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RH12409 - Gestion de l'Archivage et de la Compression

Contenu du Module

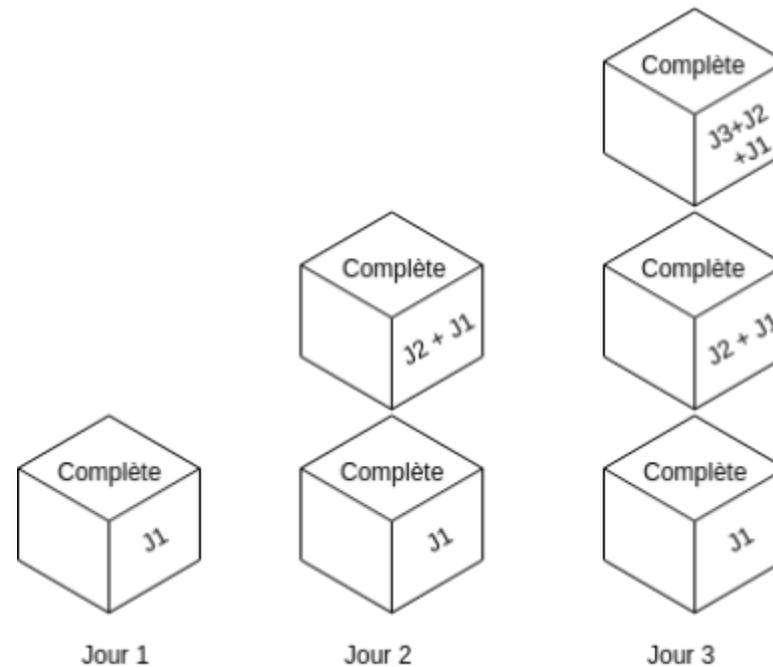
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Types de Sauvegardes

Sauvegarde complète

Dans ce cas on sauvegarde tous les fichiers et dossiers, toute la partition ou tout le disque :



La restauration nécessite :

- La dernière sauvegarde complète.

Avantage :

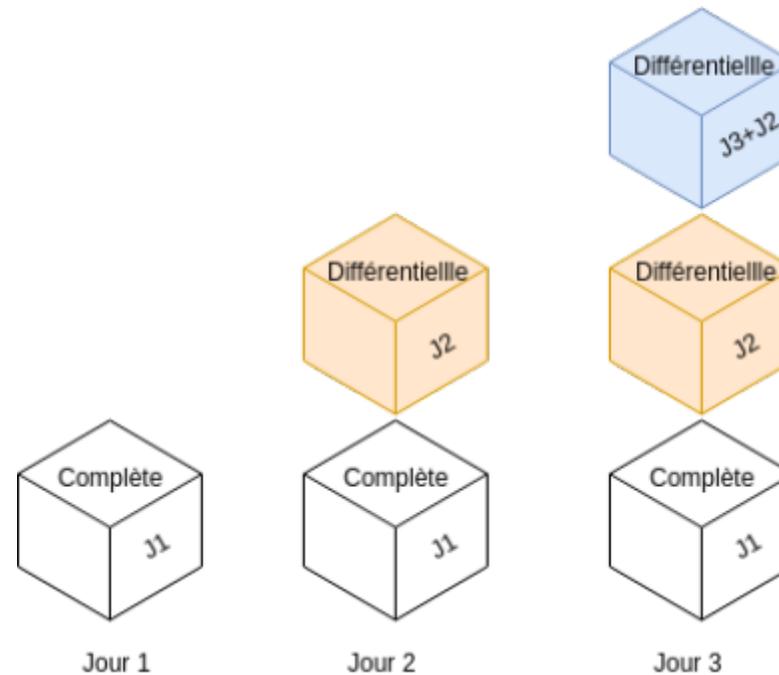
- Restauration plus rapide et plus simple que les restaurations à partir de sauvegardes différentielles et incrémentales.

Inconvénient :

- Nécessite plus d'espace de stockage que les sauvegardes différentielles et incrémentales.

Sauvegarde différentielle

Dans ce cas on sauvegarde des données modifiées ou nouvellement ajoutées sur la base de la **dernière sauvegarde complète** :



La restauration nécessite :

- La dernière sauvegarde complète,
- La dernière sauvegarde différentielle.

Avantage :

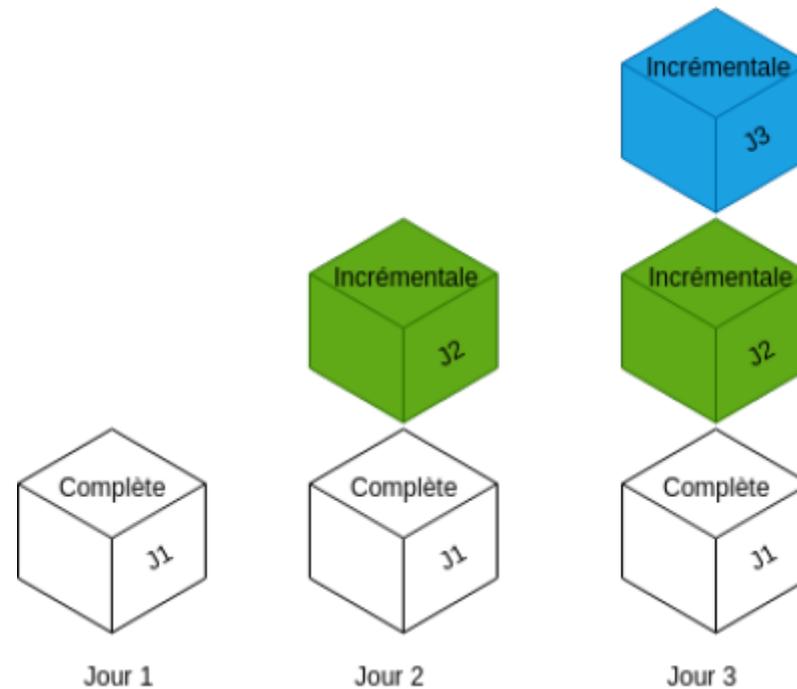
- Restauration plus rapide que la restauration à partir d'une sauvegarde incrémentale.

Inconvénient :

- Nécessite plus d'espace de stockage que la sauvegarde incrémentale.

Sauvegarde incrémentale

Dans ce cas, on ne sauvegarde que ce qui a changé depuis la dernière sauvegarde quelle qu'elle soit (complète, différentielle ou incrémentale) :



La restauration nécessite :

- La dernière sauvegarde complète,
- Toutes les sauvegardes incrémentales effectuées depuis, et dans l'ordre.

Avantage :

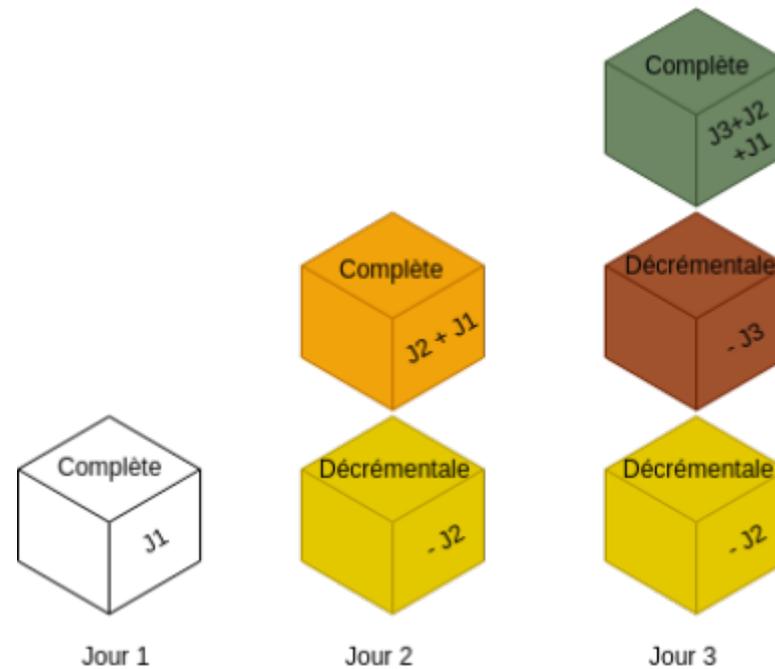
- Sauvegarde plus rapide que la sauvegarde complète ou différentielle,
- Nécessite moins d'espace de stockage que la sauvegarde différentielle.

Inconvénient :

- Plus longue à restaurer.

Sauvegarde décrementale

Dans ce cas on sauvegarde tous les fichiers puis on produit une sauvegarde de ce qui a changé depuis la dernière sauvegarde complète. Cette sauvegarde est appelée une sauvegarde décrementale :



La restauration nécessite :

- La dernière sauvegarde complète.

La restauration de J-1 nécessite :

- La dernière sauvegarde complète,
- La sauvegarde décrementale J.

Par exemple pour obtenir un état du système J1 quand on est à J2, il convient de restaurer la sauvegarde complète de J2 qui est en réalité J2+J1 puis la

sauvegarde décrementale -J2. De cette façon et d'une manière mathématique on obtient : $J2 + J1 - J2 = J1$.

Avantage :

- Restauration plus rapide et plus simple que les restaurations à partir de sauvegardes différentielles et incrémentales.

Inconvénient :

- Nécessite plus de manipulation de données à chaque sauvegarde.

Outils classiques de sauvegarde

Préparation

Afin de poursuivre, il convient de créer une arborescence à sauvegarder :

```
[root@redhat9 ~]# mkdir -p /test/repY; mkdir /test/repZ
[root@redhat9 ~]# cd /test/repY; touch Y1 Y2 Y3
[root@redhat9 repY]# cd /test/repZ; touch Z1 Z2
[root@redhat9 repZ]# ls -lR /test
/test:
total 0
drwxr-xr-x. 2 root root 36 Sep 27 07:51 repY
drwxr-xr-x. 2 root root 26 Sep 27 07:51 repZ

/test/repY:
total 0
-rw-r--r--. 1 root root 0 Sep 27 07:51 Y1
-rw-r--r--. 1 root root 0 Sep 27 07:51 Y2
-rw-r--r--. 1 root root 0 Sep 27 07:51 Y3

/test/repZ:
```

```
total 0
-rw-r--r--. 1 root root 0 Sep 27 07:51 Z1
-rw-r--r--. 1 root root 0 Sep 27 07:51 Z2
```

La Commande tar

Présentation

Le programme **tar** a été originellement prévu pour sauvegarder sur des bandes magnétiques, d'où son nom issu de **tape archiver**.

La commande **tar** peut sauvegarder vers :

- un fichier spécial, par exemple le nom d'un lecteur de bande,
- un fichier ordinaire sur disque,
- la sortie standard pour être utilisé dans un pipe.

Options de la Commande

Les options de la commande tar sont :

```
[root@redhat9 repZ]# tar --help
Usage: tar [OPTION...] [FILE]...
GNU 'tar' saves many files together into a single tape or disk archive, and can
restore individual files from the archive.
```

Exemples:

```
tar -cf archive.tar foo bar # Create archive.tar from files foo and bar.
tar -tvf archive.tar        # List all files in archive.tar verbosely.
tar -xf archive.tar         # Extract all files from archive.tar.
```

Main operation mode:

```
-A, --catenate, --concatenate  append tar files to an archive
-c, --create                    create a new archive
  --delete                      delete from the archive (not on mag tapes!)
-d, --diff, --compare          find differences between archive and file system
-r, --append                   append files to the end of an archive
  --test-label                  test the archive volume label and exit
-t, --list                     list the contents of an archive
-u, --update                   only append files newer than copy in archive
-x, --extract, --get          extract files from an archive
```

Operation modifiers:

```
  --check-device               check device numbers when creating incremental
                              archives (default)
-g, --listed-incremental=FILE  handle new GNU-format incremental backup
-G, --incremental             handle old GNU-format incremental backup
  --hole-detection=TYPE       technique to detect holes
  --ignore-failed-read        do not exit with nonzero on unreadable files
  --level=NUMBER              dump level for created listed-incremental archive
  --no-check-device           do not check device numbers when creating
                              incremental archives
  --no-seek                   archive is not seekable
-n, --seek                    archive is seekable
  --occurrence[=NUMBER]      process only the NUMBERth occurrence of each file
                              in the archive; this option is valid only in
                              conjunction with one of the subcommands --delete,
                              --diff, --extract or --list and when a list of
                              files is given either on the command line or via
                              the -T option; NUMBER defaults to 1
  --sparse-version=MAJOR[.MINOR]
                              set version of the sparse format to use (implies
                              --sparse)
-S, --sparse                  handle sparse files efficiently
```

Local file name selection:

```
--add-file=FILE      add given FILE to the archive (useful if its name
                    starts with a dash)
-C, --directory=DIR  change to directory DIR
--exclude=PATTERN    exclude files, given as a PATTERN
--exclude-backups    exclude backup and lock files
--exclude-caches     exclude contents of directories containing
                    CACHEDIR.TAG, except for the tag file itself
--exclude-caches-all  exclude directories containing CACHEDIR.TAG
--exclude-caches-under  exclude everything under directories containing
                    CACHEDIR.TAG
--exclude-ignore=FILE  read exclude patterns for each directory from
                    FILE, if it exists
--exclude-ignore-recursive=FILE
                    read exclude patterns for each directory and its
                    subdirectories from FILE, if it exists
--exclude-tag=FILE    exclude contents of directories containing FILE,
                    except for FILE itself
--exclude-tag-all=FILE  exclude directories containing FILE
--exclude-tag-under=FILE  exclude everything under directories
                    containing FILE
--exclude-vcs         exclude version control system directories
--exclude-vcs-ignores  read exclude patterns from the VCS ignore files
--no-null            disable the effect of the previous --null option
--no-recursion       avoid descending automatically in directories
--no-unquote         do not unquote input file or member names
--no-verbatim-files-from  -T treats file names starting with dash as
                    options (default)
--null              -T reads null-terminated names; implies
                    --verbatim-files-from
--recursion         recurse into directories (default)
-T, --files-from=FILE  get names to extract or create from FILE
--unquote          unquote input file or member names (default)
--verbatim-files-from  -T reads file names verbatim (no escape or option
```

```
handling)
-X, --exclude-from=FILE  exclude patterns listed in FILE
```

File name matching options (affect both exclude and include patterns):

```
--anchored           patterns match file name start
--ignore-case        ignore case
--no-anchored         patterns match after any '/' (default for
                    exclusion)
--no-ignore-case     case sensitive matching (default)
--no-wildcards        verbatim string matching
--no-wildcards-match-slash  wildcards do not match '/'
--wildcards           use wildcards (default for exclusion)
--wildcards-match-slash  wildcards match '/' (default)
```

Overwrite control:

```
--keep-directory-symlink  preserve existing symlinks to directories when
                    extracting
--keep-newer-files        don't replace existing files that are newer than
                    their archive copies
-k, --keep-old-files      don't replace existing files when extracting,
                    treat them as errors
--no-overwrite-dir        preserve metadata of existing directories
--one-top-level[=DIR]    create a subdirectory to avoid having loose files
                    extracted
--overwrite              overwrite existing files when extracting
--overwrite-dir          overwrite metadata of existing directories when
                    extracting (default)
--recursive-unlink       empty hierarchies prior to extracting directory
--remove-files           remove files after adding them to the archive
--skip-old-files         don't replace existing files when extracting,
                    silently skip over them
-U, --unlink-first       remove each file prior to extracting over it
```

-W, --verify attempt to verify the archive after writing it

Select output stream:

--ignore-command-error ignore exit codes of children
--no-ignore-command-error treat non-zero exit codes of children as error
-0, --to-stdout extract files to standard output
--to-command=COMMAND pipe extracted files to another program

Handling of file attributes:

--atime-preserve[=METHOD] preserve access times on dumped files, either by restoring the times after reading (METHOD='replace'; default) or by not setting the times in the first place (METHOD='system')
--clamp-mtime only set time when the file is more recent than what was given with --mtime
--delay-directory-restore delay setting modification times and permissions of extracted directories until the end of extraction
--group=NAME force NAME as group for added files
--group-map=FILE use FILE to map file owner GIDs and names
--mode=CHANGES force (symbolic) mode CHANGES for added files
--mtime=DATE-OR-FILE set mtime for added files from DATE-OR-FILE
-m, --touch don't extract file modified time
--no-delay-directory-restore cancel the effect of --delay-directory-restore option
--no-same-owner extract files as yourself (default for ordinary users)
--no-same-permissions apply the user's umask when extracting permissions from the archive (default for ordinary users)
--numeric-owner always use numbers for user/group names

```
--owner=NAME      force NAME as owner for added files
--owner-map=FILE  use FILE to map file owner UIDs and names
-p, --preserve-permissions, --same-permissions
                  extract information about file permissions
                  (default for superuser)
--same-owner      try extracting files with the same ownership as
                  exists in the archive (default for superuser)
--sort=ORDER      directory sorting order: none (default), name or
                  inode
-s, --preserve-order, --same-order
                  member arguments are listed in the same order as
                  the files in the archive
```

Handling of extended file attributes:

```
--acls            Enable the POSIX ACLs support
--no-acls         Disable the POSIX ACLs support
--no-selinux      Disable the SELinux context support
--no-xattrs       Disable extended attributes support
--selinux         Enable the SELinux context support
--xattrs          Enable extended attributes support
--xattrs-exclude=MASK specify the exclude pattern for xattr keys
--xattrs-include=MASK specify the include pattern for xattr keys
```

Device selection and switching:

```
--force-local     archive file is local even if it has a colon
-f, --file=ARCHIVE use archive file or device ARCHIVE
-F, --info-script=NAME, --new-volume-script=NAME
                  run script at end of each tape (implies -M)
-L, --tape-length=NUMBER change tape after writing NUMBER x 1024 bytes
-M, --multi-volume create/list/extract multi-volume archive
--rmt-command=COMMAND use given rmt COMMAND instead of rmt
--rsh-command=COMMAND use remote COMMAND instead of rsh
```

--volno-file=FILE use/update the volume number in FILE

Device blocking:

-b, --blocking-factor=BLOCKS BLOCKS x 512 bytes per record
-B, --read-full-records reblock as we read (for 4.2BSD pipes)
-i, --ignore-zeros ignore zeroed blocks in archive (means EOF)
--record-size=NUMBER NUMBER of bytes per record, multiple of 512

Archive format selection:

-H, --format=FORMAT create archive of the given format

FORMAT is one of the following:

gnu GNU tar 1.13.x format
oldgnu GNU format as per tar <= 1.12
pax POSIX 1003.1-2001 (pax) format
posix same as pax
ustar POSIX 1003.1-1988 (ustar) format
v7 old V7 tar format

--old-archive, --portability

same as --format=v7

--pax-option=keyword[:=value][,keyword[:=value]]...

control pax keywords

--posix same as --format=posix

-V, --label=TEXT create archive with volume name TEXT; at
list/extract time, use TEXT as a globbing pattern
for volume name

Compression options:

-a, --auto-compress use archive suffix to determine the compression
program

```
-I, --use-compress-program=PROG      filter through PROG (must accept -d)
-j, --bzip2                          filter the archive through bzip2
-J, --xz                             filter the archive through xz
  --lzip                             filter the archive through lzip
  --lzma                             filter the archive through xz --format=lzma
  --lzop                             filter the archive through lzop
  --no-auto-compress                 do not use archive suffix to determine the
                                     compression program
  --zstd                             filter the archive through zstd
-z, --gzip, --gunzip, --ungzip      filter the archive through gzip
-Z, --compress, --uncompress        filter the archive through compress
```

Local file selection:

```
--backup[=CONTROL]                 backup before removal, choose version CONTROL
--hard-dereference                  follow hard links; archive and dump the files they
                                     refer to
-h, --dereference                   follow symlinks; archive and dump the files they
                                     point to
-K, --starting-file=MEMBER-NAME    begin at member MEMBER-NAME when reading the
                                     archive
  --newer-mtime=DATE                compare date and time when data changed only
-N, --newer=DATE-OR-FILE, --after-date=DATE-OR-FILE
                                     only store files newer than DATE-OR-FILE
  --one-file-system                 stay in local file system when creating archive
-P, --absolute-names               don't strip leading '/'s from file names
  --suffix=STRING                   backup before removal, override usual suffix ('~'
                                     unless overridden by environment variable
                                     SIMPLE_BACKUP_SUFFIX)
```

File name transformations:

```
--strip-components=NUMBER  strip NUMBER leading components from file
                             names on extraction
--transform=EXPRESSION, --xform=EXPRESSION
                             use sed replace EXPRESSION to transform file
                             names
```

Informative output:

```
--checkpoint[=NUMBER]  display progress messages every NUMBERth record
                        (default 10)
--checkpoint-action=ACTION  execute ACTION on each checkpoint
--full-time              print file time to its full resolution
--index-file=FILE       send verbose output to FILE
-l, --check-links       print a message if not all links are dumped
--no-quote-chars=STRING  disable quoting for characters from STRING
--quote-chars=STRING    additionally quote characters from STRING
--quoting-style=STYLE   set name quoting style; see below for valid STYLE
                        values
-R, --block-number      show block number within archive with each message
--show-defaults         show tar defaults
--show-omitted-dirs    when listing or extracting, list each directory
                        that does not match search criteria
--show-snapshot-field-ranges
                        show valid ranges for snapshot-file fields
--show-transformed-names, --show-stored-names
                        show file or archive names after transformation
--totals[=SIGNAL]      print total bytes after processing the archive;
                        with an argument - print total bytes when this
                        SIGNAL is delivered; Allowed signals are: SIGHUP,
                        SIGQUIT, SIGINT, SIGUSR1 and SIGUSR2; the names
                        without SIG prefix are also accepted
--utc                  print file modification times in UTC
-v, --verbose          verbosely list files processed
--warning=KEYWORD      warning control
```

-w, --interactive, --confirmation
ask for confirmation for every action

Compatibility options:

-o when creating, same as --old-archive; when
extracting, same as --no-same-owner

Other options:

-, --help give this help list
--restrict disable use of some potentially harmful options
--usage give a short usage message
--version print program version

Mandatory or optional arguments to long options are also mandatory or optional for any corresponding short options.

The backup suffix is '~', unless set with --suffix or SIMPLE_BACKUP_SUFFIX.
The version control may be set with --backup or VERSION_CONTROL, values are:

none, off	never make backups
t, numbered	make numbered backups
nil, existing	numbered if numbered backups exist, simple otherwise
never, simple	always make simple backups

Valid arguments for the --quoting-style option are:

literal
shell
shell-always
shell-escape
shell-escape-always
c

```
c-maybe
escape
locale
clocale
```

This tar defaults to:

```
--format=gnu -f- -b20 --quoting-style=escape --rmt-command=/etc/rmt
--rsh-command=/usr/bin/ssh
```

LAB #1 - Travailler avec la Commande tar

Vous allez maintenant sauvegarder votre dossier **test** ainsi que son contenu vers un fichier :

```
[root@redhat9 repZ]# tar cvf /tmp/test.tar /test
tar: Removing leading '/' from member names
/test/
/test/repY/
/test/repY/Y1
/test/repY/Y2
/test/repY/Y3
/test/repZ/
/test/repZ/Z1
/test/repZ/Z2
```

Pour visualiser la **table of contents** de votre sauvegarde, utilisez la commande suivante :

```
[root@redhat9 repZ]# tar tvf /tmp/test.tar
drwxr-xr-x root/root      0 2024-09-27 07:51 test/
drwxr-xr-x root/root      0 2024-09-27 07:51 test/repY/
-rw-r--r-- root/root      0 2024-09-27 07:51 test/repY/Y1
-rw-r--r-- root/root      0 2024-09-27 07:51 test/repY/Y2
-rw-r--r-- root/root      0 2024-09-27 07:51 test/repY/Y3
```

```
drwxr-xr-x root/root      0 2024-09-27 07:51 test/repZ/  
-rw-r--r-- root/root      0 2024-09-27 07:51 test/repZ/Z1  
-rw-r--r-- root/root      0 2024-09-27 07:51 test/repZ/Z2
```

Afin de créer une sauvegarde incrémentale, vous avez besoin de créer un fichier qui servira de référence de date :

```
[root@redhat9 repZ]# touch /tmp/dateref
```

Modifiez maintenant deux des fichiers de votre arborescence **test** :

```
[root@redhat9 repZ]# echo "CentOS est super \!" > /test/repY/Y1
```

```
[root@redhat9 repZ]# echo "RHEL is wonderful \!" > /test/repZ/Z1
```

Pour procéder à votre sauvegarde incrémentale, vous devez sauvegarder uniquement les fichiers modifiés ou créés depuis la création de votre fichier **/tmp/dateref**.

Saisissez donc la commande suivante :

```
[root@redhat9 repZ]# tar -cvf /tmp/incremental.tar -N /tmp/dateref /test  
tar: Removing leading `/' from member names  
/test/  
/test/repY/  
/test/repY/Y1  
tar: /test/repY/Y2: file is unchanged; not dumped  
tar: /test/repY/Y3: file is unchanged; not dumped  
/test/repZ/  
/test/repZ/Z1  
tar: /test/repZ/Z2: file is unchanged; not dumped
```



Important - Notez l'utilisation de l'option **-N** avec l'argument **/tmp/dateref** qui permet d'identifier les fichiers modifiés ou créés depuis la création de **/tmp/dateref**.

Contrôlez maintenant le contenu de l'archive **/tmp/incremental.tar** :

```
[root@redhat9 repZ]# tar tvf /tmp/incremental.tar
drwxr-xr-x root/root      0 2024-09-27 07:51 test/
drwxr-xr-x root/root      0 2024-09-27 07:51 test/repY/
-rw-r--r-- root/root    20 2024-09-27 07:58 test/repY/Y1
drwxr-xr-x root/root      0 2024-09-27 07:51 test/repZ/
-rw-r--r-- root/root    21 2024-09-27 07:58 test/repZ/Z1
```

Supprimez maintenant le contenu du répertoire **test** :

```
[root@redhat9 ~]# rm -rf /test/*
```



Important - Notez que le système vous permet de supprimer le répertoire **/test/repZ**, or vous vous situez dans ce même répertoire !

Afin de pouvoir restaurer les fichiers de votre première sauvegarde, placez-vous à la racine de votre système et restaurez le contenu de votre répertoire **test** en saisissant la commande tar suivante :

```
[root@redhat9 ~]# cd /
[root@redhat9 /]# tar xvf /tmp/test.tar
test/
test/repY/
test/repY/Y1
test/repY/Y2
test/repY/Y3
test/repZ/
test/repZ/Z1
test/repZ/Z2
```

Constatez maintenant que l'opération s'est bien déroulée :

```
root@redhat9 /]# ls -lR /test
/test:
total 0
drwxr-xr-x. 2 root root 36 Sep 27 07:51 repY
drwxr-xr-x. 2 root root 26 Sep 27 07:51 repZ

/test/repY:
total 0
-rw-r--r--. 1 root root 0 Sep 27 07:51 Y1
-rw-r--r--. 1 root root 0 Sep 27 07:51 Y2
-rw-r--r--. 1 root root 0 Sep 27 07:51 Y3

/test/repZ:
total 0
-rw-r--r--. 1 root root 0 Sep 27 07:51 Z1
-rw-r--r--. 1 root root 0 Sep 27 07:51 Z2
```



Important - Notez qu'à ce stade les fichiers **/test/repY/Y1** et **/test/repZ/Z1** sont vides.

Restaurez maintenant votre archive incrémentale :

```
[root@redhat9 /]# tar xvf /tmp/incremental.tar
test/
test/repY/
test/repY/Y1
test/repZ/
test/repZ/Z1
```

Constatez maintenant que l'opération s'est bien déroulée :

```
[root@redhat9 /]# ls -lR /test
```

```
/test:
total 0
drwxr-xr-x. 2 root root 36 Sep 27 07:51 repY
drwxr-xr-x. 2 root root 26 Sep 27 07:51 repZ

/test/repY:
total 4
-rw-r--r--. 1 root root 20 Sep 27 07:58 Y1
-rw-r--r--. 1 root root 0 Sep 27 07:51 Y2
-rw-r--r--. 1 root root 0 Sep 27 07:51 Y3

/test/repZ:
total 4
-rw-r--r--. 1 root root 21 Sep 27 07:58 Z1
-rw-r--r--. 1 root root 0 Sep 27 07:51 Z2
```



Important - Notez que les fichiers **/test/repY/Y1** et **/test/repZ/Z1** sont maintenant non-vides.

La Commande GPL tar et la Compression

Dernièrement, la commande tar peut archiver en utilisant des algorithmes de compression :

Algorithme	Option de la commande tar
gzip	z
bzip2	j
lzma	J

La Commande **cpio**

Présentation

La commande **cpio** (Copy Input To Output). **cpio** peut gérer les archives au format **tar**. La différence majeure entre **tar** et **cpio** est que ce dernier stocke les chemins d'accès aux fichiers sauvegardés en même temps que les fichiers eux-mêmes. Ceci implique que dans le cas où le chemin absolu a été spécifié lors de la sauvegarde, il est impossible de restaurer un fichier à un autre emplacement que son emplacement d'origine.

Vous allez utiliser maintenant le logiciel **cpio** pour effectuer les sauvegardes et restaurations.

Options de la Commande

Les options de la commande **cpio** sont :

```
[root@redhat9 /]# cpio --help
Usage: cpio [OPTION...] [destination-directory]
GNU `cpio' copies files to and from archives

Examples:
# Copy files named in name-list to the archive
cpio -o < name-list [> archive]
# Extract files from the archive
cpio -i [< archive]
# Copy files named in name-list to destination-directory
cpio -p destination-directory < name-list

Main operation mode:
-i, --extract          Extract files from an archive (run in copy-in
mode)
-o, --create          Create the archive (run in copy-out mode)
-p, --pass-through    Run in copy-pass mode
```

-t, --list Print a table of contents of the input

Operation modifiers valid in any mode:

--block-size=BLOCK-SIZE Set the I/O block size to BLOCK-SIZE * 512 bytes

-B Set the I/O block size to 5120 bytes

-c Identical to "-H newc", use the new (SVR4) portable format. If you wish the old portable (ASCII) archive format, use "-H odc" instead.

-C, --io-size=NUMBER Set the I/O block size to the given NUMBER of bytes

-D, --directory=DIR Change to directory DIR

--force-local Archive file is local, even if its name contains colons

-H, --format=FORMAT Use given archive FORMAT

--quiet Do not print the number of blocks copied

-R, --owner=[USER][:.][GROUP] Set the ownership of all files created to the specified USER and/or GROUP

-v, --verbose Verbosely list the files processed

-V, --dot Print a "." for each file processed

-W, --warning=FLAG Control warning display. Currently FLAG is one of 'none', 'truncate', 'all'. Multiple options accumulate.

Operation modifiers valid in copy-in and copy-out modes

-F, --file=[[USER@]HOST:]FILE-NAME Use this FILE-NAME instead of standard input or output. Optional USER and HOST specify the user and host names in case of a remote archive

-M, --message=STRING Print STRING when the end of a volume of the backup media is reached

--rsh-command=COMMAND Use COMMAND instead of rsh

Operation modifiers valid only in copy-in mode:

-b, --swap Swap both halfwords of words and bytes of halfwords in the data. Equivalent to -sS

-f, --nonmatching Only copy files that do not match any of the given patterns

-I [[USER@]HOST:]FILE-NAME Archive filename to use instead of standard input. Optional USER and HOST specify the user and host names in case of a remote archive

-n, --numeric-uid-gid In the verbose table of contents listing, show numeric UID and GID

-r, --rename Interactively rename files

-s, --swap-bytes Swap the bytes of each halfword in the files

-S, --swap-halfwords Swap the halfwords of each word (4 bytes) in the files

--to-stdout Extract files to standard output

-E, --pattern-file=FILE Read additional patterns specifying filenames to extract or list from FILE

--only-verify-crc When reading a CRC format archive, only verify the checksum of each file in the archive, don't actually extract the files

Operation modifiers valid only in copy-out mode:

-A, --append Append to an existing archive.

--device-independent, --reproducible Create device-independent (reproducible) archives

--ignore-devno Don't store device numbers

-O [[USER@]HOST:]FILE-NAME Archive filename to use instead of standard output. Optional USER and HOST specify the user and host names in case of a remote archive

--renumber-inodes Renumber inodes

Operation modifiers valid only in copy-pass mode:

-l, --link Link files instead of copying them, when possible

Operation modifiers valid in copy-in and copy-out modes:

--absolute-filenames Do not strip file system prefix components from the file names

--no-absolute-filenames Create all files relative to the current directory

Operation modifiers valid in copy-out and copy-pass modes:

-0, --null Filenames in the list are delimited by null characters instead of newlines

-a, --reset-access-time Reset the access times of files after reading them

-L, --dereference Dereference symbolic links (copy the files that they point to instead of copying the links).

Operation modifiers valid in copy-in and copy-pass modes:

-d, --make-directories Create leading directories where needed

-m, --preserve-modification-time Retain previous file modification times when creating files

--no-preserve-owner Do not change the ownership of the files

--sparse Write files with large blocks of zeros as sparse files

-u, --unconditional Replace all files unconditionally

-, --help give this help list

--usage give a short usage message

```
--version          print program version
```

Mandatory or optional arguments to long options are also mandatory or optional for any corresponding short options.

Report bugs to <bug-cpio@gnu.org>.

LAB #2 - Travailler avec la Commande cpio

Dans un premier temps, vous devez utiliser la commande **find** pour construire une liste de fichiers à sauvegarder :

```
[root@redhat9 ~]# find /test > /tmp/cpio.list
[root@redhat9 ~]# cat /tmp/cpio.list
/test
/test/repY
/test/repY/Y2
/test/repY/Y3
/test/repY/Y1
/test/repZ
/test/repZ/Z2
/test/repZ/Z1
```

Sauvegardez maintenant les fichiers et répertoires référencés par le fichier **/tmp/cpio.list** :

```
[root@redhat9 ~]# cpio -ov < /tmp/cpio.list > /tmp/test.cpio
/test
/test/repY
/test/repY/Y2
/test/repY/Y3
/test/repY/Y1
/test/repZ
/test/repZ/Z2
```

```
/test/repZ/Z1  
1 block
```

Consultez maintenant la **table of contents** de votre sauvegarde :

```
[root@redhat9 ~]# cpio -it < /tmp/test.cpio  
/test  
/test/repY  
/test/repY/Y2  
/test/repY/Y3  
/test/repY/Y1  
/test/repZ  
/test/repZ/Z2  
/test/repZ/Z1  
1 block
```

Supprimez maintenant le répertoire **/test/repY** et son contenu :

```
[root@redhat9 ~]# rm -rf /test/repY
```

Contrôlez le bon déroulement de la suppression :

```
[root@redhat9 ~]# ls -lR /test  
/test:  
total 0  
drwxr-xr-x. 2 root root 26 Sep 27 07:51 repZ  
  
/test/repZ:  
total 4  
-rw-r--r--. 1 root root 21 Sep 27 07:58 Z1  
-rw-r--r--. 1 root root  0 Sep 27 07:51 Z2
```

Restaurez les fichiers supprimés :

```
[root@redhat9 ~]# cpio -ivdum "/test/repY/*" < /tmp/test.cpio
/test/repY/Y2
/test/repY/Y3
/test/repY/Y1
1 block
```



Important - Notez l'utilisation de la chaîne **"/test/repY/*"** qui permet de rechercher uniquement le répertoire **repY** ainsi que les fichiers **Y1**, **Y2** et **Y3** dans l'archive test.cpio.

Contrôlez le bon déroulement de la restauration :

```
[root@redhat9 ~]# ls -lR /test
/test:
total 0
drwxr-xr-x. 2 root root 36 Sep 27 08:10 repY
drwxr-xr-x. 2 root root 26 Sep 27 07:51 repZ

/test/repY:
total 4
-rw-r--r--. 1 root root 20 Sep 27 07:58 Y1
-rw-r--r--. 1 root root  0 Sep 27 07:51 Y2
-rw-r--r--. 1 root root  0 Sep 27 07:51 Y3

/test/repZ:
total 4
-rw-r--r--. 1 root root 21 Sep 27 07:58 Z1
-rw-r--r--. 1 root root  0 Sep 27 07:51 Z2
```

La Commande dd

Présentation

La commande **dd** n'est pas réellement une commande de sauvegarde.

La commande **dd** copie le fichier passé en entrée dans le fichier de sortie en limitant le nombre d'octets copiés par l'utilisation de deux options :

- **count**
 - le nombre
- **bs**
 - la taille du bloc à copier

Options de la Commande

Les options de la commande **dd** sont :

```
[root@redhat9 /]# dd --help
Usage: dd [OPERAND]...
      or: dd OPTION
Copy a file, converting and formatting according to the operands.

bs=BYTES      read and write up to BYTES bytes at a time (default: 512);
               overrides ibs and obs
cbs=BYTES      convert BYTES bytes at a time
conv=CONVS     convert the file as per the comma separated symbol list
count=N        copy only N input blocks
ibs=BYTES      read up to BYTES bytes at a time (default: 512)
if=FILE        read from FILE instead of stdin
iflag=FLAGS    read as per the comma separated symbol list
obs=BYTES      write BYTES bytes at a time (default: 512)
of=FILE        write to FILE instead of stdout
```

```
oflag=FLAGS    write as per the comma separated symbol list
seek=N        skip N obs-sized blocks at start of output
skip=N        skip N ibs-sized blocks at start of input
status=LEVEL  The LEVEL of information to print to stderr;
              'none' suppresses everything but error messages,
              'noxfer' suppresses the final transfer statistics,
              'progress' shows periodic transfer statistics
```

N and BYTES may be followed by the following multiplicative suffixes:
c=1, w=2, b=512, kB=1000, K=1024, MB=1000*1000, M=1024*1024, xM=M,
GB=1000*1000*1000, G=1024*1024*1024, and so on for T, P, E, Z, Y.
Binary prefixes can be used, too: KiB=K, MiB=M, and so on.

Each CONV symbol may be:

```
ascii    from EBCDIC to ASCII
ebcdic   from ASCII to EBCDIC
ibm      from ASCII to alternate EBCDIC
block    pad newline-terminated records with spaces to cbs-size
unblock  replace trailing spaces in cbs-size records with newline
lcase    change upper case to lower case
ucase    change lower case to upper case
sparse   try to seek rather than write all-NUL output blocks
swab     swap every pair of input bytes
sync     pad every input block with NULs to ibs-size; when used
         with block or unblock, pad with spaces rather than NULs
excl     fail if the output file already exists
nocreat  do not create the output file
notrunc  do not truncate the output file
noerror  continue after read errors
fdatsync physically write output file data before finishing
fsync    likewise, but also write metadata
```

Each FLAG symbol may be:

```
append      append mode (makes sense only for output; conv=notrunc suggested)
direct      use direct I/O for data
directory   fail unless a directory
dsync       use synchronized I/O for data
sync        likewise, but also for metadata
fullblock   accumulate full blocks of input (iflag only)
nonblock    use non-blocking I/O
noatime     do not update access time
nocache     Request to drop cache.  See also oflag=sync
noctty     do not assign controlling terminal from file
nofollow    do not follow symlinks
count_bytes treat 'count=N' as a byte count (iflag only)
skip_bytes  treat 'skip=N' as a byte count (iflag only)
seek_bytes  treat 'seek=N' as a byte count (oflag only)
```

Sending a USR1 signal to a running 'dd' process makes it print I/O statistics to standard error and then resume copying.

Options are:

```
--help      display this help and exit
--version   output version information and exit
```

GNU coreutils online help: <<https://www.gnu.org/software/coreutils/>>

Full documentation <<https://www.gnu.org/software/coreutils/dd>>

or available locally via: info '(coreutils) dd invocation'

LAB #3 - Travailler avec la Commande dd

Vous allez utiliser maintenant le logiciel **dd** pour effectuer une sauvegarde de votre MBR et de la table des partitions.

Effectuez une sauvegarde de votre MBR qui se trouve dans les premiers 446 octets de votre disque **/dev/sda** :

```
[root@redhat9 /]# dd if=/dev/sda of=/tmp/mbr.save bs=1 count=446
446+0 records in
446+0 records out
446 bytes copied, 0.00114645 s, 389 kB/s
```

Effectuez maintenant une sauvegarde de votre table des partitions qui se trouve dans les 64 octets après les 446 précédemment sauvegardés :

```
[root@redhat9 /]# dd if=/dev/sda of=/tmp/tblpart.save bs=1 count=64 skip=446
64+0 records in
64+0 records out
64 bytes copied, 0.000282251 s, 227 kB/s
```



Important - Notez l'utilisation de l'option **skip** qui permet de positionner le début de la sauvegarde au 447^{ième} octet.

Les Commandes dump et restore

Présentation

Les commandes **dump** et **restore** se basent sur le format d'enregistrement des données (ext3). Pour cette raison il n'est pas possible de sauvegarder des répertoires à l'intérieur d'un système de fichiers mais uniquement des systèmes de fichiers complets.

Il est important de noter que le système de fichier ne doit pas être utilisé pendant le processus de dump. Pour cette raison il est normalement conseillé de démonter le système de fichiers.

Il existe 10 niveaux de dump possibles de **0** à **9**. Lors d'un dump le niveau est spécifié. Chaque fois qu'un dump est effectué, cette information est sauvegardée dans le fichier /etc/dumpdates.

Par définition un dump de niveau **0** est une sauvegarde complète tandis que le dump de niveau **1** est une sauvegarde incrémentale.

Notez que les fichiers sont sauvegardés avec des nom relatifs. Ceci implique que vous devez vous positionner dans le système de fichiers lors de la restauration avec la commande **restore**.

Outils Avancés de Sauvegarde

Outils de Sauvegarde Unidirectionnelle

Ces outils sauvegardent des fichiers vers un répertoire local ou distant dans un seul sens.

Ce premier tableau compare les outils par rapport aux caractéristiques et aux capacités des opérations de sauvegarde :

Outil	Backend	Sauvegarde différentielle	Sauvegarde incrémentale	Sauvegarde décrémentele	Planification incorporée	Restauration incorporée	Chiffrement	Compression	Site
AMANDA	tar, gzip								AMANDA
Areca Backup	Aucun								Areca Backup
bacula (Bareos)	MySQL								bacula
BackInTime	rsync, diff, meld								BackInTime
BackupPC	rsync, samba, tar								BackupPC
Dar	Aucun								Dar
Déjà Dup	duplicity								Duplicity
Grsync	rsync								Grsync
luckyBackup	rsync								luckyBackup

Outil	Backend	Sauvegarde différentielle	Sauvegarde incrémentale	Sauvegarde décrementale	Planification incorporée	Restauration incorporée	Chiffrement	Compression	Site
SBackup	Aucun								SBackup



A Faire - Consultez la page [List of backup software](#) sur Wikipedia pour plus d'informations.

Ce deuxième tableau compare les outils triés par la date de dernière version connue :

Outil	Ecrit en	Licence	Dernière Version	Date Version	Linux	Windows	Mac	Site Web
Dar	C++	GPL	2.6.2	09/02/2019				Dar
Bacula (Bareos)	C, C++	GNU Affero General Public License v3.0	9.4.2	04/02/2019				bacula
BackupPC	Perl	GPL v3.0	4.3.0	25/11/2018				BackupPC
luckyBackup	C++	GPL v3.0	0.5.0	18/11/2018				luckyBackup
Déjà Dup (Duplicity)	Python	GPL	0.7.18.2	17/11/2018				Duplicity
AMANDA	C, Perl	GPL, LGPL, Apache, Amanda License	3.5.1	01/12/2017				AMANDA
BackInTime	Python3	GPL	1.1.24	07/11/2017				BackInTime
Grsync	GTK	GPL	1.2.6	15/03/2016				Grsync
Areca Backup	Java	GPLv2	7.5	26/08/2015				Areca Backup
SBackup	GTK	GPLv2	0.11.6	24/02/2014				SBackup

Outils de Sauvegarde Multidirectionnelle

Ces outils synchronisent les fichiers entre deux serveurs.

Ce premier tableau compare les outils par rapport aux caractéristiques et aux capacités des opérations de sauvegarde :

Outil	Backend	Sauvegarde différentielle	Sauvegarde incrémentale	Sauvegarde décrementale	Planification incorporée	Restauration incorporée	Chiffrement	Compression
FullSync	smb, ftp, sftp					S/O		
FreeFileSync	Aucun					S/O		
unison	SSH, RSH					S/O		
Synkron	Aucun							



A Faire - Consultez la page [Comparison of file synchronization software](#) sur Wikipedia pour plus d'informations..

Ce deuxième tableau compare les outils triés par la date de dernière version connue :

Outil	Ecrit en	Licence	Dernière Version	Date Version	Linux	Windows	Mac	Site Web
FreeFileSync	Divers	GPL v3.0	10.8	05/01/2019				FreeFileSync
unison	OCaml	GPL v3.0	2.51.2	27/01/2018				unison
FullSync	Java	GPLv2	0.10.4	05/04/2016				FullSync
Synkron	C++	GPL v2	1.6.2	25/01/2011				Synkron

Outils de Sauvegarde des Partitions

Ce premier tableau compare les outils par rapport aux caractéristiques et aux capacités des opérations de sauvegarde :

Outil	Backend	Sauvegarde différentielle	Sauvegarde incrémentale	Sauvegarde décrementale	Planification incorporée	Restauration incorporée	Chiffrement	Compression
CloneZilla	SSH, samba, NFS							
Partclone	Aucun							
partimage	Aucun							



A Faire - Consultez la page [Comparison of disk cloning software](#) sur Wikipedia pour plus d'informations.

Ce deuxième tableau compare les outils triés par la date de dernière version connue :

Outil	Ecrit en	Licence	Dernière Version	Date Version	Linux	Windows	Mac	Site Web
CloneZilla	Perl, Unix shell	GPL	2.6.0-37	10/01/2019				CloneZilla
Partclone	C	GPL	0.2.89	05/07/2016				Partclone
partimage	C	GPL	0.6.9	25/07/2010				Partimage

LAB #4 - Que Sauvegarder en Priorité ?

Sauvegarde de la Liste des Paquets

Supprimez les fichiers de verrouillage de la base de données RPM :

```
root@redhat9 /]# rm -f /var/lib/rpm/__db*
```

Sauvegardez les bases de données RPM :

```
[root@redhat9 /]# tar czvf $(hostname).rpmdb.tar.gz /var/lib/rpm
tar: Removing leading `/' from member names
/var/lib/rpm/
/var/lib/rpm/rpmdb.sqlite
/var/lib/rpm/rpmdb.sqlite-wal
/var/lib/rpm/rpmdb.sqlite-shm
/var/lib/rpm/.rpm.lock
```

Pour sauvegarder la liste des paquets à l'identique en termes de version, utilisez la commande RPM :

```
[root@redhat9 /]# rpm -qa > liste-des-paquets_`hostname`_`date +%Y-%m-%d-%H-%M`
```

Consultez le contenu de ce fichier :

```
[root@redhat9 /]# more liste-des-paquets_redhat9.ittraining.loc_2024-09-27-08-15
fonts-filesystem-2.0.5-7.el9.1.noarch
xkeyboard-config-2.33-2.el9.noarch
abattis-cantarell-fonts-0.301-4.el9.noarch
yelp-xsl-40.2-1.el9.noarch
mozilla-filesystem-1.9-30.el9.x86_64
google-noto-fonts-common-20201206-4.el9.noarch
foomatic-db-filesystem-4.0-72.20210209.el9.noarch
adobe-mappings-cmap-20171205-12.el9.noarch
subscription-manager-rhsm-certificates-20220623-1.el9.noarch
libreport-filesystem-2.15.2-6.el9.noarch
adobe-mappings-cmap-deprecated-20171205-12.el9.noarch
adobe-source-code-pro-fonts-2.030.1.050-12.el9.1.noarch
dejavu-sans-mono-fonts-2.37-18.el9.noarch
dejavu-sans-fonts-2.37-18.el9.noarch
```

```
langpacks-core-font-en-3.0-16.el9.noarch
google-droid-sans-fonts-20200215-11.el9.2.noarch
thai-scalable-fonts-common-0.7.2-5.el9.noarch
redhat-indexhtml-9-4.el9_2.noarch
poppler-data-0.4.9-9.el9.noarch
mobile-broadband-provider-info-20210805-2.el9.noarch
man-pages-overrides-9.0.0.0-1.el9.noarch
hunspell-filesystem-1.7.0-11.el9.x86_64
hplip-common-3.21.2-6.el9.x86_64
gawk-all-langpacks-5.1.0-6.el9.x86_64
adwaita-cursor-theme-40.1.1-3.el9.noarch
adobe-mappings-pdf-20180407-10.el9.noarch
vim-filesystem-8.2.2637-20.el9_1.noarch
rhsm-icons-6-1.el9.noarch
filesystem-3.16-2.el9.x86_64
urw-base35-fonts-common-20200910-6.el9.noarch
basesystem-11-13.el9.noarch
quota-nls-4.06-6.el9.noarch
publicsuffix-list-dafsa-20210518-3.el9.noarch
pkgconf-m4-1.7.3-10.el9.noarch
popt-1.18-8.el9.x86_64
xz-libs-5.2.5-8.el9_0.x86_64
libxcrypt-4.4.18-3.el9.x86_64
bzip2-libs-1.0.8-8.el9.x86_64
libzstd-1.5.1-2.el9.x86_64
libpng-1.6.37-12.el9.x86_64
libcap-ng-0.8.2-7.el9.x86_64
libicu-67.1-9.el9.x86_64
libunistring-0.9.10-15.el9.x86_64
libgpg-error-1.42-5.el9.x86_64
libseccomp-2.5.2-2.el9.x86_64
lcms2-2.12-3.el9.x86_64
readline-8.1-4.el9.x86_64
libwayland-client-1.21.0-1.el9.x86_64
```

```
libwayland-server-1.21.0-1.el9.x86_64
jansson-2.14-1.el9.x86_64
libxkbcommon-1.0.3-4.el9.x86_64
libwayland-egl-1.21.0-1.el9.x86_64
keyutils-libs-1.6.3-1.el9.x86_64
libdhash-0.5.0-53.el9.x86_64
libXau-1.0.9-8.el9.x86_64
--More-- (4%)
[q]
```



Important - Il convient ensuite de sauvegarder les deux fichiers **liste-des-paquets_*** et **\$(hostname).rpmdatabase.tar.gz** sur un support externe.

Afin de restaurer les sauvegardes, récupérez les deux fichiers **liste-des-paquets_*** et **\$(hostname).rpmdatabase.tar.gz** du support externe à la racine du système de fichiers :

```
[root@redhat9 ~]# cp liste-des-paquets_redhat9.ittraining.loc_2024-09-27-08-15
redhat9.ittraining.loc.rpmdatabase.tar.gz /
```

Placez-vous à la racine du système de fichiers et restaurez les bases de données RPM :

```
[root@redhat9 /]# tar xvf redhat9.ittraining.loc.rpmdatabase.tar.gz
var/lib/rpm/
var/lib/rpm/rpmdb.sqlite
var/lib/rpm/rpmdb.sqlite-wal
var/lib/rpm/rpmdb.sqlite-shm
var/lib/rpm/.rpm.lock
```

Utilisez YUM pour restaurer les paquets :

```
[root@redhat9 /]# dnf -y install -y $(cat liste-des-paquets_redhat9.ittraining.loc_2024-09-27-08-15)
```

Sauvegarde d'un Mémo sur la Structure du Disque Dur Système

```
[root@redhat9 ~]# cd ~
[root@redhat9 ~]# fdisk -l /dev/sda > structure.list
[root@redhat9 ~]# cat structure.list
Disk /dev/sda: 50 GiB, 53687091200 bytes, 104857600 sectors
Disk model: QEMU HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xd00dfc8a

Device      Boot  Start        End  Sectors  Size Id Type
/dev/sda1   *      2048    2099199    2097152    1G 83 Linux
/dev/sda2           2099200 104857599 102758400    49G 8e Linux LVM
```



Important - Il convient ensuite de sauvegarder le fichier **structure.list** sur un support externe.

Sauvegarde d'un Mémo sur les Points de Montage du Disque Dur Système

Saisissez la commande suivante :

```
[root@redhat9 ~]# df -h | grep "^/dev/" > montages.list
[root@redhat9 ~]# cat montages.list
/dev/mapper/rhel-root    44G  7.8G   37G  18% /
/dev/sda1                1014M 398M  617M  40% /boot
```



Important - Il convient ensuite de sauvegarder le fichier **montages.list** sur un support externe.

Sauvegarde du Chargeur de Démarrage

GRUB Legacy

```
# cp /boot/grub/menu.lst grubmenu.lst
```

GRUB 2 avec BIOS

Saisissez les commandes suivantes :

```
[root@redhat9 ~]# cp /boot/grub2/grub.cfg grub.cfg  
[root@redhat9 ~]# cp /boot/grub2/device.map device.map
```

GRUB 2 avec EFI

```
# cp /boot/efi/EFI/redhat/grub.cfg grub.cfg  
# cp /boot/grub2/device.map device.map
```



Important - Il convient ensuite de sauvegarder le fichier **menu.lst** ou **grub.cfg** et le fichier **device.map** sur un support externe.

Sauvegarde des Dossiers Utilisateurs

```
[root@redhat9 ~]# cp -apv /home/ .
'/home/' -> './home'
'/home/trainee' -> './home/trainee'
'/home/trainee/training' -> './home/trainee/training'
'/home/trainee/training/f1' -> './home/trainee/training/f1'
'/home/trainee/training/f2' -> './home/trainee/training/f2'
'/home/trainee/training/f3' -> './home/trainee/training/f3'
'/home/trainee/training/f4' -> './home/trainee/training/f4'
'/home/trainee/training/f5' -> './home/trainee/training/f5'
'/home/trainee/training/f52' -> './home/trainee/training/f52'
'/home/trainee/training/f62' -> './home/trainee/training/f62'
'/home/trainee/training/a100' -> './home/trainee/training/a100'
'/home/trainee/training/f' -> './home/trainee/training/f'
'/home/trainee/training/f.txt' -> './home/trainee/training/f.txt'
'/home/trainee/training/f123.txt' -> './home/trainee/training/f123.txt'
'/home/trainee/training/f123123.txt' -> './home/trainee/training/f123123.txt'
'/home/trainee/training/f123123123.txt' -> './home/trainee/training/f123123123.txt'
'/home/trainee/training/file' -> './home/trainee/training/file'
'/home/trainee/training/user_check' -> './home/trainee/training/user_check'
'/home/trainee/bin' -> './home/trainee/bin'
'/home/trainee/bin/myscript' -> './home/trainee/bin/myscript'
'/home/trainee/Desktop' -> './home/trainee/Desktop'
'/home/trainee/Documents' -> './home/trainee/Documents'
'/home/trainee/.config' -> './home/trainee/.config'
'/home/trainee/.config/ibus' -> './home/trainee/.config/ibus'
'/home/trainee/.config/ibus/bus' -> './home/trainee/.config/ibus/bus'
'/home/trainee/.config/ibus/bus/5a35a3eb625c45cea1d33535723e791f-unix-wayland-0' ->
 './home/trainee/.config/ibus/bus/5a35a3eb625c45cea1d33535723e791f-unix-wayland-0'
'/home/trainee/.config/user-dirs.dirs' -> './home/trainee/.config/user-dirs.dirs'
'/home/trainee/.config/user-dirs.locale' -> './home/trainee/.config/user-dirs.locale'
'/home/trainee/.config/evolution' -> './home/trainee/.config/evolution'
```

```
'/home/trainee/.config/evolution/sources' -> './home/trainee/.config/evolution/sources'  
'/home/trainee/.config/evolution/sources/system-proxy.source' ->  
 './home/trainee/.config/evolution/sources/system-proxy.source'  
'/home/trainee/.config/gtk-3.0' -> './home/trainee/.config/gtk-3.0'  
'/home/trainee/.config/gtk-3.0/bookmarks' -> './home/trainee/.config/gtk-3.0/bookmarks'  
'/home/trainee/.config/.gsd-keyboard.settings-ported' -> './home/trainee/.config/.gsd-keyboard.settings-ported'  
'/home/trainee/.config/gnome-initial-setup-done' -> './home/trainee/.config/gnome-initial-setup-done'  
'/home/trainee/.config/goa-1.0' -> './home/trainee/.config/goa-1.0'  
'/home/trainee/.config/pulse' -> './home/trainee/.config/pulse'  
'/home/trainee/.config/pulse/cookie' -> './home/trainee/.config/pulse/cookie'  
'/home/trainee/.config/dconf' -> './home/trainee/.config/dconf'  
'/home/trainee/.config/dconf/user' -> './home/trainee/.config/dconf/user'  
'/home/trainee/codes' -> './home/trainee/codes'  
'/home/trainee/codes/exit.txt' -> './home/trainee/codes/exit.txt'  
'/home/trainee/.local' -> './home/trainee/.local'  
'/home/trainee/.local/share' -> './home/trainee/.local/share'  
'/home/trainee/.local/share/evolution' -> './home/trainee/.local/share/evolution'  
'/home/trainee/.local/share/evolution/addressbook' -> './home/trainee/.local/share/evolution/addressbook'  
'/home/trainee/.local/share/evolution/addressbook/system' ->  
 './home/trainee/.local/share/evolution/addressbook/system'  
'/home/trainee/.local/share/evolution/addressbook/system/contacts.db' ->  
 './home/trainee/.local/share/evolution/addressbook/system/contacts.db'  
'/home/trainee/.local/share/evolution/addressbook/system/photos' ->  
 './home/trainee/.local/share/evolution/addressbook/system/photos'  
'/home/trainee/.local/share/evolution/addressbook/trash' ->  
 './home/trainee/.local/share/evolution/addressbook/trash'  
'/home/trainee/.local/share/evolution/mail' -> './home/trainee/.local/share/evolution/mail'  
'/home/trainee/.local/share/evolution/mail/trash' -> './home/trainee/.local/share/evolution/mail/trash'  
'/home/trainee/.local/share/evolution/tasks' -> './home/trainee/.local/share/evolution/tasks'  
'/home/trainee/.local/share/evolution/tasks/system' -> './home/trainee/.local/share/evolution/tasks/system'  
'/home/trainee/.local/share/evolution/tasks/system/tasks.ics' ->  
 './home/trainee/.local/share/evolution/tasks/system/tasks.ics'  
'/home/trainee/.local/share/evolution/tasks/trash' -> './home/trainee/.local/share/evolution/tasks/trash'  
'/home/trainee/.local/share/evolution/calendar' -> './home/trainee/.local/share/evolution/calendar'
```

```
'/home/trainee/.local/share/evolution/calendar/trash' -> './home/trainee/.local/share/evolution/calendar/trash'  
'/home/trainee/.local/share/evolution/calendar/system' -> './home/trainee/.local/share/evolution/calendar/system'  
'/home/trainee/.local/share/evolution/calendar/system/calendar.ics' ->  
'./home/trainee/.local/share/evolution/calendar/system/calendar.ics'  
'/home/trainee/.local/share/evolution/memos' -> './home/trainee/.local/share/evolution/memos'  
'/home/trainee/.local/share/evolution/memos/trash' -> './home/trainee/.local/share/evolution/memos/trash'  
'/home/trainee/.local/share/applications' -> './home/trainee/.local/share/applications'  
'/home/trainee/.local/share/icc' -> './home/trainee/.local/share/icc'  
'/home/trainee/.local/share/icc/edid-bb6ad72dc802b000932c73ad20996ae5.icc' ->  
'./home/trainee/.local/share/icc/edid-bb6ad72dc802b000932c73ad20996ae5.icc'  
'/home/trainee/.local/share/sounds' -> './home/trainee/.local/share/sounds'  
'/home/trainee/.local/share/flatpak' -> './home/trainee/.local/share/flatpak'  
'/home/trainee/.local/share/flatpak/repo' -> './home/trainee/.local/share/flatpak/repo'  
'/home/trainee/.local/share/flatpak/repo/refs' -> './home/trainee/.local/share/flatpak/repo/refs'  
'/home/trainee/.local/share/flatpak/repo/refs/heads' -> './home/trainee/.local/share/flatpak/repo/refs/heads'  
'/home/trainee/.local/share/flatpak/repo/refs/mirrors' -> './home/trainee/.local/share/flatpak/repo/refs/mirrors'  
'/home/trainee/.local/share/flatpak/repo/refs/remotes' -> './home/trainee/.local/share/flatpak/repo/refs/remotes'  
'/home/trainee/.local/share/flatpak/repo/objects' -> './home/trainee/.local/share/flatpak/repo/objects'  
'/home/trainee/.local/share/flatpak/repo/config' -> './home/trainee/.local/share/flatpak/repo/config'  
'/home/trainee/.local/share/flatpak/repo/tmp' -> './home/trainee/.local/share/flatpak/repo/tmp'  
'/home/trainee/.local/share/flatpak/repo/tmp/cache' -> './home/trainee/.local/share/flatpak/repo/tmp/cache'  
'/home/trainee/.local/share/flatpak/repo/extensions' -> './home/trainee/.local/share/flatpak/repo/extensions'  
'/home/trainee/.local/share/flatpak/repo/state' -> './home/trainee/.local/share/flatpak/repo/state'  
'/home/trainee/.local/share/flatpak/.changed' -> './home/trainee/.local/share/flatpak/.changed'  
'/home/trainee/.local/share/flatpak/db' -> './home/trainee/.local/share/flatpak/db'  
'/home/trainee/.local/share/pki' -> './home/trainee/.local/share/pki'  
'/home/trainee/.local/share/pki/nssdb' -> './home/trainee/.local/share/pki/nssdb'  
'/home/trainee/.local/share/keyrings' -> './home/trainee/.local/share/keyrings'  
'/home/trainee/.local/share/keyrings/login.keyring' -> './home/trainee/.local/share/keyrings/login.keyring'  
'/home/trainee/.local/share/keyrings/user.keystore' -> './home/trainee/.local/share/keyrings/user.keystore'  
'/home/trainee/.local/share/gnome-shell' -> './home/trainee/.local/share/gnome-shell'  
'/home/trainee/.local/share/gnome-shell/gnome-overrides-migrated' -> './home/trainee/.local/share/gnome-shell/gnome-overrides-migrated'  
'/home/trainee/.local/share/gnome-shell/application_state' -> './home/trainee/.local/share/gnome-
```

```
shell/application_state'  
'/home/trainee/.local/share/gvfs-metadata' -> './home/trainee/.local/share/gvfs-metadata'  
'/home/trainee/.local/share/gvfs-metadata/home' -> './home/trainee/.local/share/gvfs-metadata/home'  
'/home/trainee/.local/share/gvfs-metadata/root' -> './home/trainee/.local/share/gvfs-metadata/root'  
'/home/trainee/.local/share/gvfs-metadata/home-6f6e2002.log' -> './home/trainee/.local/share/gvfs-  
metadata/home-6f6e2002.log'  
'/home/trainee/.local/share/gvfs-metadata/root-47507e37.log' -> './home/trainee/.local/share/gvfs-  
metadata/root-47507e37.log'  
'/home/trainee/.local/share/gnome-settings-daemon' -> './home/trainee/.local/share/gnome-settings-daemon'  
'/home/trainee/.local/share/gnome-settings-daemon/input-sources-converted' -> './home/trainee/.local/share/gnome-  
settings-daemon/input-sources-converted'  
'/home/trainee/.local/state' -> './home/trainee/.local/state'  
'/home/trainee/.local/state/wireplumber' -> './home/trainee/.local/state/wireplumber'  
'/home/trainee/.local/state/wireplumber/restore-stream' -> './home/trainee/.local/state/wireplumber/restore-  
stream'  
'/home/trainee/Downloads' -> './home/trainee/Downloads'  
'/home/trainee/Music' -> './home/trainee/Music'  
'/home/trainee/.cache' -> './home/trainee/.cache'  
'/home/trainee/.cache/event-sound-cache.tdb.5a35a3eb625c45cea1d33535723e791f.x86_64-redhat-linux-gnu' ->  
'./home/trainee/.cache/event-sound-cache.tdb.5a35a3eb625c45cea1d33535723e791f.x86_64-redhat-linux-gnu'  
'/home/trainee/.cache/gstreamer-1.0' -> './home/trainee/.cache/gstreamer-1.0'  
'/home/trainee/.cache/gstreamer-1.0/registry.x86_64.bin' ->  
'./home/trainee/.cache/gstreamer-1.0/registry.x86_64.bin'  
'/home/trainee/.cache/appstream' -> './home/trainee/.cache/appstream'  
'/home/trainee/.cache/mesa_shader_cache' -> './home/trainee/.cache/mesa_shader_cache'  
'/home/trainee/.cache/mesa_shader_cache/35' -> './home/trainee/.cache/mesa_shader_cache/35'  
'/home/trainee/.cache/mesa_shader_cache/35/fdf1af19fe3030e69e8f1eb8e8b27af5336130' ->  
'./home/trainee/.cache/mesa_shader_cache/35/fdf1af19fe3030e69e8f1eb8e8b27af5336130'  
'/home/trainee/.cache/mesa_shader_cache/37' -> './home/trainee/.cache/mesa_shader_cache/37'  
'/home/trainee/.cache/mesa_shader_cache/37/e5792d1d01536d5334b02004e37fb0e4447734' ->  
'./home/trainee/.cache/mesa_shader_cache/37/e5792d1d01536d5334b02004e37fb0e4447734'  
'/home/trainee/.cache/mesa_shader_cache/db' -> './home/trainee/.cache/mesa_shader_cache/db'  
'/home/trainee/.cache/mesa_shader_cache/db/61eeaba3f7216beef1a6584479498f1a1bcc6e' ->  
'./home/trainee/.cache/mesa_shader_cache/db/61eeaba3f7216beef1a6584479498f1a1bcc6e'
```

```
'/home/trainee/.cache/mesa_shader_cache/89' -> './home/trainee/.cache/mesa_shader_cache/89'  
'/home/trainee/.cache/mesa_shader_cache/89/e5753098f3e9b475aea4ee27559d24e8a477cd' ->  
'./home/trainee/.cache/mesa_shader_cache/89/e5753098f3e9b475aea4ee27559d24e8a477cd'  
'/home/trainee/.cache/mesa_shader_cache/89/f6154a1a3badafdf80810f15b7fcdcf76055f7' ->  
'./home/trainee/.cache/mesa_shader_cache/89/f6154a1a3badafdf80810f15b7fcdcf76055f7'  
'/home/trainee/.cache/mesa_shader_cache/29' -> './home/trainee/.cache/mesa_shader_cache/29'  
'/home/trainee/.cache/mesa_shader_cache/29/192c9c298ee4c8c9fbf0ec63ef2235bd284281' ->  
'./home/trainee/.cache/mesa_shader_cache/29/192c9c298ee4c8c9fbf0ec63ef2235bd284281'  
'/home/trainee/.cache/mesa_shader_cache/ba' -> './home/trainee/.cache/mesa_shader_cache/ba'  
'/home/trainee/.cache/mesa_shader_cache/ba/c8c6c30bb2fd3a6ad51b81489fba57176bdb63' ->  
'./home/trainee/.cache/mesa_shader_cache/ba/c8c6c30bb2fd3a6ad51b81489fba57176bdb63'  
'/home/trainee/.cache/mesa_shader_cache/80' -> './home/trainee/.cache/mesa_shader_cache/80'  
'/home/trainee/.cache/mesa_shader_cache/80/51554895958b09bfcc357550bff8c7c91d3f13' ->  
'./home/trainee/.cache/mesa_shader_cache/80/51554895958b09bfcc357550bff8c7c91d3f13'  
'/home/trainee/.cache/mesa_shader_cache/de' -> './home/trainee/.cache/mesa_shader_cache/de'  
'/home/trainee/.cache/mesa_shader_cache/de/594a26def33b0ccfc9b9af4ee0d1f15e01af73' ->  
'./home/trainee/.cache/mesa_shader_cache/de/594a26def33b0ccfc9b9af4ee0d1f15e01af73'  
'/home/trainee/.cache/mesa_shader_cache/2c' -> './home/trainee/.cache/mesa_shader_cache/2c'  
'/home/trainee/.cache/mesa_shader_cache/2c/58c677aeedca2646d85af2feeaa58bcaba11cd' ->  
'./home/trainee/.cache/mesa_shader_cache/2c/58c677aeedca2646d85af2feeaa58bcaba11cd'  
'/home/trainee/.cache/mesa_shader_cache/66' -> './home/trainee/.cache/mesa_shader_cache/66'  
'/home/trainee/.cache/mesa_shader_cache/66/189cc50668aeaf9534cda7798d819feafd56c7' ->  
'./home/trainee/.cache/mesa_shader_cache/66/189cc50668aeaf9534cda7798d819feafd56c7'  
'/home/trainee/.cache/mesa_shader_cache/6e' -> './home/trainee/.cache/mesa_shader_cache/6e'  
'/home/trainee/.cache/mesa_shader_cache/6e/590e396934a1b10561cef716c8f8e4ab789a36' ->  
'./home/trainee/.cache/mesa_shader_cache/6e/590e396934a1b10561cef716c8f8e4ab789a36'  
'/home/trainee/.cache/mesa_shader_cache/ed' -> './home/trainee/.cache/mesa_shader_cache/ed'  
'/home/trainee/.cache/mesa_shader_cache/ed/48dbafa506e7835391085c2b2979ffad8a8940' ->  
'./home/trainee/.cache/mesa_shader_cache/ed/48dbafa506e7835391085c2b2979ffad8a8940'  
'/home/trainee/.cache/mesa_shader_cache/56' -> './home/trainee/.cache/mesa_shader_cache/56'  
'/home/trainee/.cache/mesa_shader_cache/56/520536fab9c4bd7b65662bdcc0099f3d1fd090' ->  
'./home/trainee/.cache/mesa_shader_cache/56/520536fab9c4bd7b65662bdcc0099f3d1fd090'  
'/home/trainee/.cache/mesa_shader_cache/7b' -> './home/trainee/.cache/mesa_shader_cache/7b'  
'/home/trainee/.cache/mesa_shader_cache/7b/b2b9a86dde20d2ffe0c14d344d36dfae760c54' ->
```

```
./home/trainee/.cache/mesa_shader_cache/7b/b2b9a86dde20d2ffe0c14d344d36dfae760c54'  
./home/trainee/.cache/mesa_shader_cache/17' -> './home/trainee/.cache/mesa_shader_cache/17'  
./home/trainee/.cache/mesa_shader_cache/17/7d02a06d53b04eae8fb946e8bff91c951d8dc3' ->  
./home/trainee/.cache/mesa_shader_cache/17/7d02a06d53b04eae8fb946e8bff91c951d8dc3'  
./home/trainee/.cache/mesa_shader_cache/2f' -> './home/trainee/.cache/mesa_shader_cache/2f'  
./home/trainee/.cache/mesa_shader_cache/2f/5b6e06b2728ebe3fa7976bcea3474fed301b2b' ->  
./home/trainee/.cache/mesa_shader_cache/2f/5b6e06b2728ebe3fa7976bcea3474fed301b2b'  
./home/trainee/.cache/mesa_shader_cache/d0' -> './home/trainee/.cache/mesa_shader_cache/d0'  
./home/trainee/.cache/mesa_shader_cache/d0/6fca52ab2f687b8e6f4c135e084e39bcb0c859' ->  
./home/trainee/.cache/mesa_shader_cache/d0/6fca52ab2f687b8e6f4c135e084e39bcb0c859'  
./home/trainee/.cache/mesa_shader_cache/9e' -> './home/trainee/.cache/mesa_shader_cache/9e'  
./home/trainee/.cache/mesa_shader_cache/9e/d50ad4e45ed562c3e7b4570526c4cc8154f214' ->  
./home/trainee/.cache/mesa_shader_cache/9e/d50ad4e45ed562c3e7b4570526c4cc8154f214'  
./home/trainee/.cache/mesa_shader_cache/6c' -> './home/trainee/.cache/mesa_shader_cache/6c'  
./home/trainee/.cache/mesa_shader_cache/6c/2e2e9047a693755c7cfdc286874dc0e3e30b4e' ->  
./home/trainee/.cache/mesa_shader_cache/6c/2e2e9047a693755c7cfdc286874dc0e3e30b4e'  
./home/trainee/.cache/mesa_shader_cache/6c/3101d0fdf7a12f96507b4ac96b83de38448541' ->  
./home/trainee/.cache/mesa_shader_cache/6c/3101d0fdf7a12f96507b4ac96b83de38448541'  
./home/trainee/.cache/mesa_shader_cache/d3' -> './home/trainee/.cache/mesa_shader_cache/d3'  
./home/trainee/.cache/mesa_shader_cache/d3/075b420db4b80da890c1576f69ba7758421738' ->  
./home/trainee/.cache/mesa_shader_cache/d3/075b420db4b80da890c1576f69ba7758421738'  
./home/trainee/.cache/mesa_shader_cache/e2' -> './home/trainee/.cache/mesa_shader_cache/e2'  
./home/trainee/.cache/mesa_shader_cache/e2/eda2c17a911182ce0675a982c19d7ec332fe48' ->  
./home/trainee/.cache/mesa_shader_cache/e2/eda2c17a911182ce0675a982c19d7ec332fe48'  
./home/trainee/.cache/mesa_shader_cache/3c' -> './home/trainee/.cache/mesa_shader_cache/3c'  
./home/trainee/.cache/mesa_shader_cache/3c/5cfbfcea5eaa35a106d2bad38d8d89c7da4759' ->  
./home/trainee/.cache/mesa_shader_cache/3c/5cfbfcea5eaa35a106d2bad38d8d89c7da4759'  
./home/trainee/.cache/mesa_shader_cache/61' -> './home/trainee/.cache/mesa_shader_cache/61'  
./home/trainee/.cache/mesa_shader_cache/61/d347702600b207e1d67f23f11f089553172512' ->  
./home/trainee/.cache/mesa_shader_cache/61/d347702600b207e1d67f23f11f089553172512'  
./home/trainee/.cache/mesa_shader_cache/03' -> './home/trainee/.cache/mesa_shader_cache/03'  
./home/trainee/.cache/mesa_shader_cache/03/d956db16f83ba111f7e395ca2e6b7b3f83ff46' ->  
./home/trainee/.cache/mesa_shader_cache/03/d956db16f83ba111f7e395ca2e6b7b3f83ff46'  
./home/trainee/.cache/mesa_shader_cache/a4' -> './home/trainee/.cache/mesa_shader_cache/a4'
```

```
'/home/trainee/.cache/mesa_shader_cache/a4/a2550d53877cc1471892b1bec5444abc719ef8' ->
'./home/trainee/.cache/mesa_shader_cache/a4/a2550d53877cc1471892b1bec5444abc719ef8'
'/home/trainee/.cache/mesa_shader_cache/ab' -> './home/trainee/.cache/mesa_shader_cache/ab'
'/home/trainee/.cache/mesa_shader_cache/ab/d56ebc4a54bcc4e49aa3dde4fddb884ff797c1' ->
'./home/trainee/.cache/mesa_shader_cache/ab/d56ebc4a54bcc4e49aa3dde4fddb884ff797c1'
'/home/trainee/.cache/mesa_shader_cache/b1' -> './home/trainee/.cache/mesa_shader_cache/b1'
'/home/trainee/.cache/mesa_shader_cache/b1/8414b51e1825350f6af7ba143d082ba6e91338' ->
'./home/trainee/.cache/mesa_shader_cache/b1/8414b51e1825350f6af7ba143d082ba6e91338'
'/home/trainee/.cache/mesa_shader_cache/c8' -> './home/trainee/.cache/mesa_shader_cache/c8'
'/home/trainee/.cache/mesa_shader_cache/c8/d3f9f8d81fa2bafb1e8e03193e8861047adcde' ->
'./home/trainee/.cache/mesa_shader_cache/c8/d3f9f8d81fa2bafb1e8e03193e8861047adcde'
'/home/trainee/.cache/mesa_shader_cache/df' -> './home/trainee/.cache/mesa_shader_cache/df'
'/home/trainee/.cache/mesa_shader_cache/df/ad5863cff76ca47fcea0a47b9f8d81bf57c605' ->
'./home/trainee/.cache/mesa_shader_cache/df/ad5863cff76ca47fcea0a47b9f8d81bf57c605'
'/home/trainee/.cache/mesa_shader_cache/index' -> './home/trainee/.cache/mesa_shader_cache/index'
'/home/trainee/.cache/mesa_shader_cache/fc' -> './home/trainee/.cache/mesa_shader_cache/fc'
'/home/trainee/.cache/mesa_shader_cache/fc/0a9b98f3ab91773422fdf596d8b90aa3f0319f' ->
'./home/trainee/.cache/mesa_shader_cache/fc/0a9b98f3ab91773422fdf596d8b90aa3f0319f'
'/home/trainee/.cache/mesa_shader_cache/0f' -> './home/trainee/.cache/mesa_shader_cache/0f'
'/home/trainee/.cache/mesa_shader_cache/0f/30c6ae612cca20f942383cf6c3d207a5fa23cc' ->
'./home/trainee/.cache/mesa_shader_cache/0f/30c6ae612cca20f942383cf6c3d207a5fa23cc'
'/home/trainee/.cache/mesa_shader_cache/0f/10bb2c604d0ef8a698a506a297cc7a72885e1f' ->
'./home/trainee/.cache/mesa_shader_cache/0f/10bb2c604d0ef8a698a506a297cc7a72885e1f'
'/home/trainee/.cache/mesa_shader_cache/9a' -> './home/trainee/.cache/mesa_shader_cache/9a'
'/home/trainee/.cache/mesa_shader_cache/9a/32ee45d4531554f10a8184bf639fdf0a072fba' ->
'./home/trainee/.cache/mesa_shader_cache/9a/32ee45d4531554f10a8184bf639fdf0a072fba'
'/home/trainee/.cache/mesa_shader_cache/9a/3061c95eb9135ea46575ef514f2fae7f4711cc' ->
'./home/trainee/.cache/mesa_shader_cache/9a/3061c95eb9135ea46575ef514f2fae7f4711cc'
'/home/trainee/.cache/mesa_shader_cache/06' -> './home/trainee/.cache/mesa_shader_cache/06'
'/home/trainee/.cache/mesa_shader_cache/06/3c901c6133c1b0568bb9b8ff1d4a35af6d8df4' ->
'./home/trainee/.cache/mesa_shader_cache/06/3c901c6133c1b0568bb9b8ff1d4a35af6d8df4'
'/home/trainee/.cache/mesa_shader_cache/7c' -> './home/trainee/.cache/mesa_shader_cache/7c'
'/home/trainee/.cache/mesa_shader_cache/7c/40694e298e691a0e7ac606cb160097a65c5fe9' ->
'./home/trainee/.cache/mesa_shader_cache/7c/40694e298e691a0e7ac606cb160097a65c5fe9'
```

```
'/home/trainee/.cache/mesa_shader_cache/77' -> './home/trainee/.cache/mesa_shader_cache/77'  
'/home/trainee/.cache/mesa_shader_cache/77/390cf9430a3344e71ec336b898ff0af5362f27' ->  
'./home/trainee/.cache/mesa_shader_cache/77/390cf9430a3344e71ec336b898ff0af5362f27'  
'/home/trainee/.cache/mesa_shader_cache/57' -> './home/trainee/.cache/mesa_shader_cache/57'  
'/home/trainee/.cache/mesa_shader_cache/57/b7f8fa574271b61ecbd67cfdbf0fbfa4e7309f' ->  
'./home/trainee/.cache/mesa_shader_cache/57/b7f8fa574271b61ecbd67cfdbf0fbfa4e7309f'  
'/home/trainee/.cache/mesa_shader_cache/78' -> './home/trainee/.cache/mesa_shader_cache/78'  
'/home/trainee/.cache/mesa_shader_cache/78/37d600b50e8a23efed7bcb298703d700c4bdde' ->  
'./home/trainee/.cache/mesa_shader_cache/78/37d600b50e8a23efed7bcb298703d700c4bdde'  
'/home/trainee/.cache/mesa_shader_cache/08' -> './home/trainee/.cache/mesa_shader_cache/08'  
'/home/trainee/.cache/mesa_shader_cache/08/c25769e6f0d114ee11363b6a006276457ba0fe' ->  
'./home/trainee/.cache/mesa_shader_cache/08/c25769e6f0d114ee11363b6a006276457ba0fe'  
'/home/trainee/.cache/mesa_shader_cache/52' -> './home/trainee/.cache/mesa_shader_cache/52'  
'/home/trainee/.cache/mesa_shader_cache/52/675f8b2f5bf87b675ae31f54f2b3c412721c24' ->  
'./home/trainee/.cache/mesa_shader_cache/52/675f8b2f5bf87b675ae31f54f2b3c412721c24'  
'/home/trainee/.cache/mesa_shader_cache/72' -> './home/trainee/.cache/mesa_shader_cache/72'  
'/home/trainee/.cache/mesa_shader_cache/72/6f5d4d61d416fbce8e03f0ba6f3be83b7617ef' ->  
'./home/trainee/.cache/mesa_shader_cache/72/6f5d4d61d416fbce8e03f0ba6f3be83b7617ef'  
'/home/trainee/.cache/mesa_shader_cache/1d' -> './home/trainee/.cache/mesa_shader_cache/1d'  
'/home/trainee/.cache/mesa_shader_cache/1d/16707620c6d057cc29f510df219eae84cb9433' ->  
'./home/trainee/.cache/mesa_shader_cache/1d/16707620c6d057cc29f510df219eae84cb9433'  
'/home/trainee/.cache/mesa_shader_cache/da' -> './home/trainee/.cache/mesa_shader_cache/da'  
'/home/trainee/.cache/mesa_shader_cache/da/35509cf05c257db6419f61347e3abcbfb47931' ->  
'./home/trainee/.cache/mesa_shader_cache/da/35509cf05c257db6419f61347e3abcbfb47931'  
'/home/trainee/.cache/mesa_shader_cache/b2' -> './home/trainee/.cache/mesa_shader_cache/b2'  
'/home/trainee/.cache/mesa_shader_cache/b2/cfbf371328300a5b5d686da17d3722ea1ea680' ->  
'./home/trainee/.cache/mesa_shader_cache/b2/cfbf371328300a5b5d686da17d3722ea1ea680'  
'/home/trainee/.cache/mesa_shader_cache/3d' -> './home/trainee/.cache/mesa_shader_cache/3d'  
'/home/trainee/.cache/mesa_shader_cache/3d/e830f90f2d4d3d79bba17a59903ad4aa4736ed' ->  
'./home/trainee/.cache/mesa_shader_cache/3d/e830f90f2d4d3d79bba17a59903ad4aa4736ed'  
'/home/trainee/.cache/mesa_shader_cache/53' -> './home/trainee/.cache/mesa_shader_cache/53'  
'/home/trainee/.cache/mesa_shader_cache/53/5db4be69e145c6708f2d30c70b5a292464c990' ->  
'./home/trainee/.cache/mesa_shader_cache/53/5db4be69e145c6708f2d30c70b5a292464c990'  
'/home/trainee/.cache/mesa_shader_cache/e7' -> './home/trainee/.cache/mesa_shader_cache/e7'
```

```
'/home/trainee/.cache/mesa_shader_cache/e7/b2552c608263fa6b536e5aba787ce66bbb222b' ->
'./home/trainee/.cache/mesa_shader_cache/e7/b2552c608263fa6b536e5aba787ce66bbb222b'
'/home/trainee/.cache/mesa_shader_cache/59' -> './home/trainee/.cache/mesa_shader_cache/59'
'/home/trainee/.cache/mesa_shader_cache/59/87c57c825b5080423c1f92ee06f23998a21164' ->
'./home/trainee/.cache/mesa_shader_cache/59/87c57c825b5080423c1f92ee06f23998a21164'
'/home/trainee/.cache/mesa_shader_cache/04' -> './home/trainee/.cache/mesa_shader_cache/04'
'/home/trainee/.cache/mesa_shader_cache/04/7e399922091e12b6b1038ffd9d65cb8a8d4e52' ->
'./home/trainee/.cache/mesa_shader_cache/04/7e399922091e12b6b1038ffd9d65cb8a8d4e52'
'/home/trainee/.cache/mesa_shader_cache/5e' -> './home/trainee/.cache/mesa_shader_cache/5e'
'/home/trainee/.cache/mesa_shader_cache/5e/c3362db3becd652b156ef7cef7b65a14000175' ->
'./home/trainee/.cache/mesa_shader_cache/5e/c3362db3becd652b156ef7cef7b65a14000175'
'/home/trainee/.cache/mesa_shader_cache/4b' -> './home/trainee/.cache/mesa_shader_cache/4b'
'/home/trainee/.cache/mesa_shader_cache/4b/c7bfac6ba6440df22b676247a760ea33ef00e9' ->
'./home/trainee/.cache/mesa_shader_cache/4b/c7bfac6ba6440df22b676247a760ea33ef00e9'
'/home/trainee/.cache/mesa_shader_cache/38' -> './home/trainee/.cache/mesa_shader_cache/38'
'/home/trainee/.cache/mesa_shader_cache/38/ab4c0ec5a2678353a62e2adb585cac57621027' ->
'./home/trainee/.cache/mesa_shader_cache/38/ab4c0ec5a2678353a62e2adb585cac57621027'
'/home/trainee/.cache/mesa_shader_cache/f0' -> './home/trainee/.cache/mesa_shader_cache/f0'
'/home/trainee/.cache/mesa_shader_cache/f0/23c0293a789bd41028bbe52116a8050da78300' ->
'./home/trainee/.cache/mesa_shader_cache/f0/23c0293a789bd41028bbe52116a8050da78300'
'/home/trainee/.cache/mesa_shader_cache/f0/fe14587cf5f14504a4d663d50b842ab6708459' ->
'./home/trainee/.cache/mesa_shader_cache/f0/fe14587cf5f14504a4d663d50b842ab6708459'
'/home/trainee/.cache/mesa_shader_cache/0a' -> './home/trainee/.cache/mesa_shader_cache/0a'
'/home/trainee/.cache/mesa_shader_cache/0a/2e07fbab5189565440428bc82a0b3716f1c7f9' ->
'./home/trainee/.cache/mesa_shader_cache/0a/2e07fbab5189565440428bc82a0b3716f1c7f9'
'/home/trainee/.cache/mesa_shader_cache/21' -> './home/trainee/.cache/mesa_shader_cache/21'
'/home/trainee/.cache/mesa_shader_cache/21/f7c9c648eaf6ad5386e464adf635c5fcbda019' ->
'./home/trainee/.cache/mesa_shader_cache/21/f7c9c648eaf6ad5386e464adf635c5fcbda019'
'/home/trainee/.cache/mesa_shader_cache/41' -> './home/trainee/.cache/mesa_shader_cache/41'
'/home/trainee/.cache/mesa_shader_cache/41/c7d27f4328971dfae62cbeeb047f4051f58de2' ->
'./home/trainee/.cache/mesa_shader_cache/41/c7d27f4328971dfae62cbeeb047f4051f58de2'
'/home/trainee/.cache/mesa_shader_cache/2b' -> './home/trainee/.cache/mesa_shader_cache/2b'
'/home/trainee/.cache/mesa_shader_cache/2b/a8165b2be71340b0d73b74a10311320d6c8cf2' ->
'./home/trainee/.cache/mesa_shader_cache/2b/a8165b2be71340b0d73b74a10311320d6c8cf2'
```

```
'/home/trainee/.cache/mesa_shader_cache/13' -> '/home/trainee/.cache/mesa_shader_cache/13'  
'/home/trainee/.cache/mesa_shader_cache/13/b31a6f63cea64dc9bbe84ea28710f135184274' ->  
'./home/trainee/.cache/mesa_shader_cache/13/b31a6f63cea64dc9bbe84ea28710f135184274'  
'/home/trainee/.cache/mesa_shader_cache/c4' -> '/home/trainee/.cache/mesa_shader_cache/c4'  
'/home/trainee/.cache/mesa_shader_cache/c4/9bbd97238c5299a3e74ac9606194a6bbe48334' ->  
'./home/trainee/.cache/mesa_shader_cache/c4/9bbd97238c5299a3e74ac9606194a6bbe48334'  
'/home/trainee/.cache/mesa_shader_cache/63' -> '/home/trainee/.cache/mesa_shader_cache/63'  
'/home/trainee/.cache/mesa_shader_cache/63/9e6e421d46d0b2e7802b4919b10a7c3cfb5a57' ->  
'./home/trainee/.cache/mesa_shader_cache/63/9e6e421d46d0b2e7802b4919b10a7c3cfb5a57'  
'/home/trainee/.cache/ibus' -> '/home/trainee/.cache/ibus'  
'/home/trainee/.cache/flatpak' -> '/home/trainee/.cache/flatpak'  
'/home/trainee/.cache/flatpak/system-cache' -> '/home/trainee/.cache/flatpak/system-cache'  
'/home/trainee/.cache/evolution' -> '/home/trainee/.cache/evolution'  
'/home/trainee/.cache/evolution/addressbook' -> '/home/trainee/.cache/evolution/addressbook'  
'/home/trainee/.cache/evolution/addressbook/trash' -> '/home/trainee/.cache/evolution/addressbook/trash'  
'/home/trainee/.cache/evolution/mail' -> '/home/trainee/.cache/evolution/mail'  
'/home/trainee/.cache/evolution/mail/trash' -> '/home/trainee/.cache/evolution/mail/trash'  
'/home/trainee/.cache/evolution/sources' -> '/home/trainee/.cache/evolution/sources'  
'/home/trainee/.cache/evolution/sources/trash' -> '/home/trainee/.cache/evolution/sources/trash'  
'/home/trainee/.cache/evolution/calendar' -> '/home/trainee/.cache/evolution/calendar'  
'/home/trainee/.cache/evolution/calendar/trash' -> '/home/trainee/.cache/evolution/calendar/trash'  
'/home/trainee/.cache/evolution/memos' -> '/home/trainee/.cache/evolution/memos'  
'/home/trainee/.cache/evolution/memos/trash' -> '/home/trainee/.cache/evolution/memos/trash'  
'/home/trainee/.cache/evolution/tasks' -> '/home/trainee/.cache/evolution/tasks'  
'/home/trainee/.cache/evolution/tasks/trash' -> '/home/trainee/.cache/evolution/tasks/trash'  
'/home/trainee/.cache/gnome-software' -> '/home/trainee/.cache/gnome-software'  
'/home/trainee/.cache/gnome-software/appstream' -> '/home/trainee/.cache/gnome-software/appstream'  
'/home/trainee/.cache/gnome-software/appstream/components.xmlb' -> '/home/trainee/.cache/gnome-  
software/appstream/components.xmlb'  
'/home/trainee/.cache/gnome-software/flatpak-system-default' -> '/home/trainee/.cache/gnome-software/flatpak-  
system-default'  
'/home/trainee/.cache/gnome-software/flatpak-system-default/components.xmlb' -> '/home/trainee/.cache/gnome-  
software/flatpak-system-default/components.xmlb'  
'/home/trainee/.cache/gnome-software/flatpak-user-user' -> '/home/trainee/.cache/gnome-software/flatpak-user-
```

```
user'  
'/home/trainee/.cache/gnome-software/flatpak-user-user/components.xmlb' -> './home/trainee/.cache/gnome-  
software/flatpak-user-user/components.xmlb'  
'/home/trainee/.cache/gnome-software/odrs' -> './home/trainee/.cache/gnome-software/odrs'  
'/home/trainee/.cache/gnome-software/odrs/ratings.json' -> './home/trainee/.cache/gnome-  
software/odrs/ratings.json'  
'/home/trainee/.bash_logout' -> './home/trainee/.bash_logout'  
'/home/trainee/.exrc' -> './home/trainee/.exrc'  
'/home/trainee/.viminfo' -> './home/trainee/.viminfo'  
'/home/trainee/vitext' -> './home/trainee/vitext'  
'/home/trainee/aac' -> './home/trainee/aac'  
'/home/trainee/abc' -> './home/trainee/abc'  
'/home/trainee/bca' -> './home/trainee/bca'  
'/home/trainee/xyz' -> './home/trainee/xyz'  
'/home/trainee/.lessht' -> './home/trainee/.lessht'  
'/home/trainee/errorlog' -> './home/trainee/errorlog'  
'/home/trainee/file' -> './home/trainee/file'  
'/home/trainee/file1' -> './home/trainee/file1'  
'/home/trainee/file2' -> './home/trainee/file2'  
'/home/trainee/list' -> './home/trainee/list'  
'/home/trainee/typescript' -> './home/trainee/typescript'  
'/home/trainee/Templates' -> './home/trainee/Templates'  
'/home/trainee/Pictures' -> './home/trainee/Pictures'  
'/home/trainee/.bash_profile' -> './home/trainee/.bash_profile'  
'/home/trainee/.bashrc' -> './home/trainee/.bashrc'  
'/home/trainee/.bash_history' -> './home/trainee/.bash_history'  
'/home/trainee/Public' -> './home/trainee/Public'  
'/home/trainee/Videos' -> './home/trainee/Videos'  
'/home/trainee/.mozilla' -> './home/trainee/.mozilla'  
'/home/trainee/.mozilla/extensions' -> './home/trainee/.mozilla/extensions'  
'/home/trainee/.mozilla/plugins' -> './home/trainee/.mozilla/plugins'
```



Important - Il convient ensuite de sauvegarder le dossier **/root/home** sur un support



externe.

La Commande Rsync

Présentation

Rsync ou *Remote Sync* est un utilitaire de synchronisation de fichiers qui utilise un algorithme qui minimise la quantité de données copiée en ne copiant que les parties des fichiers qui ont été modifiées.

LAB #5 - Travailler avec la Commande rsync

Créez les répertoires **/test/repA** et `mkdir /test/repB` :

```
[root@redhat9 ~]# mkdir -p /test/repA; mkdir /test/repB
```

Créez maintenant 20 fichiers vides dans le répertoire **/test/repA** :

```
[root@redhat9 ~]# touch /test/repA/file{1..20}
[root@redhat9 ~]# ls -l /test/repA/
total 0
-rw-r--r--. 1 root root 0 Sep 27 11:43 file1
-rw-r--r--. 1 root root 0 Sep 27 11:43 file10
-rw-r--r--. 1 root root 0 Sep 27 11:43 file11
-rw-r--r--. 1 root root 0 Sep 27 11:43 file12
-rw-r--r--. 1 root root 0 Sep 27 11:43 file13
-rw-r--r--. 1 root root 0 Sep 27 11:43 file14
-rw-r--r--. 1 root root 0 Sep 27 11:43 file15
-rw-r--r--. 1 root root 0 Sep 27 11:43 file16
-rw-r--r--. 1 root root 0 Sep 27 11:43 file17
```

```
-rw-r--r--. 1 root root 0 Sep 27 11:43 file18
-rw-r--r--. 1 root root 0 Sep 27 11:43 file19
-rw-r--r--. 1 root root 0 Sep 27 11:43 file2
-rw-r--r--. 1 root root 0 Sep 27 11:43 file20
-rw-r--r--. 1 root root 0 Sep 27 11:43 file3
-rw-r--r--. 1 root root 0 Sep 27 11:43 file4
-rw-r--r--. 1 root root 0 Sep 27 11:43 file5
-rw-r--r--. 1 root root 0 Sep 27 11:43 file6
-rw-r--r--. 1 root root 0 Sep 27 11:43 file7
-rw-r--r--. 1 root root 0 Sep 27 11:43 file8
-rw-r--r--. 1 root root 0 Sep 27 11:43 file9
```

Pout synchroniser les fichiers de **/test/repA** vers le répertoire **/test/repB**, utilisez l'option **-r** de la commande rsync :

```
[root@redhat9 ~]# rsync -r /test/repA/ /test/repB
[root@redhat9 ~]# ls -l /test/repB/
total 0
-rw-r--r--. 1 root root 0 Sep 27 11:45 file1
-rw-r--r--. 1 root root 0 Sep 27 11:45 file10
-rw-r--r--. 1 root root 0 Sep 27 11:45 file11
-rw-r--r--. 1 root root 0 Sep 27 11:45 file12
-rw-r--r--. 1 root root 0 Sep 27 11:45 file13
-rw-r--r--. 1 root root 0 Sep 27 11:45 file14
-rw-r--r--. 1 root root 0 Sep 27 11:45 file15
-rw-r--r--. 1 root root 0 Sep 27 11:45 file16
-rw-r--r--. 1 root root 0 Sep 27 11:45 file17
-rw-r--r--. 1 root root 0 Sep 27 11:45 file18
-rw-r--r--. 1 root root 0 Sep 27 11:45 file19
-rw-r--r--. 1 root root 0 Sep 27 11:45 file2
-rw-r--r--. 1 root root 0 Sep 27 11:45 file20
-rw-r--r--. 1 root root 0 Sep 27 11:45 file3
-rw-r--r--. 1 root root 0 Sep 27 11:45 file4
-rw-r--r--. 1 root root 0 Sep 27 11:45 file5
-rw-r--r--. 1 root root 0 Sep 27 11:45 file6
```

```
-rw-r--r--. 1 root root 0 Sep 27 11:45 file7  
-rw-r--r--. 1 root root 0 Sep 27 11:45 file8  
-rw-r--r--. 1 root root 0 Sep 27 11:45 file9
```



Important - Notez que l'horodatage des fichiers synchronisés n'a pas été préservé.

Supprimez les fichiers dans **/test/repB** :

```
[root@redhat9 ~]# rm -rf /test/repB/*  
[root@redhat9 ~]# ls -l /test/repB/  
total 0
```

Pour synchroniser les fichiers de **/test/repA** vers le répertoire **/test/repB**, utilisez l'option **-a** de la commande rsync :

```
[root@redhat9 ~]# rsync -a /test/repA/ /test/repB  
[root@redhat9 ~]# ls -l /test/repB/  
total 0  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file1  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file10  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file11  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file12  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file13  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file14  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file15  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file16  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file17  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file18  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file19  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file2  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file20  
-rw-r--r--. 1 root root 0 Sep 27 11:43 file3
```

```
-rw-r--r--. 1 root root 0 Sep 27 11:43 file4
-rw-r--r--. 1 root root 0 Sep 27 11:43 file5
-rw-r--r--. 1 root root 0 Sep 27 11:43 file6
-rw-r--r--. 1 root root 0 Sep 27 11:43 file7
-rw-r--r--. 1 root root 0 Sep 27 11:43 file8
-rw-r--r--. 1 root root 0 Sep 27 11:43 file9
```



Important - Notez que non seulement l'option **-a** de la commande **rsync** synchronise les fichiers d'une manière récursive, toute comme l'option **-r**, mais elle préserve aussi les fichiers spéciaux, les liens symboliques, les permissions, les propriétaires, les groupes ainsi que les dates de modification des fichiers.

De nouveau, supprimez les fichiers dans le répertoire **/test/repB** :

```
[root@redhat9 ~]# rm -rf /test/repB/*
[root@redhat9 ~]# ls -l /test/repB/
total 0
```

Exécutez maintenant le commande suivante et constatez le résultat :

```
[root@redhat9 ~]# rsync -a /test/repA /test/repB
[root@redhat9 ~]# ls -l /test/repB/
total 4
drwxr-xr-x. 2 root root 4096 Sep 27 11:43 repA
[root@redhat9 ~]# ls -l /test/repB/repA/
total 0
-rw-r--r--. 1 root root 0 Sep 27 11:43 file1
-rw-r--r--. 1 root root 0 Sep 27 11:43 file10
-rw-r--r--. 1 root root 0 Sep 27 11:43 file11
-rw-r--r--. 1 root root 0 Sep 27 11:43 file12
-rw-r--r--. 1 root root 0 Sep 27 11:43 file13
```

```
-rw-r--r--. 1 root root 0 Sep 27 11:43 file14
-rw-r--r--. 1 root root 0 Sep 27 11:43 file15
-rw-r--r--. 1 root root 0 Sep 27 11:43 file16
-rw-r--r--. 1 root root 0 Sep 27 11:43 file17
-rw-r--r--. 1 root root 0 Sep 27 11:43 file18
-rw-r--r--. 1 root root 0 Sep 27 11:43 file19
-rw-r--r--. 1 root root 0 Sep 27 11:43 file2
-rw-r--r--. 1 root root 0 Sep 27 11:43 file20
-rw-r--r--. 1 root root 0 Sep 27 11:43 file3
-rw-r--r--. 1 root root 0 Sep 27 11:43 file4
-rw-r--r--. 1 root root 0 Sep 27 11:43 file5
-rw-r--r--. 1 root root 0 Sep 27 11:43 file6
-rw-r--r--. 1 root root 0 Sep 27 11:43 file7
-rw-r--r--. 1 root root 0 Sep 27 11:43 file8
-rw-r--r--. 1 root root 0 Sep 27 11:43 file9
```



Important - Notez que dans ce cas, le caractère / est manquant après **repA** dans la commande **rsync -a /test/repA /test/repB**. Le résultat est la synchronisation du répertoire **/test/repA** vers **/test/repB**.

Pour éviter des erreurs, la commande **rsync** vous permet de visualiser le résultat de votre commande sans exécuter la commande grâce à l'utilisation des options **-n** et **-r**.

De nouveau, supprimez les fichiers dans le répertoire **/test/repB** :

```
[root@redhat9 ~]# rm -rf /test/repB/*
[root@redhat9 ~]# ls -l /test/repB/
total 0
```

Exécutez la commande ci-dessous :

```
[root@redhat9 ~]# rsync -avn /test/repA/ /test/repB
sending incremental file list
./
file1
file10
file11
file12
file13
file14
file15
file16
file17
file18
file19
file2
file20
file3
file4
file5
file6
file7
file8
file9

sent 387 bytes  received 79 bytes  932.00 bytes/sec
total size is 0  speedup is 0.00 (DRY RUN)

[root@redhat9 ~]# ls -l /test/repB/
total 0
```



Important - Notez que dans ce cas, le résultat de la synchronisation est d'envoyer le **contenu** du répertoire **/test/repA** vers **/test/repB**.

Maintenant, exécutez la commande ci-dessous :

```
[root@redhat9 ~]# rsync -anv /test/repA /test/repB
sending incremental file list
repA/
repA/file1
repA/file10
repA/file11
repA/file12
repA/file13
repA/file14
repA/file15
repA/file16
repA/file17
repA/file18
repA/file19
repA/file2
repA/file20
repA/file3
repA/file4
repA/file5
repA/file6
repA/file7
repA/file8
repA/file9

sent 397 bytes  received 80 bytes  954.00 bytes/sec
total size is 0  speedup is 0.00 (DRY RUN)

[root@redhat9 ~]# ls -l /test/repB/
total 0
```



Important - Notez que dans ce cas, le résultat de la synchronisation est d'envoyer le



répertoire **/test/repA** vers **/test/repB**.

Options de la Commande

Les options de la commande rsync sont :

```
[root@redhat9 ~]# rsync --help
rsync version 3.2.3 protocol version 31
Copyright (C) 1996-2020 by Andrew Tridgell, Wayne Davison, and others.
Web site: https://rsync.samba.org/
Capabilities:
  64-bit files, 64-bit inums, 64-bit timestamps, 64-bit long ints,
  socketpairs, hardlinks, hardlink-specials, symlinks, IPv6, atimes,
  batchfiles, inplace, append, ACLs, xattrs, optional protect-args, iconv,
  symtimes, prealloc, stop-at, no ctimes
Optimizations:
  SIMD, asm, openssl-crypto
Checksum list:
  md5 md4 none
Compress list:
  zstd lz4 zlibx zlib none
```

rsync comes with ABSOLUTELY NO WARRANTY. This is free software, and you are welcome to redistribute it under certain conditions. See the GNU General Public Licence for details.

rsync is a file transfer program capable of efficient remote update via a fast differencing algorithm.

```
Usage: rsync [OPTION]... SRC [SRC]... DEST
       or  rsync [OPTION]... SRC [SRC]... [USER@]HOST:DEST
```

```
or  rsync [OPTION]... SRC [SRC]... [USER@]HOST::DEST
or  rsync [OPTION]... SRC [SRC]... rsync://[USER@]HOST[:PORT]/DEST
or  rsync [OPTION]... [USER@]HOST:SRC [DEST]
or  rsync [OPTION]... [USER@]HOST::SRC [DEST]
or  rsync [OPTION]... rsync://[USER@]HOST[:PORT]/SRC [DEST]
```

The ':' usages connect via remote shell, while '::' & 'rsync://' usages connect to an rsync daemon, and require SRC or DEST to start with a module name.

Options

```
--verbose, -v          increase verbosity
--info=FLAGS          fine-grained informational verbosity
--debug=FLAGS         fine-grained debug verbosity
--stderr=e|a|c        change stderr output mode (default: errors)
--quiet, -q           suppress non-error messages
--no-motd              suppress daemon-mode MOTD
--checksum, -c        skip based on checksum, not mod-time & size
--archive, -a         archive mode; equals -rlptgoD (no -H,-A,-X)
--no-OPTION            turn off an implied OPTION (e.g. --no-D)
--recursive, -r       recurse into directories
--relative, -R        use relative path names
--no-implied-dirs     don't send implied dirs with --relative
--backup, -b          make backups (see --suffix & --backup-dir)
--backup-dir=DIR      make backups into hierarchy based in DIR
--suffix=SUFFIX       backup suffix (default ~ w/o --backup-dir)
--update, -u          skip files that are newer on the receiver
--inplace             update destination files in-place
--append              append data onto shorter files
--append-verify       --append w/old data in file checksum
--dirs, -d            transfer directories without recursing
--mkpath              create the destination's path component
--links, -l           copy symlinks as symlinks
--copy-links, -L      transform symlink into referent file/dir
--copy-unsafe-links   only "unsafe" symlinks are transformed
--safe-links          ignore symlinks that point outside the tree
```

```
--munge-links      munge symlinks to make them safe & unusable
--copy-dirlinks, -k  transform symlink to dir into referent dir
--keep-dirlinks, -K  treat symlinked dir on receiver as dir
--hard-links, -H    preserve hard links
--perms, -p         preserve permissions
--executability, -E  preserve executability
--chmod=CHMOD       affect file and/or directory permissions
--acls, -A          preserve ACLs (implies --perms)
--xattrs, -X        preserve extended attributes
--owner, -o         preserve owner (super-user only)
--group, -g         preserve group
--devices           preserve device files (super-user only)
--copy-devices      copy device contents as regular file
--specials         preserve special files
-D                 same as --devices --specials
--times, -t        preserve modification times
--atimes, -U       preserve access (use) times
--open-noatime     avoid changing the atime on opened files
--crtimes, -N      preserve create times (newness)
--omit-dir-times, -O  omit directories from --times
--omit-link-times, -J  omit symlinks from --times
--super           receiver attempts super-user activities
--fake-super      store/recover privileged attrs using xattrs
--sparse, -S      turn sequences of nulls into sparse blocks
--preallocate     allocate dest files before writing them
--write-devices   write to devices as files (implies --inplace)
--dry-run, -n     perform a trial run with no changes made
--whole-file, -W  copy files whole (w/o delta-xfer algorithm)
--checksum-choice=STR  choose the checksum algorithm (aka --cc)
--one-file-system, -x  don't cross filesystem boundaries
--block-size=SIZE, -B  force a fixed checksum block-size
--rsh=COMMAND, -e   specify the remote shell to use
--rsync-path=PROGRAM  specify the rsync to run on remote machine
--existing        skip creating new files on receiver
```

```
--ignore-existing      skip updating files that exist on receiver
--remove-source-files  sender removes synchronized files (non-dir)
--del                  an alias for --delete-during
--delete              delete extraneous files from dest dirs
--delete-before       receiver deletes before xfer, not during
--delete-during       receiver deletes during the transfer
--delete-delay        find deletions during, delete after
--delete-after        receiver deletes after transfer, not during
--delete-excluded     also delete excluded files from dest dirs
--ignore-missing-args ignore missing source args without error
--delete-missing-args delete missing source args from destination
--ignore-errors       delete even if there are I/O errors
--force              force deletion of dirs even if not empty
--max-delete=NUM     don't delete more than NUM files
--max-size=SIZE      don't transfer any file larger than SIZE
--min-size=SIZE      don't transfer any file smaller than SIZE
--max-alloc=SIZE     change a limit relating to memory alloc
--partial            keep partially transferred files
--partial-dir=DIR    put a partially transferred file into DIR
--delay-updates       put all updated files into place at end
--prune-empty-dirs, -m prune empty directory chains from file-list
--numeric-ids        don't map uid/gid values by user/group name
--usermap=STRING     custom username mapping
--groupmap=STRING    custom groupname mapping
--chown=USER:GROUP   simple username/groupname mapping
--timeout=SECONDS    set I/O timeout in seconds
--contimeout=SECONDS set daemon connection timeout in seconds
--ignore-times, -I   don't skip files that match size and time
--size-only          skip files that match in size
--modify-window=NUM, -@ set the accuracy for mod-time comparisons
--temp-dir=DIR, -T   create temporary files in directory DIR
--fuzzy, -y         find similar file for basis if no dest file
--compare-dest=DIR   also compare destination files relative to DIR
--copy-dest=DIR      ... and include copies of unchanged files
```

```
--link-dest=DIR      hardlink to files in DIR when unchanged
--compress, -z       compress file data during the transfer
--compress-choice=STR choose the compression algorithm (aka --zc)
--compress-level=NUM explicitly set compression level (aka --zl)
--skip-compress=LIST skip compressing files with suffix in LIST
--cvs-exclude, -C    auto-ignore files in the same way CVS does
--filter=RULE, -f    add a file-filtering RULE
-F                   same as --filter='dir-merge /.rsync-filter'
                    repeated: --filter='- .rsync-filter'

--exclude=PATTERN    exclude files matching PATTERN
--exclude-from=FILE  read exclude patterns from FILE
--include=PATTERN    don't exclude files matching PATTERN
--include-from=FILE  read include patterns from FILE
--files-from=FILE    read list of source-file names from FILE
--from0, -0          all *-from/filter files are delimited by 0s
--protect-args, -s   no space-splitting; wildcard chars only
--copy-as=USER[:GROUP] specify user & optional group for the copy
--address=ADDRESS    bind address for outgoing socket to daemon
--port=PORT          specify double-colon alternate port number
--sockopts=OPTIONS   specify custom TCP options
--blocking-io        use blocking I/O for the remote shell
--outbuf=N|L|B       set out buffering to None, Line, or Block
--stats             give some file-transfer stats
--8-bit-output, -8   leave high-bit chars unescaped in output
--human-readable, -h output numbers in a human-readable format
--progress          show progress during transfer
-P                 same as --partial --progress
--itemize-changes, -i output a change-summary for all updates
--remote-option=OPT, -M send OPTION to the remote side only
--out-format=FORMAT  output updates using the specified FORMAT
--log-file=FILE      log what we're doing to the specified FILE
--log-file-format=FMT log updates using the specified FMT
--password-file=FILE read daemon-access password from FILE
--early-input=FILE   use FILE for daemon's early exec input
```

```
--list-only          list the files instead of copying them
--bwlimit=RATE       limit socket I/O bandwidth
--stop-after=MINS    Stop rsync after MINS minutes have elapsed
--stop-at=y-m-dTh:m Stop rsync at the specified point in time
--write-batch=FILE   write a batched update to FILE
--only-write-batch=FILE like --write-batch but w/o updating dest
--read-batch=FILE    read a batched update from FILE
--protocol=NUM       force an older protocol version to be used
--iconv=CONVERT_SPEC request charset conversion of filenames
--checksum-seed=NUM  set block/file checksum seed (advanced)
--ipv4, -4           prefer IPv4
--ipv6, -6           prefer IPv6
--version, -V        print the version + other info and exit
--help, -h (*)       show this help (* -h is help only on its own)
```

Use "rsync --daemon --help" to see the daemon-mode command-line options.
Please see the rsync(1) and rsyncd.conf(5) man pages for full documentation.
See <https://rsync.samba.org/> for updates, bug reports, and answers

Compression

La Commande gzip

Présentation

La commande **gzip** est un utilitaire de compression sous GNU/Linux. La commande **gunzip** est un utilitaire de décompression sous GNU/Linux.

Options des Commandes

Les options de la commande **gzip** sont :

```
[root@redhat9 ~]# gzip --help
Usage: gzip [OPTION]... [FILE]...
Compress or uncompress FILEs (by default, compress FILES in-place).

Mandatory arguments to long options are mandatory for short options too.

-c, --stdout      write on standard output, keep original files unchanged
-d, --decompress  decompress
-f, --force       force overwrite of output file and compress links
-h, --help       give this help
-k, --keep        keep (don't delete) input files
-l, --list        list compressed file contents
-L, --license     display software license
-n, --no-name     do not save or restore the original name and timestamp
-N, --name        save or restore the original name and timestamp
-q, --quiet       suppress all warnings
-r, --recursive  operate recursively on directories
    --rsyncable   make rsync-friendly archive
-S, --suffix=SUF use suffix SUF on compressed files
    --synchronous synchronous output (safer if system crashes, but slower)
-t, --test        test compressed file integrity
-v, --verbose     verbose mode
-V, --version     display version number
-1, --fast        compress faster
-9, --best        compress better
```

With no FILE, or when FILE is -, read standard input.

Report bugs to <bug-gzip@gnu.org>.

Les options de la commande **gunzip** sont :

```
[root@redhat9 ~]# gunzip --help
Usage: /usr/bin/gunzip [OPTION]... [FILE]...
Uncompress FILEs (by default, in-place).

Mandatory arguments to long options are mandatory for short options too.

-c, --stdout      write on standard output, keep original files unchanged
-f, --force       force overwrite of output file and compress links
-k, --keep        keep (don't delete) input files
-l, --list        list compressed file contents
-n, --no-name     do not save or restore the original name and timestamp
-N, --name        save or restore the original name and timestamp
-q, --quiet       suppress all warnings
-r, --recursive  operate recursively on directories
-S, --suffix=SUF use suffix SUF on compressed files
--synchronous    synchronous output (safer if system crashes, but slower)
-t, --test        test compressed file integrity
-v, --verbose     verbose mode
--help           display this help and exit
--version        display version information and exit
```

With no FILE, or when FILE is -, read standard input.

Report bugs to <bug-gzip@gnu.org>.

LAB #6 - Travailler avec la Commande gzip

Utilisez **gzip** pour compresser votre fichier tar :

```
[root@redhat9 ~]# gzip /tmp/test.tar
```

Constatez la taille du fichier **test.tar.gz** :

```
[root@redhat9 ~]# ls -l /tmp/test.tar.gz
-rw-r--r--. 1 root root 222 Sep 27 07:57 /tmp/test.tar.gz
```



Important - Notez que le fichier compressé a été créé dans le même répertoire que le fichier source et que le fichier source a disparu.

Décompressez le fichier test.tar.gz :

```
[root@redhat9 ~]# gunzip /tmp/test.tar.gz
```

La Commande bzip2

Présentation

La commande **bzip2** est un utilitaire de compression sous GNU/Linux. La commande **bunzip2** est un utilitaire de décompression sous GNU/Linux.

Options des Commandes

Les options de la commande **bzip2** sont :

```
[root@redhat9 ~]# bzip2 --help
bzip2, a block-sorting file compressor.  Version 1.0.8, 13-Jul-2019.
```

```
usage: bzip2 [flags and input files in any order]
```

```
-h --help          print this message
-d --decompress    force decompression
-z --compress      force compression
```

```
-k --keep      keep (don't delete) input files
-f --force    overwrite existing output files
-t --test     test compressed file integrity
-c --stdout   output to standard out
-q --quiet    suppress noncritical error messages
-v --verbose  be verbose (a 2nd -v gives more)
-L --license  display software version & license
-V --version  display software version & license
-s --small    use less memory (at most 2500k)
-l .. -9     set block size to 100k .. 900k
--fast       alias for -l
--best       alias for -9
```

If invoked as `bzip2', default action is to compress.
as `bunzip2', default action is to decompress.
as `bzip2', default action is to decompress to stdout.

If no file names are given, bzip2 compresses or decompresses from standard input to standard output. You can combine short flags, so `-v -4' means the same as -v4 or -4v, &c.

Les options de la commande **bunzip2** sont :

```
[root@redhat9 ~]# bunzip2 --help
bzip2, a block-sorting file compressor.  Version 1.0.8, 13-Jul-2019.
```

```
usage: bunzip2 [flags and input files in any order]
```

```
-h --help      print this message
-d --decompress force decompression
-z --compress  force compression
-k --keep      keep (don't delete) input files
-f --force    overwrite existing output files
-t --test     test compressed file integrity
```

```
-c --stdout      output to standard out
-q --quiet       suppress noncritical error messages
-v --verbose     be verbose (a 2nd -v gives more)
-L --license     display software version & license
-V --version     display software version & license
-s --small       use less memory (at most 2500k)
-l .. -9         set block size to 100k .. 900k
--fast           alias for -l
--best           alias for -9
```

If invoked as `bzip2', default action is to compress.
as `bunzip2', default action is to decompress.
as `bzcata', default action is to decompress to stdout.

If no file names are given, bzip2 compresses or decompresses from standard input to standard output. You can combine short flags, so `-v -4' means the same as -v4 or -4v, &c.0

LAB #7 - Travailler avec la Commande bzip2

Utilisez **bzip2** pour compresser votre fichier tar :

```
[root@redhat9 ~]# bzip2 /tmp/test.tar
```

Constatez la taille du fichier **tar.bz2** :

```
[root@redhat9 ~]# ls -l /tmp | grep test.tar.bz
-rw-r--r--. 1 root root      207 Sep 27 07:57 test.tar.bz2
```



Important - Notez que le fichier compressé a été créé dans le même répertoire que le fichier source et que le fichier source a disparu.

Décompressez le fichier tar.bz2 :

```
[root@redhat9 ~]# bunzip2 /tmp/test.tar.bz2
```

La Commande xz

Présentation

La commande **xz** est un utilitaire de compression sous GNU/Linux. D'autres commandes sont :

- **unxz** - équivalent à **xz -decompress**.
- **xzcat** - équivalent à **xz -decompress -stdout**.
- **lzma** - équivalent à **xz -format=lzma**.
- **unlzma** - équivalent à **xz -format=lzma -decompress**.
- **lzcat** - équivalent à **xz -format=lzma -decompress -stdout**.

La commande xz ne compressera pas le fichier si :

- le fichier n'est pas de type standard
- le fichier est un lien symbolique
- le fichier est un lien physique
- le fichier possède le sticky bit, le SUID bit ou le SGID bit
- le fichier possède déjà une extension .xz ou .lzma

La commande xz ne décompressera pas le fichier si :

- le fichier ne possède pas d'extension .xz ou .lzma

Options des Commandes

Les options de la commande **xz** sont :

```
[root@redhat9 ~]# xz --help
Usage: xz [OPTION]... [FILE]...
Compress or decompress FILEs in the .xz format.

  -z, --compress          force compression
  -d, --decompress       force decompression
  -t, --test             test compressed file integrity
  -l, --list             list information about .xz files
  -k, --keep             keep (don't delete) input files
  -f, --force            force overwrite of output file and (de)compress links
  -c, --stdout           write to standard output and don't delete input files
  -0 ... -9             compression preset; default is 6; take compressor *and*
                        decompressor memory usage into account before using 7-9!
  -e, --extreme          try to improve compression ratio by using more CPU time;
                        does not affect decompressor memory requirements
  -T, --threads=NUM     use at most NUM threads; the default is 1; set to 0
                        to use as many threads as there are processor cores
  -q, --quiet           suppress warnings; specify twice to suppress errors too
  -v, --verbose          be verbose; specify twice for even more verbose
  -h, --help            display this short help and exit
  -H, --long-help       display the long help (lists also the advanced options)
  -V, --version         display the version number and exit
```

With no FILE, or when FILE is -, read standard input.

Report bugs to <lasse.collin@tukaani.org> (in English or Finnish).

XZ Utils home page: <<https://tukaani.org/xz/>>

LAB #8 - Travailler avec la Commande xz

Utilisez **xz** pour compresser votre fichier tar :

```
[root@redhat9 ~]# xz /tmp/test.tar
```



Important - Notez que le fonctionnement par défaut de la commande est identique à celui de l'option **-z**.

Constatez la présence du fichier **test.tar.xz** :

```
[root@redhat9 ~]# ls -l /tmp | grep test.tar.xz
-rw-r--r--. 1 root root      236 Sep 27 07:57 test.tar.xz
```



Important - Notez que le fichier compressé a été créé dans le même répertoire que le fichier source et que le fichier source a disparu. Le fichier source peut être maintenu si l'option **-keep** est spécifiée. Si le fichier test.tar.xz avait déjà existé, la commande aurait échoué avec un message d'erreur. L'extension du fichier est **.xz**, cependant la commande peut aussi gérer l'extension **.lzma**.

Décompressez le fichier test.tar.xz :

```
[root@redhat9 ~]# xz -d /tmp/test.tar.xz
[root@redhat9 ~]# ls -l /tmp | grep test
-rw-r--r--. 1 root root      160 Sep 25 16:05 greptest
-rw-r--r--. 1 root root       49 Sep 25 16:05 greptest1
-rw-r--r--. 1 root root  687556 Sep 25 16:08 sedtest
-rw-r--r--. 1 root root      512 Sep 27 08:08 test.cpio
-rw-r--r--. 1 root root    10240 Sep 27 07:57 test.tar
```

Autres Utilitaires

Il existe d'autres utilitaires pour la compression, chacun produisant un fichier ayant une extension spécifique :

Outil	Extension	Commande de Compression	Commande de Décompression
compress	.Z	compress	uncompress
rar	.rar	rar	unrar
zip	.zip	zip	unzip

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