DFSMShsm UNIX File Incremental Backup enhancement

OA61080

Andrew Wilt

anwilt@us.ibm.com

V1.2

1.1   z/OS DFSMShsm Storage Administration

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Add a new chapter after Chapter 68 "Storage administrator mode for UNIX commands", titled "Java hbackup command for Incremental UNIX file backup" as follows:

Java hbackup command for Incremental UNIX file backup

With the installation of OA61080, a Java program, hbackup, is provided to assist with finding UNIX files in need of incremental backup. It examines the requested file tree for files that have a backup date older than the modification or change time. Any files in need of backup are sent to the DFSMShsm host for backup.

Description:

The Java hbackup program examines the requested directory sub-tree for files that have changed since their last backup. The files and directories examined can be modified by exclude criteria, either on the command or in a file. Only files that DFSMShsm supports for backup will be examined. The program runs under the user's authority, so permitting the userid READ access to `SUPERUSER.FILESYS` in the `UNIXPRIV` class is recommended if you want to avoid permission errors during the examination.

```
Syntax: (requires CLASSPATH and LIBPATH to be set correctly)
java hbackup {-C STD|PREF|REQ} {-e <exclude_list>} {-E
<exclude_filename>} {-h} {-o} {-p nn} {-r dddd} {-t DASD|Tape} {--
test} {-v[val]} {-X|-R} {-f} {--version} directory_name
```

directory_name

> Specifies the starting directory for the hbackup program to start examining for files. Only one directory name may be specified.

The Java hbackup program takes the following options:

Options:

-X   Specifies that sub-directories should be examined for files in need of backup. However, if a sub-directory is the mount point for a different file system, then that sub-directory should not be entered. (Equivalent to RECURSE(NOCROSSMOUNTS) on the BACKDS

Storage Administrator command.) Default processing is not to examine sub-directories. This option cannot be specified along with the -R option.

-R   Specifies that sub-directories should be examined for files in need of backup. All sub-directories are entered until no more are found. (Equivalent to RECURSE(CROSSMOUNTS) on the BACKDS Storage Administrator command.) Default processing is not to examine sub-directories. This option cannot be specified along with the -X option.

-C STD|PREF|REQ

Specifies what form of zFS File Snapshot processing to use for the UNIX files. Options are:

STD   Do not use zFS File Snapshot to process the UNIX files. Serialization is held on the UNIX file for the duration of the backup.

PREF Use the zFS File Snapshot processing if possible. Once the zFS File Snapshot has been initiated, serialization on the file is released and other processes can write to the file without changing the contents that are being backed up. Once the backup is complete, the zFS File Snapshot resources are released.

REQ   zFS File Snapshot processing must be used. If the feature is unavailable, the backup will be failed.

-e   Specifies Exclude criteria *<exclude_list>* for filenames and directories to be excluded from backup processing. Comma separated exclude criteria patterns can be any of the following:

- Patterns to match files in the exclude list can contain any valid filename characters and may contain the wildcard characters: question mark (?) and asterisk (*). Directory names cannot be specified in a filename pattern.
- An asterisk (*) can be used to match any number of characters within a filename. An asterisk may be used at any position in the pattern.
- A question mark (?) can be used to represent any single character in the file name. Multiple question mark characters are allowed.
- A backslash character (\) must be used to escape any question mark, asterisk, open curly brace, open square bracket, and backslash characters to indicate it is not a special character. (e.g. \?, *, \{, \[, or \\). Other CCSIDs may have a different character for hex value x'5C' (CCSID 037 backslash) that need to be specified. For example, CCSID 1141 x'5C' would be the umlaut O (Ö).
- If the requested filename pattern does not include any wildcard characters, then that exact name is used to compare with files that are found in the sub-directories processed.
- Directory names specified in the exclude list must end in a forward slash character. If the directory name begins with a forward slash character, then it is considered as an absolute path. If the directory name does not begin with a forward slash character, it is considered as a relative path that begins at the directory requested on the command. Wildcard characters cannot be used in directory names.
- The comma (,) character cannot be used in filename patterns or directory names.
- The syntax /.../ can be used to indicate any number of directories matched. (Equivalent to /**/ in glob format.)
- A combination of directory names and filename pattern.
- Trailing whitespace in a criteria is trimmed off.

-E   Specifies a filename, *exclude_filename*, that contains the exclude criteria to be used during processing. The exclude criteria must be specified one per line. A line starting with a blank character is considered a comment and is ignored. Valid criteria must conform to the types of patterns described in -e description. The user must have read permission to the file.

-f   Force a new backup. Send all supported, matching files to DFSMShsm for backup.

-h   Write out this explanation of options.

-o   Storage Administrator mode. Any files that are sent to DFSMShsm for backup will be processed as if they were sent via a BACKDS Storage Administrator command. If using this option, it is recommended that the user also switch to UID(0) via the su UNIX command first so that all files are accessible to the program.

-p   Specifies the maximum number of outstanding requests sent to the DFSMShsm host at any one time. Default value is 100.

-r   Specifies the number of days to keep this backup past when it would normally be expired or rolled off. (RETAINDAYS) Default: none

-t   Specifies the target of the backup. Can be either DASD, Tape, or not specified in which case DFSMShsm will choose the backup target. Default: none

--test   Requests only the matched file names are displayed, but not sent to the DFSMShsm host for backup.

--version Display the current version of the hbackup program.

-v{*val*} Issue verbose messages during processing. An optional value may be specified for a level of verbosity. e.g. -vDTL . If -v is specified without a value, it defaults to -vSTAT.

         val may be:

         STAT   - Display statistics.
         DTL   - Display detailed information about file selection.
         TIMES - Display timestamps on messages.
         ALL   - Display all message types.

Note:

The hbackup program will only examine the following types of files:
   • Regular files
   • Empty directories
   • Symbolic links
   • FIFO files
 	
UNIX hardlinks will always be sent to DFSMShsm because only the DFSMShsm host knows if the backup version in the DFSMShsm inventory is the most recent for that filename.

Environment configuration:

Two environment variables need to be configured correctly for the Java hbackup program to execute:

CLASSPATH

The /usr/lpp/dfsms/bin/hbackup.jar path needs to be included in the CLASSPATH environment variable.

```
CLASSPATH="$CLASSPATH":/usr/lpp/dfsms/bin/hbackup.jar
export CLASSPATH="$CLASSPATH"
```

LIBPATH

The /usr/lpp/dfsms/bin path needs to be included in the LIBPATH environment variable.

```
LIBPATH="$LIBPATH":/usr/lpp/dfsms/bin
export LIBPATH="$LIBPATH"
```

Invocation example:

Example 1
```
//BPXBAKJ1 JOB  (XXXX),'BACKUP JOB',NOTIFY=&SYSUID,MSGLEVEL=(1,1),
// MSGCLASS=H
//*****************************************************************
//* Search directory sub-tree for files in need of Incremental backup
//* using Java hbackup program.
//*****************************************************************
//STEP1    EXEC PGM=BPXBATCH,REGION=0M
//SYSPRINT DD   SYSOUT=*
//STDOUT   DD   SYSOUT=*
//STDERR   DD   SYSOUT=*
//STDENV   DD   DUMMY
//STDPARM  DD   *
SH /bin/sh -c '
set -x;
CLASSPATH="$CLASSPATH":/usr/lpp/dfsms/bin/hbackup.jar ;
export CLASSPATH="$CLASSPATH" ;
LIBPATH="$LIBPATH":/usr/lpp/dfsms/bin ;
export LIBPATH="$LIBPATH" ;
su ;
java hbackup -v -o --test /test/ ;
'
/*
```

1.2   z/OS MVS System Messages Vol 2 (ARC-ASA)

SA38-0669

1.2.1   ARC0573I (New)

ARC0573I EXCLUDED DIR: *dirpath*

Explanation:

When -X, requesting recursion into sub-directories without crossing mountpoints, is requested, this message is issued for each directory that is found that is in a different zFS filesystem. That directory is skipped for examination.

System Action: None.

Programmer Action: None.

1.2.2   ARC0574I (New)

ARC0574I UNSUPPORTED FILE: *filepath*

Explanation:

When -vDTL (detailed) or higher verbose output is requested, and UNIX files are found that are unsupported by DFSMShsm, this message is issued. The unsupported file is not sent to DFSMShsm for backup processing. When the verbose output level is lower than DTL, this message will not be displayed. Files that are unsupported are never sent to DFSMShsm by the Java hbackup program.

System action: None.

Programmer action: None.

1.2.3   ARC0576I (New)

ARC0576I TEST MODE SELECTED FILE: *filepath*

Explanation:

When the --test option is used with the Java hbackup program, each file that is selected as possibly needing a backup will be listed using the absolute path to the file. This filename is not sent to the DFSMShsm host for backup.

System action: None.

Programmer action: None.

1.2.4   ARC0577I (New)

ARC0577I {varying statistics output}

Explanation:

When a verbose output level of STAT or higher is requested, this message will be issued with statistics information about:

- The number of files excluded due to the exclude criteria.
- The number of directories skipped due to being across a mount point.
- The number of files examined.
- The number of files sent to DFSMShsm for backup.
- The number of files that would have been set to DFSMShsm for backup, but not due to test mode requested.
- The amount of time used to do the processing in HH:MM:SS.ttt format.

 System action: None.

Programmer action: None.

1.2.5   ARC0578I (New)

ARC0578I UNCHANGED FILE: *filepath*

Explanation:

When -vDTL (detailed) or higher verbose output is requested, this message is issued when a UNIX file has been examined, but the last backup timestamp in the UNIX file metadata is the same or newer than the modification or change time. This file will not be sent to DFSMShsm for backup processing.

System Action: None.

Programmer Action: Use the zfsadm fileinfo -path *filepath* UNIX command to view the UNIX file attributes. The reftime timestamp is where the last backup date is stored.

1.2.6   ARC0579I (New)

ARC0579I EXCLUDED FILE: *filepath*

Explanation:

When -vDTL (detailed) or higher verbose output is requested, this message is issued for UNIX files that match the requested exclude criteria. This file will not be sent to DFSMShsm for backup processing.

System Action: None.

Programmer Action: None.

1.2.7   ARC1453I (New)

ARC1453I ERROR IN EXCLUDE LIST FILE *filepath*, *text*

Explanation
An error has occurred during processing exclude list file *filepath*. The *text* describes the reason of the error:
- INVALID FILE PATH
  filepath is not an absolute path or has trailing slash.
- FILE NOT FOUND
- NOT REGULAR FILE
- NOT AUTHORIZED
  The user is not authorized to read the file. This message is accompanied by the message ARC1451I.
- UNIX OR RACF SYSCALL FAILED
  This message is accompanied by the messages ARC1449I or ARC1450I.
- *service_name* RETCODE=*xxxxxxxx* RSNCODE=*xxxxxxxx*
  z/OS UNIX callable service *service_name* returned an unexpected error.
- INSUFFICIENT STORAGE
  Temporary storage shortage.
- TOO LONG EXCLUDE LIST
  Total length of all exclude criteria with added commas to separate them exceeds 32767 characters.
- COMMA IN LINE *xxxxxxxx*
  A comma is used within the exclude criterion.
- TOO LONG LINE *xxxxxxxx*
  A single line is longer than 1023 characters.
- INVALID EXCLUDE SPECIFICATION IN LINE *xxxxxxxx*
  Invalid EXCLUDE criterion is specified.

System action
DFSMShsm rejects the command with this exclude list file.

User response.
Check and modify the file *filepath* with exclude list.

Programmer response
None.

Source

DFSMShsm