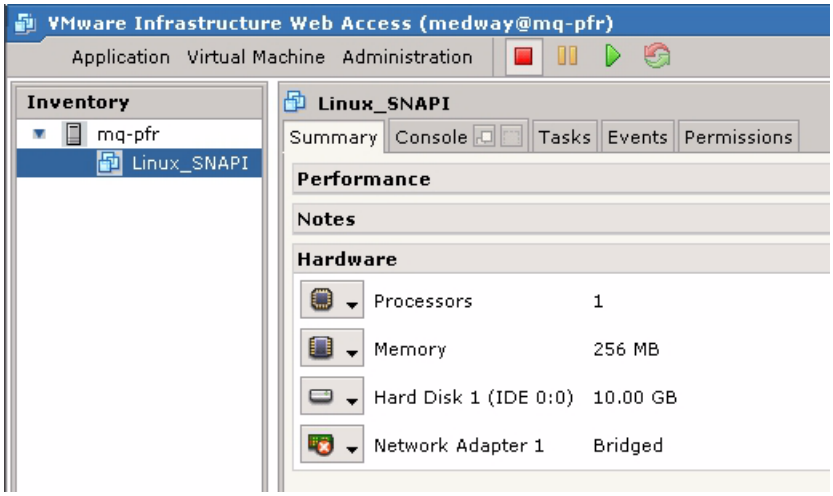
For simplicity of configuration, the SNAPI / PFR Virtual Machine is configured with a fixed Network Card MAC Address. For most scenarios, this configuration will simply work, but in environments where there is more than one Quantum StorNext PFR installation on the network, the following steps are required to ensure that there is not a clash of Network Card MAC Addresses.

For simple configurations where there will never be multiple Quantum StorNext PFR systems installed on the same network, skip this section and continue from Showing the VM and its GUI on page 27.

However, if there is to be more than one installation of Quantum StorNext PFR on the network, perform the following steps.

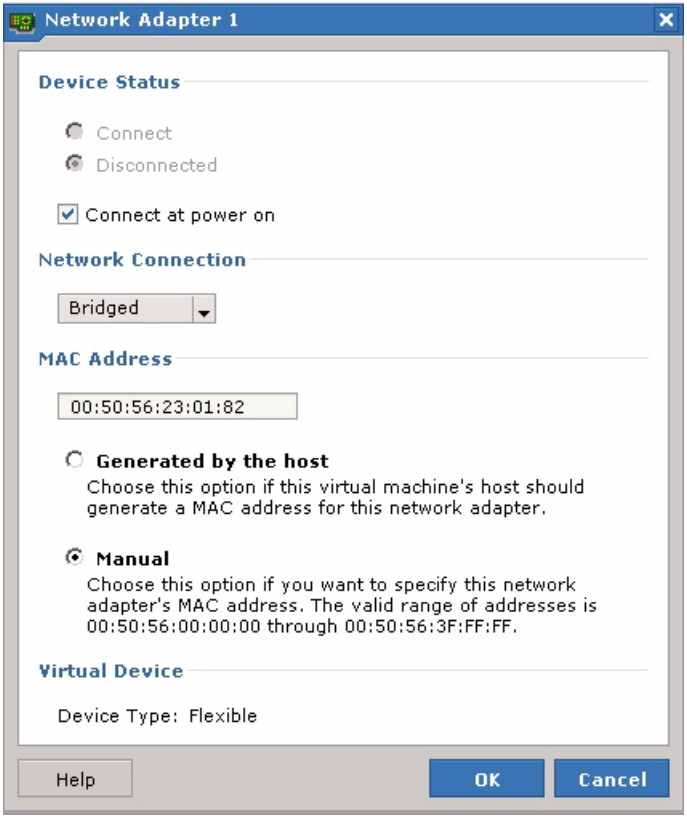
1 Continuing from above, select the **Summary** tab for the Linux_SNAPI:

Figure 12 Summary Tab



2 Press the down arrow to the left of **Network Adapter 1** and select **Edit** to display the **Network Adapter Configuration** window.

Figure 13 Network Adapter Configuration



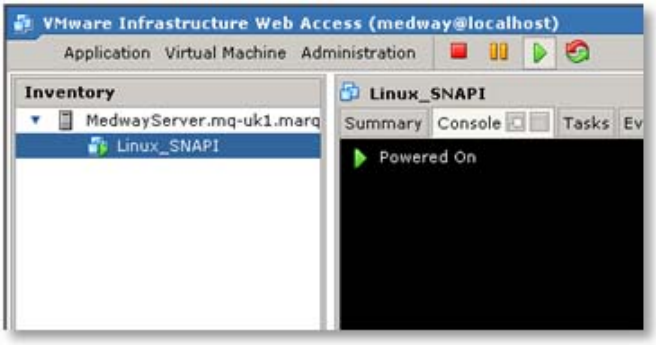
3 The MAC Address shown in the figure (00:50:56:23:01:82) is the default MAC Address for the SNAPI / Linux Virtual Machine. Where there are multiple Quantum PFR Installations on the same network, these MAC addresses must be unique. Quantum suggests achieving this by setting the last digit of the MAC Address to a different value for each Virtual Machine (83, 84, 85 etc).

Change this MAC Address so that it ends in the next unused value (for example 83) and then press **OK**. Continue with the configuration.

Showing the VM and its GUI

1 Continuing from above, select the **Console Tab** for the Linux_SNAPI:

Figure 14 Console Tab



2 Click in the black area of the screen to launch the console. The first time the console is run, it will not be running the GUI and you will be placed at a terminal window with the following prompt:

```
Linux_SNAPI logon :
```

3 Type "**root**" and when prompted for a password, enter "**pfr**" (both without the quotation marks).

4 After logging in, type "**init 5**" to launch the GUI:

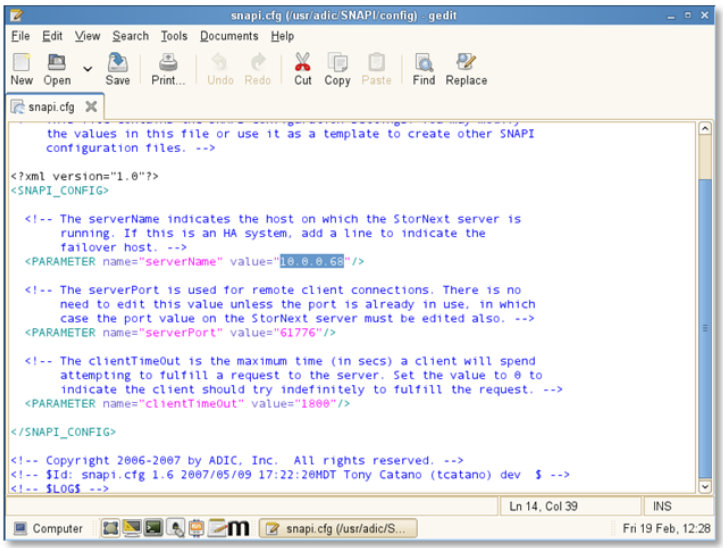
Figure 15 PFR GUI

Setting the Location of StorNext Storage Manager

The first task in setting up the Virtual Machine is to tell the Linux application where the StorNext server is located.

An icon at the bottom of the GUI screen provides a shortcut to the settings: Click this icon to edit the StorNext API Configuration File (snapi.cfg).

Figure 16 Edit SNAPI Configuration File



1 The parameter to change (**serverName**) is highlighted in the illustration above. Change this to the host that is running the StorNext server. There are additional instructions in the configuration file itself.

2 Save the changes by clicking **Save**, and then close the editor.

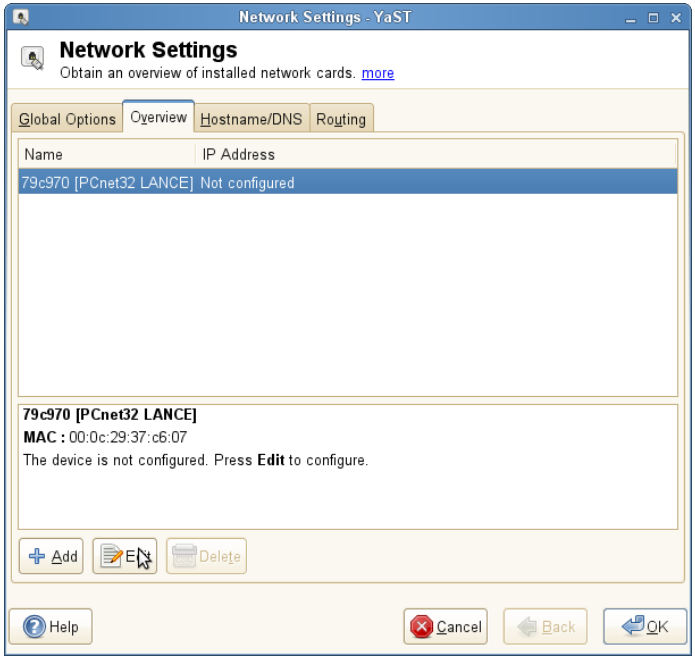
Network Configuration

Network Configuration is necessary to provide the Virtual Machine with a MAC address and an IP Address.

As with the SNAPI configuration, there is a shortcut to Network Settings at the bottom of the console (see opposite): 

Click this shortcut to launch the Network Settings application.

Figure 17 Network Settings Screen



Optional Step: Advanced Network Configuration

This optional step is required only for multiple instances of PFR. If you do not perform this step, continue with network configuration by proceeding to Editing Network Settings.

For a simple network configuration, there will be a single entry in the list shown in the figure. However, if you followed the earlier Advanced Network Configuration section in order to generate a unique MAC Address, there will be two entries shown: one for the new MAC Address and one for the original MAC Address which is no longer present. (The details are shown in the lower panel for the selected item).

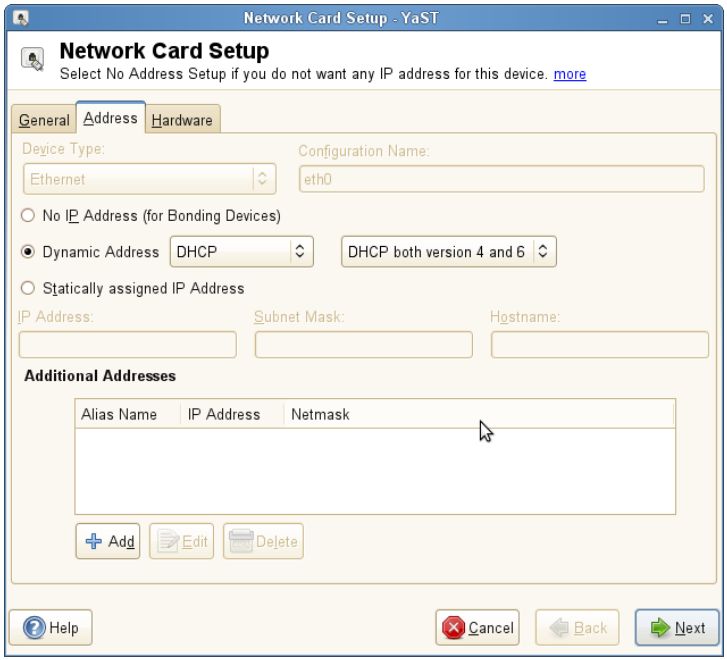
Delete the entry for the old MAC Address, which will be marked “No hwinfo” and will not show an actual MAC Address, leaving only the entry for the MAC Address you created earlier.

Editing Network Settings

Continue with the steps below.

1 Click the **Edit** button to configure the network.

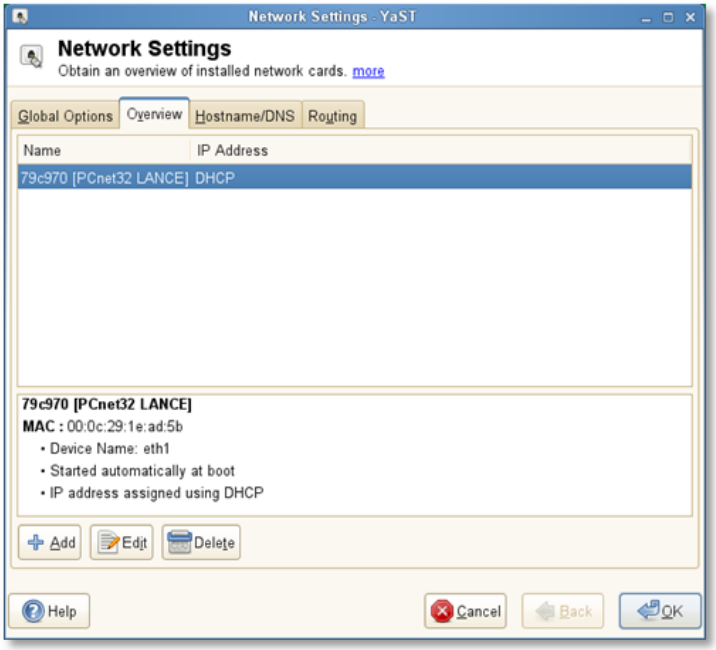
Figure 18 Edit Network Settings Address Tab



2 Set up the network settings according to the requirements of your network configuration. If you are not using DHCP, the specific settings are outside of the scope of this User Guide. Please consult your Network Administrator.

3 Click **Next** to configure. A configuration overview appears.

Figure 19 Edit Network Settings Overview Tab



4 Restart the virtual machine.

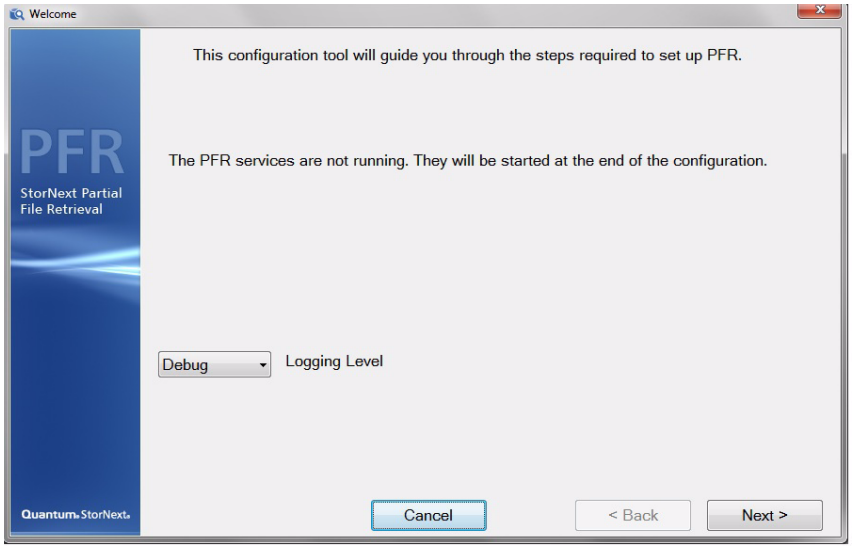
Primary Configuration

The main wizard-based tool guides you through the process of setting up the application. Configuration should only take a few minutes.

Welcome

Use the Welcome screen to select the server's logging level.

Figure 20 Welcome Screen

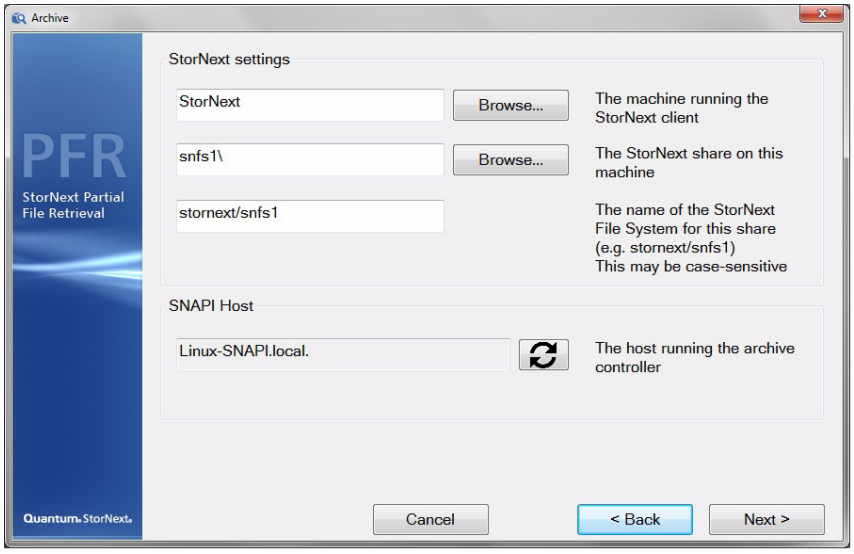


Press **Next** to continue.

Archive

The Archive pane allows you to enter the machine on which the storage resides (the archive host) and the SNFS share on this storage that will be used for access to this storage. These can either be typed in manually or, better, looked up using the "..." buttons.

Figure 21 Archive Screen



The SNAPI Host should be populated automatically. If it does not populate automatically, ensure that the SNAPI application is running in the Virtual Machine and that Bonjour is installed and running (see Chapter 3, Installation).

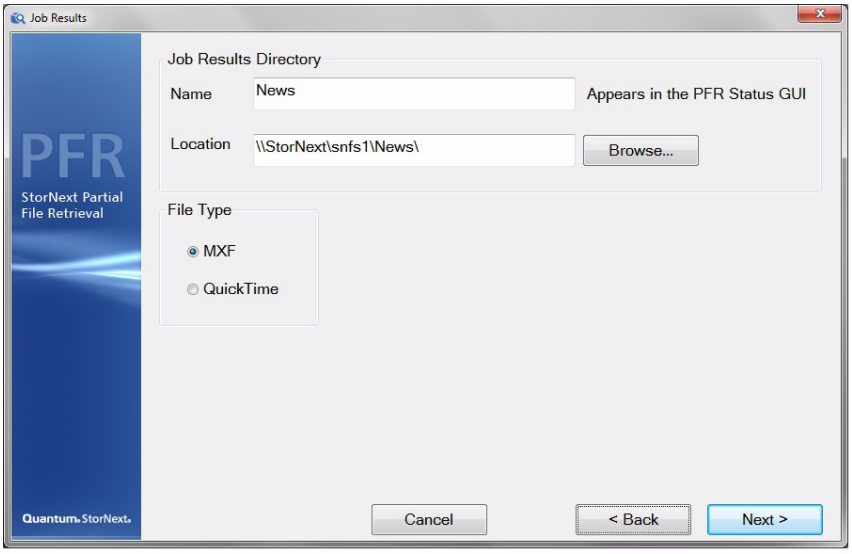
The path where the file system has been mounted on the StorNext system (e.g. stornext/snfs1).

Press **Next** to continue.

Job Results Folder

It is possible to create up to twenty Job Results Folders for the application, each for different roles within your organization (for example, News, Sports and Current Affairs). This page allows you to set up the first of these folders.

Figure 22 Job Results Screen



The **Name** is simply a friendly Name that is displayed in the Status GUI, while the **Location** is the UNC path to the parent location of the folder set (see Folder Structure on page 4).

Finally, select the desired File Type for this Job Result: either MXF (the default,) or QuickTime. Note that this setting will generate partial files of the specified type, irrespective of the source file format.

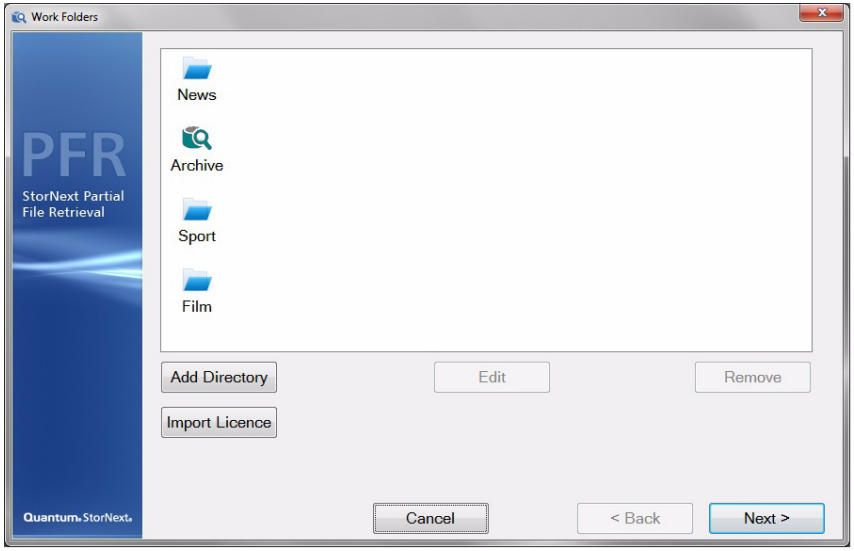
Press **Next** to continue.

Work Folders

At this stage most of the configuration has been completed. The Work Folders page provides a summary of the Archive and Job Results folders that have been set up so far. From this point you can do the following:

- Use the **Add Directory** button to add an additional Job Results folder (up to a maximum of 20), or **Edit** or **Remove** to change or delete previously configured folders
- Use **Import License** to import a permanent license (which replaces the 30-day temporary license provided upon initial installation)

Figure 23 Work Folders Screen



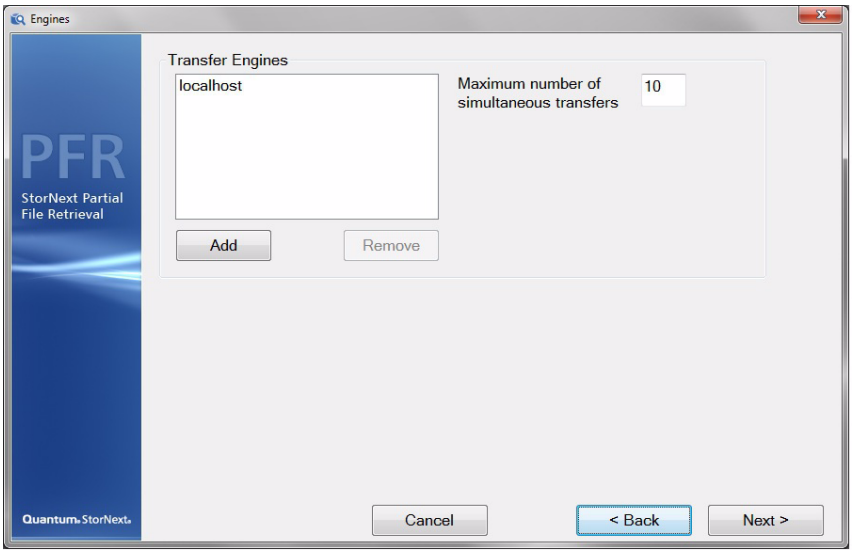
Press **Next** to continue.

Transfer Engines

In a standard installation where everything is installed onto a single machine, there will be only a single Transfer Engine, located on the current machine (localhost). This will be configured automatically and no further configuration is necessary.

However, in more extensive installations where Transfer Engines have been installed on separate Windows server machines, this is the place to specify the location of the separate machines.

Figure 24 Transfer Engines Screen



This window also allows you to specify the number of simultaneous transfers that should be attempted at once. The value entered here should not exceed the number of tape drives available to perform restores.

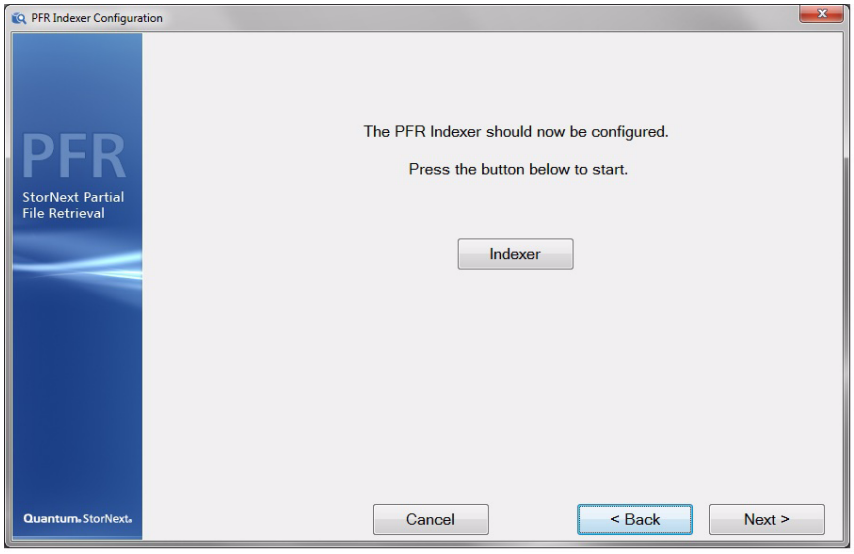
Press the **Next** to continue.

Indexer

Configuring the Indexer is accomplished using a separate application since the indexer might be physically present on a different Windows server machine. However, in case it is present on this machine it can be launched here for convenience. Please see the next section (Indexer Configuration and Monitoring) for more details.

Note that the Indexer configuration can also be launched separately.

Figure 25 PFR Indexer Screen



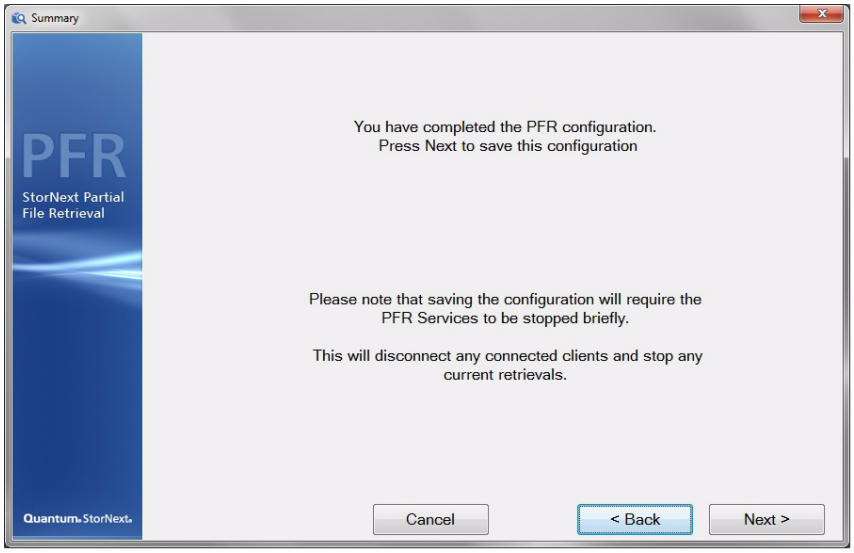
Press the **Indexer** button to launch the indexer configuration. Once complete (or if skipped), press **Next** to continue.

Summary

This page provides a final check before saving and committing the current configuration.

Caution: Saving the configuration restarts all Partial File Restore services and will therefore terminate any in-progress retrievals.

Figure 26 Summary Screen



Press **Next** to continue and save the current configuration.

Complete

The final page indicates whether the configuration has been saved (or else provides details of any problems).

Figure 27 Complete Screen

Indexer Configuration and Monitoring

The Indexer is implemented as a Windows Service. The configuration and monitoring of the service are combined into this application.

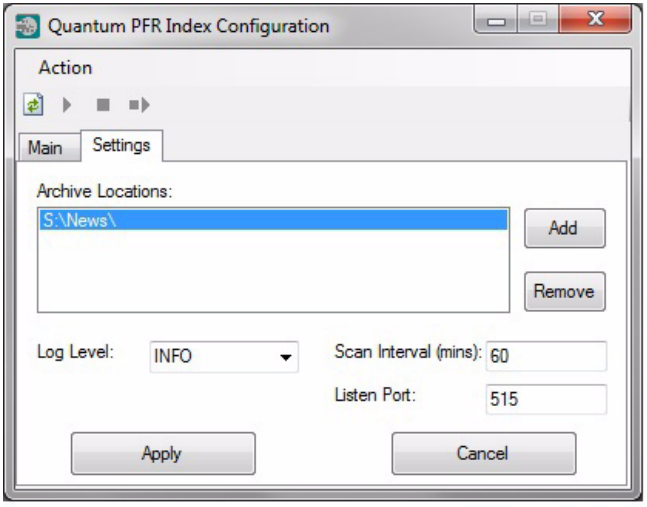
Note: The Indexer service continues to run in the background, even when this application is not running.

This application can be launched either via the main configuration tool (if they are on the same Windows server machine,) or via the Start button.

Configuration

This application contains two tabs: one for configuration and one for monitoring. The second tab is for the configuration (settings):

Figure 28 PFR Index Configuration



On this screen you can do the following:

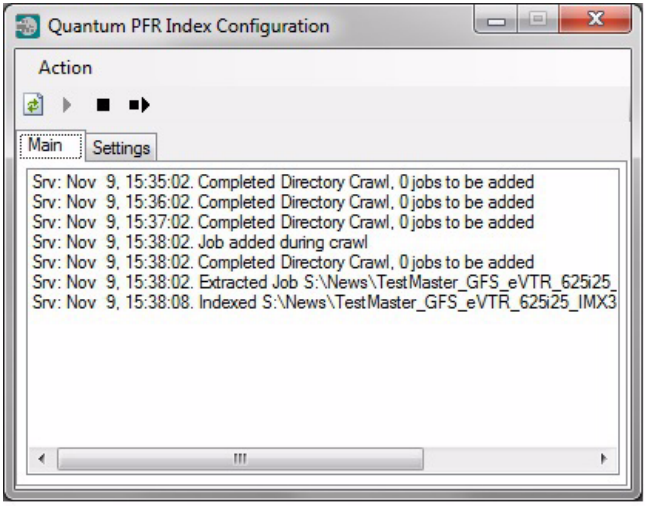
- Set one or more **Archive Locations** for which you would like to create indexes. To make changes, you can use the **Add** and **Remove** buttons on the right, or right-click with the mouse on the **Archive Locations** list. Ideally, the locations entered here will only contain media files.
- Set the **Log** (logging) **level**.
- Set the **Scan Interval** (in minutes). 60 minutes is the recommended interval, but the figure is a balance between speed of indexing and the load the indexer puts onto the storage. there is no benefit in creating indexes as soon as possible as long as they are created before the files are truncated by StorNext Storage Manager.
- The **Listen Port** is the TCP/IP port that this application and the Indexer Service use to communicate on. The default TCP/IP port is 515, and this should not be changed.

After any changes have been made, click **Apply** to save and commit your changes.

Monitoring

The Indexer tool also allows monitoring of the indexing process. As the Indexer Service scans the configured Archive Locations, log messages are written to the Log Window:

Figure 29 Indexer Log Window



It is also be possible to stop / start the Indexer Service using the toolbar buttons near the top of this screen.

Licence Process

When the Quantum PFR Configuration tool is first run, it installs a 30-day evaluation licence. This licence is permanently attached to the PFR Server Machine and will not be reset by reinstalling Quantum PFR.

At the time the evaluation licence is generated, a token file is also generated and placed onto the Windows Desktop. This file is called "<PFRSERVER> PFR Product Token.txt", where <PFRSERVER> is the machine name of the Windows Server running the PFR Server.

In order to obtain a permanent licence, you must send this PFR Product Token file to your Quantum representative, who will provide you with the corresponding permanent licence. Once you have the permanent

licence file (whose filename ends in .LIC), place it on the Windows Desktop alongside the token and use the “Import Licence“ button from the PFR Configuration Tool to browse to the Windows Desktop and import the licence into Quantum PFR.

Chapter 5

Using the Status GUI Application

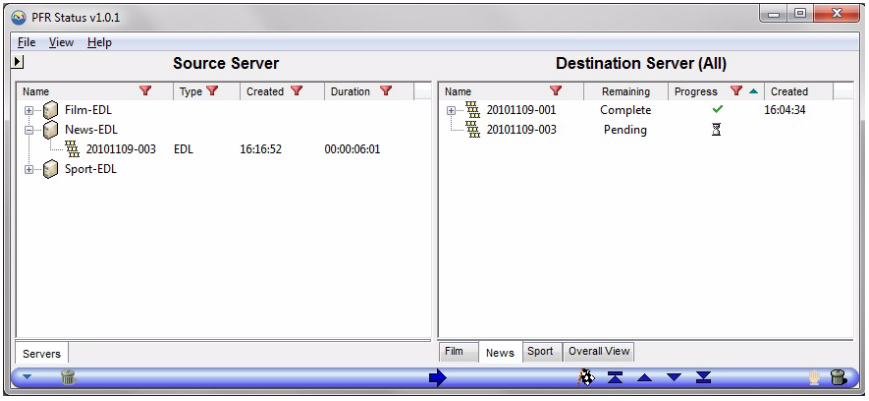
By default, the PFR Services should handle all retrieval requests automatically. However, should you wish to monitor the process, manipulate the pending requests or look at the log files, this can all be done using the Status GUI application.

Anatomy of Status GUI

The left side of the Status GUI screen lists the PFR source requests, which are the XML request files that have not yet been processed, categorized according to the folder sets defined in the configuration.

On the right are the destinations: one tab (along the bottom) for each configured folder set. The entries on the right represent pending, in-progress and complete (or failed) retrievals.

Figure 30 Status GUI Screen



Manipulating the Retrievals

The following actions can be performed on retrievals using the Status GUI. In the following descriptions, any action will reflect the selected transfer.

- **Prioritization**. Using the set of five buttons below the **Destination Servers**, a pending transfer can be given high or lower priority by moving the pending transfer to the top, up, down or bottom of the list. All high priority transfers will take place before all standard priority transfers.
- **Delete**. Using the trash icon in the bottom right, pending transfers can be removed. That also cancels active retrievals and deletes any complete transfers (it will remove the partial file).
- **View Log File**. From the **Help** menu it is possible to view the current log file. If the Status GUI is run on the same machine which runs the main PFR services, this will be the log file which also contains all of the retrieval information.

Chapter 6

Request EDL Format

The following example Request XML file should provide sufficient details to allow for creating requests.

Quantum does not recommend “hand creating” XML files. XML files should be created by a MAM or similar application.

Sample

```
<?xml version="1.0" encoding="utf-8"?>
<MarquisEDL version="2.0">
  <FrameRate>DF</FrameRate>
  <ClipList>
    <Clip>
      <UID>ID1234567891</UID>
      <Title>MyFirstPFR</Title>
     <File>//MyServer/SNFS1/Dir1/Dir2/MySourceClipFile.mxf</File>
      <Start>10:01:30;10</Start>
      <End>10:02:15;09</End>
      <NumberVideoTracks>1</NumberVideoTracks>
      <NumberAudioTracks>4</NumberAudioTracks>
    </Clip>
  </ClipList>
</MarquisEDL>
```

Notes

FrameRate	“25”	: PAL
	“DF”	: NTSC Drop Frame
	“NDF”	: NTSC Non Drop Frame
	“50”	: 50 frames per second
	“60NDF”	: 60 frames per second
	“60DF”	: 59.94 frames per second
	“24NDF”	: 24 frames per second
	“24DF”	: 23.976 frames per second
Clip	There can only be one clip provided	
UID	A unique ID for the source clip, but otherwise not used	
Title	Name of the (partial) output file	
File	The full UNC path to the source file on the StorNext managed storage	
Start	Start timecode of partial clip to be retrieved	
End	End timecode of partial clip (inclusive - e.g. timecode of last frame of partial clip)	
NumberVideoTracks	Number of video tracks in source clip. Should always be “1”	
NumberAudioTracks	Number of audio tracks in source clip	

Chapter 7

Performance and Scalability

The performance of Quantum PFR will be affected by a number of factors, and the interactions are complex. This chapter provides some guidelines, but actual performance depends largely upon the environment in which it is run.

Performance

Indexer

The Quantum PFR Indexer usually starts to index a file within two or three hours of it being written, although the StorNext policy should be set to truncate files no sooner than 24 hours.

The performance of the indexer is influenced by a number of factors, including:

- The file wrapper type - MXF files require a greater effort to index than QuickTime files
- The size and duration of the files. Of course, longer files will take longer to index, but a longer file can be indexed more efficiently than a number of smaller files of the same total size / duration.

Based upon the recommended hardware listed in Suggested Platform on page 53, tests have shown that the Quantum PFR Indexer can index a

24GB MXF file in approximately 6 minutes. This would equate to 5.4 TB or 120 hours of HD material at 100 Mb/s in a 24 hour period.

Note on Existing Archives

There is no requirement to index files before they can be retrieved by Quantum PFR. Where no index file yet exists, Quantum PFR retrieves the whole file from tape and then extracts the required partial file from the whole file.

This whole file would then be indexed before it was truncated again, meaning that the index would be available for subsequent requests. While this is less efficient than a strictly partial retrieval from tape, it does allow Quantum PFR to begin to operate on an existing archive straight away.

Partial File Retrieval via Index from Tape

Like the Quantum PFR Indexer, there are a number of factors that affect the performance of the retrieval from tape:

- There is a fixed overhead for the tape handling, working on worst case assumption that each retrieval requires unloading the previous tape and loading the new tape. A slightly conservative estimate value of three minutes is assumed for this process.
- There is an additional overhead of approximately 30 seconds for Quantum PFR to submit the request to Storage Manager, detect the completion of the partial file, generate headers for the partial file and tidy up at the end of the transfer.
- Retrieval from Tape to Spinning Disk (which is very fast).
- Subsequent creation of the partial file.

Taking into consideration the overheads, the average sustained data rate for the re-wrapping the partial file (averaged over 24 hours) would be no less than 100 Mb/s.

Very Short Partial Retrievals

With very small retrievals, the tape handling overhead tends to be the largest part of the time taken to perform a partial file retrieval. In this case, the total capacity of the system tends towards being limited by the total number of retrievals requested. Assuming approximately four minutes of overhead per transfer, when the transfers are very short

there will be a limit of approximately 15 transfers per hour or 360 transfers per day, per tape drive in the system available for restores.

Longer Partial Retrievals

With longer retrievals where the tape handling overhead is smaller than the time to create the partial file, it should be possible to drive the system in such a way that the tape system is kept busy getting ready for the next restore, while the previous partial file creation is being performed. Therefore, with longer partial retrievals, the limiting factor becomes the network bandwidth averaged over 24 hours (100 Mb/s).

Based upon a 100 Mb/s averaged network bandwidth, the point at which the tape handling overhead becomes smaller than the partial file creation would be approximately 3GB for the partial file.

This would equate to approximately 1TB of material being retrieved within 24 hours, which would equate to approximately 20 hours of HD material at 100 Mb/s.

100Mb/s is a very conservative estimate based on averaging the total system performance over a 24 hour period, assuming a mix of long and short retrievals. The peak re-wrapping performance would be expected to be several times faster than this average, showing a relative improvement in total performance for longer retrievals.

File and Folder Structure Limitations

Quantum PFR Indexer

The Quantum PFR Indexer maintains a memory image of the indexed folder and file structure during the indexing process. This will scale to millions of files and folders.

Note that the implementation of the Quantum PFR Indexer is geared around there not being a huge number of files per folder (less that 5,000). A very large number of files in each folder is more processor intensive to index than the same number of files, spread between a larger number of folders and will have a small detrimental impact upon indexing performance.

Quantum PFR Server

The Quantum PFR Server does not hold information about the files and folders to be restored, and is therefore unaffected by the size of the archive.

Scalability

Quantum PFR performance for both the Indexer and the Retrieval Process is determined largely by the available network bandwidth.

Standard Windows Server monitoring tools (such as Resource Monitor in Server 2008R2) can be used to establish whether the storage connection bandwidth is being fully utilized a large percentage of the time.

There are several ways in which the Quantum PFR system can be expanded in order to enhance performance.

Distributing the Load

- Installing the Quantum PFR Indexer onto a separate machine separates the indexing network bandwidth from the partial file retrieval network bandwidth. This would be beneficial if there is a large amount of new material being added to the system.
- Installing an additional Quantum PFR Transfer Engine on separate hardware also spreads the load of the retrieval bandwidth. This would be beneficial when there is a large number of partial retrievals being performed.

Dedicated Tape Drives

As long as network bandwidth is not a limiting factor and retrievals are from different tapes, greater throughput of the Quantum PFR system will be obtained by adding more Tape Drives to the system, dedicated to retrievals.

Suggested Platform

- Windows server 2008 R2 (64 bit)
- ≥ 2 CPUs with ≥ 2GHz clock speed
- ≥ 4GB RAM
- ≥ 8GB RAM for archive of > 1,000,000 files
- ≥ 20GB available local disk space after the pre-requisites have been loaded
- ≥ 2Gb/s Fibre-Channel connection to SAN
- Ethernet NIC for PFR status GUI access