Tivoli software

IBM ®

Tivoli Storage Manager for Space Management in a mixed GPFS cluster environment

TSM for Space Management in GPFS cluster environments with WINDOWS and UNIX nodes

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http://www.ibm.com/software/sysmgmt/products/support/Field_Guides.html

Authors can submit proposals and access papers by e-mail:

mailto:Tivoli_eSupport_Feedback@us.ibm.com

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Tivoli Storage Manager for Space Management in a GPFS cluster environment with WINDOWS and UNIX GPFS nodes in one cluster

1. Introduction

1.1 About this Field Guide
This article covers the basic setup and usage of the IBM Tivoli Storage Manager for Space Management client (UNIX HSM client) in a mixed GPFS cluster environment. Mixed GPFS cluster environment means, that there are several cluster nodes with different operating systems running in the GPFS cluster. It also deals with the integration of the Tivoli Storage Manager Backup/Archive client in such a GPFS cluster environment.

1.2 Link section for TSM
There are several helpful web pages for the Tivoli Storage Manager for Space Management.
General documentation:
http://publib.boulder.ibm.com/infocenter/tsminfo/v6r3/index.jsp
The Tivoli Storage Manager for Space Management FAQ:
http://www.ibm.com/support/docview.wss?uid=swg21474412
The Tivoli Storage Manager for Space Management and GPFS integration Field Guides:
http://www.ibm.com/support/docview.wss?uid=swg27020987
http://www-01.ibm.com/support/docview.wss?uid=swg27018848
Tivoli Storage Manager for Space Management on Linux requirements
http://www-01.ibm.com/support/docview.wss?rs=663&tc=SSGSG7&uid=swg21248771
Tivoli Storage Manager for Space Management on AIX requirements
http://www-01.ibm.com/support/docview.wss?uid=swg21248419
Tivoli Storage Manager HSM for Windows
http://www-01.ibm.com/software/tivoli/products/storage-mgr-hsm/

1.3 Link section for GPFS
Please refer to the links below for GPFS documentation.
General GPFS documentation
http://publib.boulder.ibm.com/infocenter/clresctr/vxrx/index.jsp?topic=/com.ibm.cluster.gpfs.doc/gpfsbooks.html
Installation and Basic Configuration Guide for IBM GPFS v3.4 on Microsoft Windows
http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101994
Configuring a mixed Windows and UNIX cluster
http://publib.boulder.ibm.com/infocenter/clresctr/vxrx/index.jsp?topic=%2Fcom.ibm.cluster.gpfs.v3r5.gpfs300.doc%2Fbl1ins_conwinmixed.htm

1.4 The IBM Tivoli Storage Manager for Space Management (HSM) client for UNIX

The Tivoli Storage Manager for Space Management is a hierarchical Storage Management solution (also known as HSM). A HSM solution typically moves data (files) from online local storage (disks) to backend storage like tapes and just leaves small stub files in the local storage. The stub file consumes just minimal space but leaves all metadata information on the local storage in a way that for an user or a program the file looks like a normal local stored file. When an user or a program accesses the file, the HSM solution automatically recalls (moves back) the files from the backend storage and gives the reading application access to the files when all the data is moved back online. The backend storage for the Tivoli Storage Manager for Space Management (HSM) is the Tivoli Storage Manager Server which handles the tier2 (disk storage) and tier3 (tape storage) of the storage hierarchy. That means Tivoli Storage Manager for Space Management virtually extends the managed file system with the space provided by the TSM server. Migrating files to the TSM server frees up space for new data on your local file system and takes advantage of lower cost storage resources that are available in your network environment.

The whole functionality to perform the virtual file space expansion is implemented in the product itself. The Tivoli Storage Manager for Space Management on AIX supports GPFS (General Parallel File System) and JFS2 file systems. The Tivoli Storage Manager for Space Management on Linux (System x) supports GPFS. Please note this Field Guide only refers to the Tivoli Storage Manager for Space Management clients for the GPFS file system support on AIX and Linux.
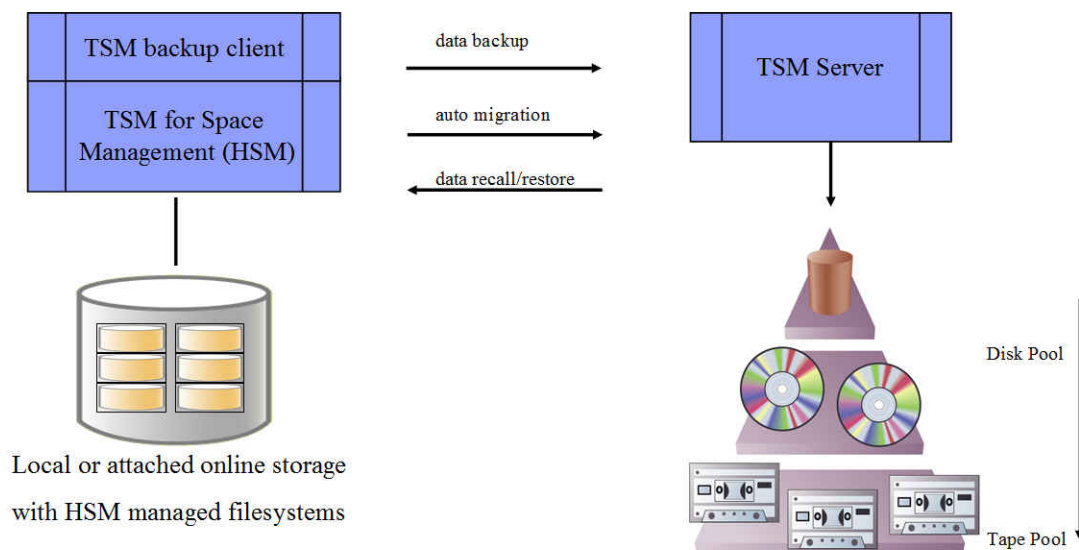
[Fig. 1.0 – Basic Tivoli Storage Manager for Space Management model]

1.5 The IBM General Parallel File System (GPFS)
GPFS is IBM´s high performance parallel file system which is basically a cluster file system which has the capability of concurrent read and write access to the same files. The entire file system is striped across all disks in one pool. It is possible to build up GPFS clusters with several nodes across the world. You can also have a setup of different operating systems on the GPFS nodes in one GPFS cluster or mount the GPFS file systems across the clusters. With GPFS you can setup different GPFS storage pools based on different disk types. For example very fast disks for important files with frequent access or slower disks for files which are accessed not very often. GPFS is supported on several operating systems, like AIX, Linux System x, Linux System p and Windows.
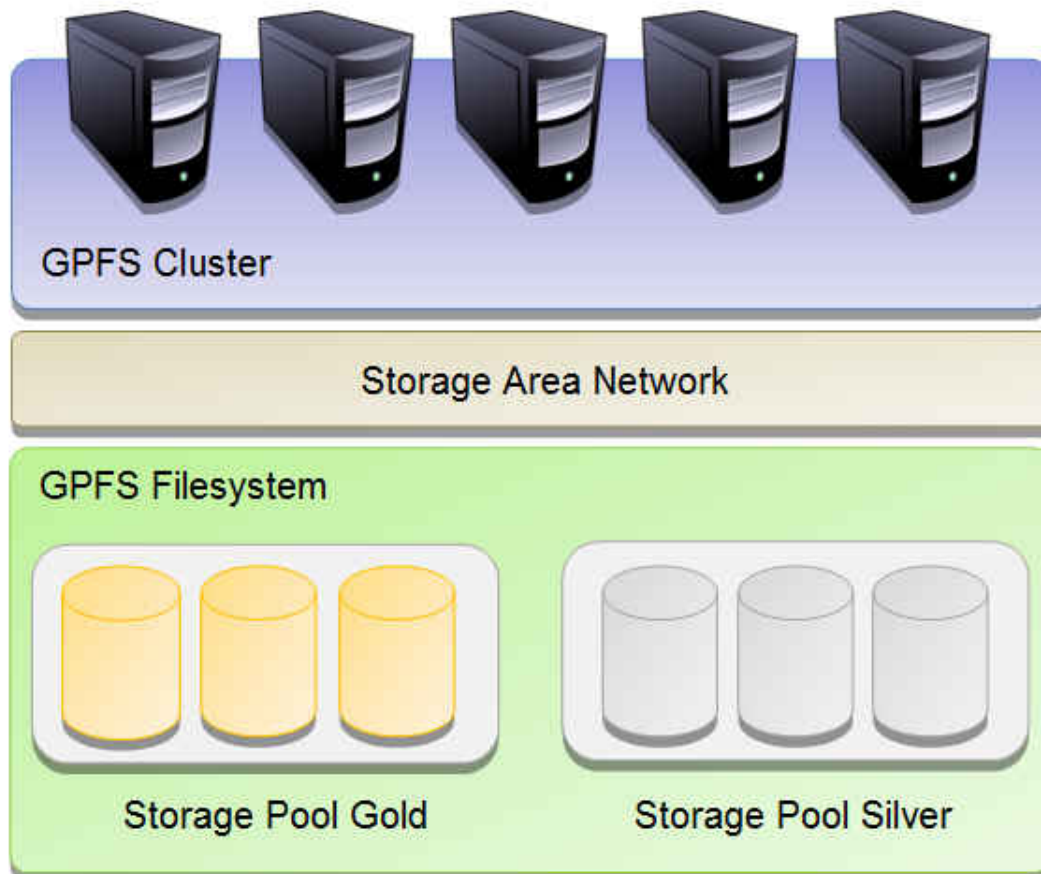
[Fig 1.1 – Example of a basic GPFS cluster with 2 different storage pools]

For more details and documentation about GPFS please see the topic "Link section for GPFS" on page 1 and open the GPFS info center web page.

1.6 Tivoli Storage Manager for Space Management and General Parallel File System (GPFS)
There is a deep integration of the Tivoli Storage Manager for Space Management as well of the Tivoli Storage Manager Backup/Archive client with GPFS.
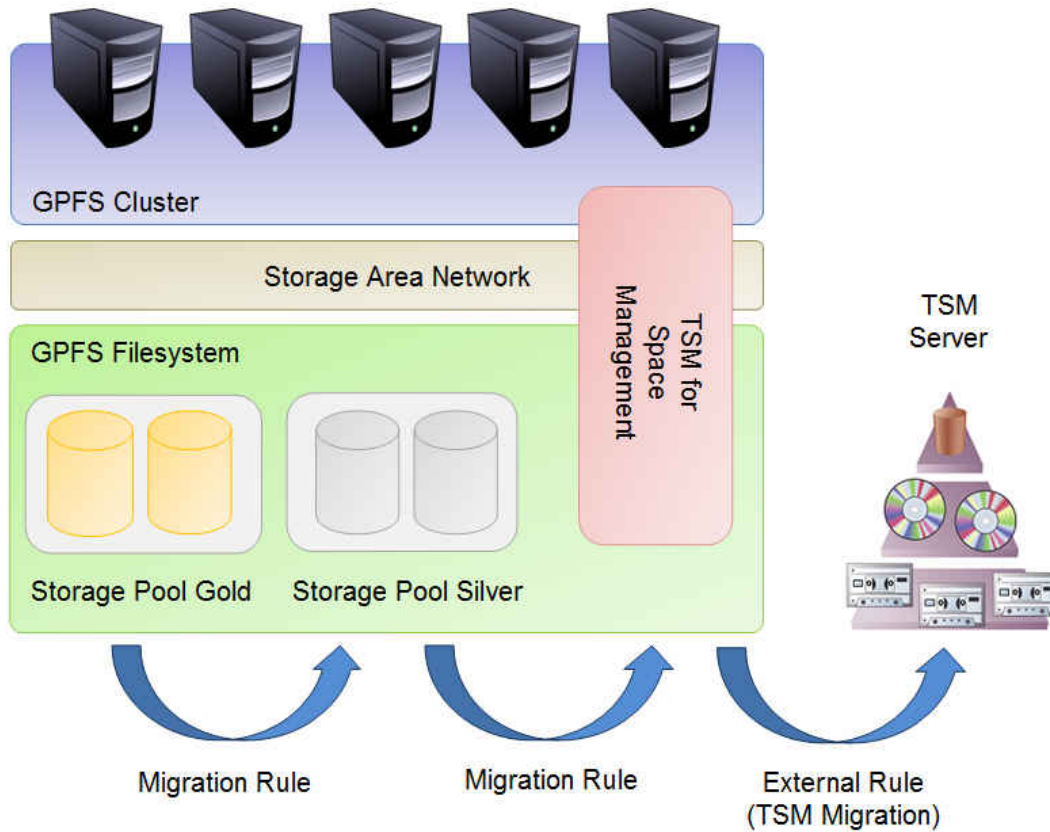
[Fig. 1.2 – Basic Tivoli Storage Manager for Space Management and GPFS integration model]

For details concerning GPFS driven migration and Tivoli Storage Manager for Space Management see the chapter "Link section for TSM" on page 1 and open the field guides.
For integration of the Tivoli Storage Manager Backup/Archive client and the Tivoli Storage Manager for Space Management (HSM client) see the link to the TSM info center in chapter "Link section for TSM" on page 1.

2. General Tivoli Storage Manager for Space Management client support

The Tivoli Storage Manager for Space Management on AIX supports GPFS (General Parallel File System) and JFS2 file systems. The Tivoli Storage Manager for Space Management on Linux (System x) supports GPFS. Please note this Field Guide only refers to the Tivoli Storage Manager for Space Management clients for the GPFS file system support on AIX and Linux.

The details you can find in the chapter "Link section for TSM" on page 1

3. General Tivoli Storage Manager for Space Management and Backup/Archive client setup

Here is a short general overview of the installation and setup of the Tivoli Storage Manager API, the Tivoli Storage Manager Backup/Archive client and the Tivoli Storage Manager for Space Management client. It is essential that you get familiar in detail how this works by reading the manuals of the clients first, which you can find in the TSM infocenter mentioned in the link section on page 1. You should do that first, before you proceed here.

3.1 GPFS
Before you start with installing the TSM clients, the GPFS installation and cluster setup needs to be successfully finished:
- Enable the cluster nodes to run GPFS (for example ssh setup, attach storage and so on)
- Install GPFS on all nodes in your cluster
- Create the GPFS cluster and create the file systems
- Start the GPFS cluster and check configuration. Here you can use for example the GPFS commands
  mmlscluster, mmlsconfig and mmgetstate –a
- All GPFS file systems which will later be added to the Tivoli Storage Manager for Space Management client
  (HSM management) need to be DMAPI enabled. After enabling DMAPI for these file systems you can only
  mount these file systems if there is at least one dsmrecall daemon in the cluster running.

Please refer to the GPFS info center for a detailed GPFS installation instruction (see link section for GPFS on page 1).

It is very important that you do not proceed with installing the TSM clients, if the GPFS cluster is not correctly up and running.

3.2 TSM clients
There are three TSM clients which need to be installed in general. They all have to have the same version in the whole GPFS cluster. The API, the Backup/Archive client and the HSM client itself also need to have the same version. All GPFS nodes which you install with the TSM clients need to have the same GPFS version.
- **The Tivoli Storage Manager API**
Install the Tivoli Storage Manager API on all nodes where you plan to run the Tivoli Storage Manager Backup/Archive client. Note, the Backup/Archive client is prerequisite for the Tivoli Storage Manager for Space Management client.
- **The Tivoli Storage Manager Backup/Archive client**
Proceed then with the installation of the Tivoli Storage Manager Backup/Archive client on all nodes where you plan to run backup. This depends on the amount of GPFS file systems you want to backup and the amount of files. With the TSM Backup/Archive client you can for example backup GPFS file system A from node A and GPFS file system B from node B. Or you can perform backups in one GPFS file system in parallel from different GPFS nodes.

- **The Tivoli Storage Manager for Space Management client**
Before you proceed installing the Tivoli Storage Manager for Space Management client (HSM client) you need to ensure several things:
1. All GPFS nodes can talk to each other via ssh for example and transfer repository files.
2. All nodes, where you want to add GPFS file systems to HSM client management, need to see and access the GPFS file systems.
3. Another very important step before installing the Tivoli Storage Manager for Space Management client is, to setup the TSM options files. You should do that right after installing the Tivoli Storage Manager Backup/Archive client. Do so on each node where you want to install the HSM client.
There are two option files. The dsm.opt and the dsm.sys file. Please refer to the manuals and sample files. To access files which were migrated by the HSM client to the TSM Server, you need to have the correct dsm.opt and dsm.sys files setup on all GPFS nodes in the cluster, where you have HSM running. Either you can copy those two files to all GPFS nodes in the cluster or use the ASNODE option setup. You find ASNODE option setup in the TSM info center.
4. You need to set DSM_CONFIG and DSM_DIR to correct directory. Please see TSM info center.
Note: On which nodes in the GPFS cluster you install the Tivoli Storage Manager for Space Management client depends also on the amount of file systems you want to manage and the amount of files. The HSM client management works by file system, so you can add management by file systems. If you have several file systems you want to manage by HSM, you can distribute that between the GPFS nodes in the cluster. For example on GPFS node A, manage file system A, B and C and on GPFS node B manage file system D and E. For Backup/Archive and HSM client integration you need to have both clients installed on same node and using the same TSM server instance. For example, if you want to run a backup on an already migrated file (stub file), this will lead to an inline copy on the TSM server and not to a recall. If you want to restore a file, you can use stub restore which only restores stub files in the file system instead of the whole content of the file.

Please read next section, to get an overview how the Tivoli Storage Manager for Space Management client supports mixed GPFS clusters.

4. Support in mixed GPFS clusters

The Tivoli Storage Manager for Space Management (HSM on UNIX) does support mixed GPFS clusters. That means that you can setup a GPFS cluster with several nodes as shown in Fig. 1.1/1.3 and with different operating systems. Please note that there are some restrictions which will be shown in this section. Most important is, that in a mixed GPFS cluster you can only install and run the Tivoli Storage Manager for Space Management client on one operating system type. You can either choose to run the Tivoli Storage Manager for Space Management client on the AIX nodes or on the Linux nodes. It is not supported and will cause problems, if you mix the Tivoli Storage Manager for Space Management client installations across the operating systems. This is the same for the integration between the Tivoli Storage Manager Backup/Archive client and the Tivoli Storage Manager for Space Management client, means you should run your backup on the same nodes where you run the HSM client and where you have managed file systems. Please see charts below.
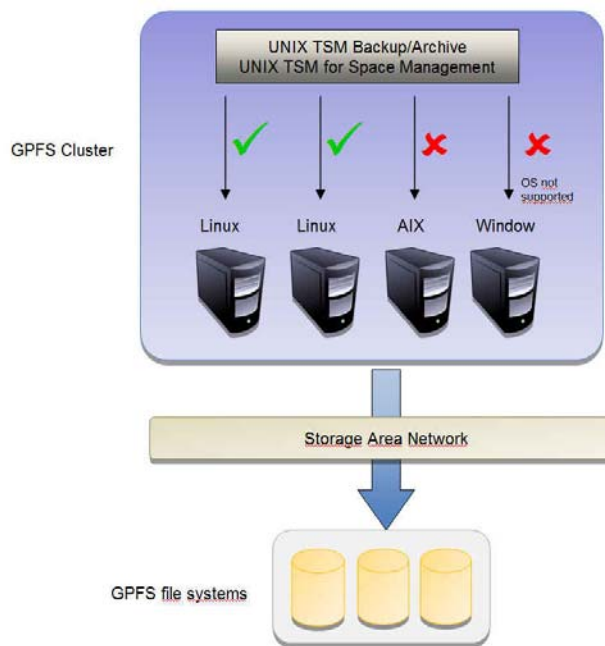
[Fig. 1.3 – GPFS cluster with TSM clients installed and running on the Linux nodes]

Fig. 1.3 shows a GPFS cluster with 4 nodes and 3 different operating systems on the cluster. There are Linux, AIX and Windows nodes in the cluster. Beside the fact, that the Tivoli Storage Manager for Space Management does not support Windows, you can see that in this figure the TSM clients are running only on the Linux nodes, not on the AIX node. Such a setup is supported.
Please note, there is a Tivoli Storage Manager HSM for Windows client available for Windows, but it only supports NTFS file systems, not GPFS, so that we do not talk about this one in this field guide at all.
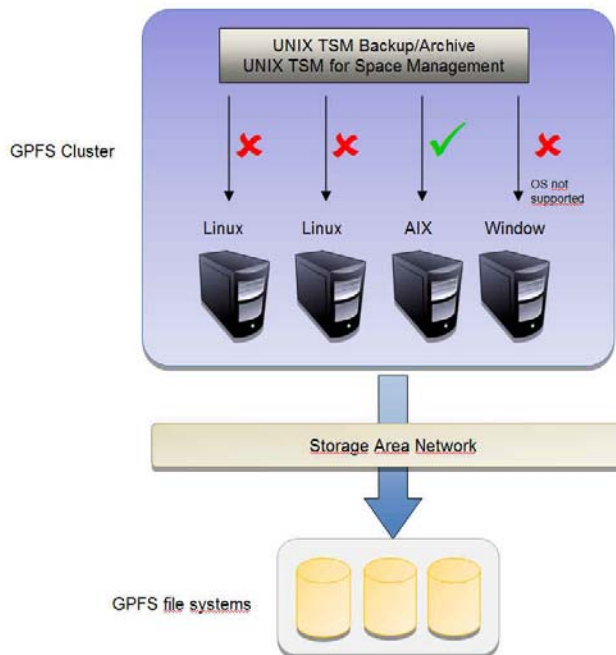
[Fig. 1.4 – GPFS cluster with TSM clients installed and running on the AIX node]

Fig. 1.4 shows a GPFS cluster with 4 nodes and 3 different operating systems on the cluster. There are Linux, AIX and Windows nodes in the cluster. Beside the fact, that the Tivoli Storage Manager for Space Management does not support Windows, you can see that in this figure the TSM client is running only on the AIX node (for sure there can be more AIX nodes), not on the Linux nodes. Such a setup is also supported.

Note: If you have setup the Tivoli Storage Manager for Space Management client on one operating system, for example on Linux, it is very difficult to change/move to AIX as operating system for the HSM client. There are different binary formats of the attached attributes, which do prevent easy move from Linux to AIX or the other way round.

5. Hints and tips for the Tivoli Storage Manager for Space Management in mixed GPFS clusters

5.1 General
There are some special cases which need to be mentioned to work with the Tivoli Storage Manager Backup/Archive client and the Tivoli Storage Manager for Space Management client in such mixed GPFS cluster environments.
- To mount a DMAPI enabled GPFS file system you need at least one dsmrecall daemon running in the GPFS cluster.
- Selective migration and recall will only work on the nodes in the cluster which are running the Tivoli Storage Manager for Space Management client. But if an application or user accesses a migrated file (stub file) on any node in the cluster, a transparent recall will be triggered on the HSM client management owner node, so that the file gets recalled. Any application or user in the GPFS cluster who fills up a file system (also on any node not installed with the Tivoli Storage Manager for Space Management client) will trigger an automigration. This automigration will run on the HSM client management owner node and free up space.
- A backup can be started from all nodes in the GPFS cluster where the TSM Backup/Archive client is installed. There is also a Windows Backup/Archive client available and could run from Windows node in the GPFS cluster (if installed) and backup the GPFS file systems in the cluster. This is not recommended. This will lead to massive recalls, driven by the HSM client running on the UNIX node, because there is no

integration between the WIN Backup/Archive client and the UNIX HSM client. So the Backup should run on the UNIX GPFS nodes, where also the Tivoli Storage Manager for Space Management client is installed.
- Adding a GPFS node with a Windows operating system to an existing GPFS cluster with UNIX nodes and Tivoli Storage Manager for Space Management running, requires a GPFS version (same version on all nodes in the whole GPFS cluster) which does support mounting a DMAPI enabled file system on Windows. Please refer to the GPFS infocenter in the link section on page 1.
- To add a Windows node to a GPFS cluster you need to prepare it carefully. There are several important steps and it is recommended to read the "Installation and Basic Configuration Guide for IBM GPFS v3.4 on Microsoft Windows". Please see the link section on page 1.
 Beside others, some examples below:
  - install the required Windows patches for GPFS
  - disable the Windows firewall
  - install subsystem for UNIX based applications and some utilities
  - open ssh setup needs to be done across whole GPFS cluster
  - assign a drive letter for the GPFS file systems you want to mount on the Windows node
  - set mmchconfig dmapiAllowMountOnWindows=yes to be able to mount DMAPI enabled GPFS file system on Windows node

5.2 Working on the Windows node in a mixed GPFS cluster

After setting up the whole GPFS cluster including the Windows nodes, the Tivoli Storage Manager for Space Management on at least one UNIX GPFS node, enabling the DMAPI for the GPFS file systems and adding the file system to HSM management, for sure you can also work on that file system from the Windows node. There are several important hints the user on the Windows node should know.
- access to migrated files (stub files) from Windows node is possible. The recall will be initiated by the UNIX node and can takes some time, if the files are on tape for example (offline). The user should know about the fact, that the file system is HSM managed and files might be migrated to tape. On the Windows side the user can identify such files by the Windows Icon. Migrated files are marked with an offline file.
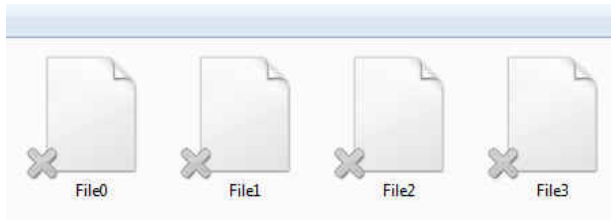
[Fig. 1.5 – Migrated files marked with offline bit on Windows 7 node]

[Fig. 1.6 – Migrated files marked with offline bit on Windows XP node]

- there are several processes which will initiate the recall of a migrated file (stub file). Some of them might initiate massive recalls. To prevent from massive recalls you can set Quota for the HSM managed file system. Below are some examples how massive recalls can be initiated.
        - if you use the Tivoli Storage Manager Backup/Archive client on Windows or any other backup tool. In such a case, the backup will initiate a recall of all files. If you want to backup your files use the Tivoli Storage Manager Backup/Archive client on the same node the Tivoli Storage Manager

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for Space Management client is running.
- if you move folders or copy files out of the HSM managed file system
- if the Windows Explorer shows attributes, thumbnails or details/properties of the files. This depends on the settings for the Windows Explorer and also the Windows version, for example Windows XP and Windows 7 does treat the single click on the file with a mouse differently.
- all virus scanner tools which do not respect the offline bit. In the Symantec virus scanner for example you can set "skip offline files".
- any other application on Windows which does request detailed information of files, like Google Desktop.
- any other application on Windows who does not respect the offline bit of a file
- A recall of a file will be initiated if you do the following operations on a Windows node.
- opening the properties of a file (this depends on the file type)
- changing to thumbnails view in the Windows Explorer, for example for pictures
- changing ACL of a file
- copying a file
- moving a file out of the HSM managed file system
- Renaming a file or moving a file inside the HSM managed file system will not trigger a recall.
- If you fill the file system on Windows above the high threshold level, automigration will be triggered by the Tivoli Storage Manager for Space Management client on the UNIX node.
- In case of a failure (for example one Unix cluster node is down) it is recommended to have at least two nodes in the GPFS cluster running Tivoli Storage Manager for Space Management. In such a case the HSM management for a file system will be taken over by one of the other available HSM nodes. As long as there is one node running with HSM, the access to a migrated file from the Windows node is possible. If no HSM node is available in the cluster, it is important to know that different applications do show different errors on the Windows node, while trying to access a migrated file (stub file).

6. Some other environments

In this chapter I want to mention shortly some other environments, which might raise some questions.

6.1 GPFS cluster with Windows nodes only
If you build up a GPFS cluster with Windows nodes only in the whole GPFS cluster (no UNIX nodes), there is no Tivoli Storage Manager for Space Management client available. There is a Tivoli Storage Manager Backup/Archive client for Windows to backup and archive GPFS file systems. However, the Tivoli Storage Manager for Space Management (HSM UNIX client) is not available on Windows for the GPFS file systems. There is a Tivoli Storage Manager HSM for Windows client, but it does support NTFS file systems only. For details please refer to the Tivoli Storage Manager HSM for Windows link on page 1.
So to run Tivoli Storage Manager for Space Management client you need at least one UNIX node as described in the chapter 4.

6.2 Remote mounts between GPFS clusters
With GPFS you can create a grid of GPFS clusters which are located in different countries for example. Each of those clusters can be connected to each other via remote GPFS mounts. Means you mount one GPFS file system from GPFS cluster A in location A to GPFS cluster B in location B. The same rules as described in chapter 4 and 5 are valid for such an environment. Beside that it is important to know, that the Tivoli Storage Manager for Space Management client can only manage local file systems, not the remote mounted GPFS file systems. Anyway the DSMLS command might show wrong information about migration status of files, if you run it on a remote GPFS file system. Anyway, if you fill up files above high threshold from a remote note (file system remote mounted) into a HSM managed file system, the HSM owner node (file system mounted local) will trigger the automigration as well recalls and so on.

6.3 Cifs/Samba export of HSM managed GPFS file systems
It is possible to setup a Cifs/Samba client/server to export a HSM managed GPFS file system to a Windows node. There is a special Samba client for GPFS which is enabled to show the Offline Bits on Windows. It needs a special compile with special flags and some special options in the smb.conf file to show this Offline Bits. For

such environments you have nearly the same rules as described in chapter 4 and 5. Please note the Offline Bit will get lost with samba client 3.6.0 in case of renaming a file in a HSM managed file system from Windows node. This is currently addressed by a defect in samba. If you rename lot of files, the virus scanner for example will scan those files and initiate recalls.

7. Summary

There are several approaches to setup clusters with the Tivoli Storage Manager for Space Management client with more or less complexity. From TSM/HSM Lab point of view, one of the most important steps to understand and setup, is to read the manuals very carefully. This Field Guide does base on the manuals and on a funded knowledge about the basics of the clients.
A very important second step to work in such an environment is to know about the fact, that there is an environment setup with the Tivoli Storage Manager Backup/Archive client and the Tivoli Storage Manager for Space Management client. All users in such an environment need to get an education. All applications in such an environment need to get checked, if they are somehow compliant to the described rules in chapter 4 and 5. The planning of such a setup makes the difference and helps you to work with that in the future.