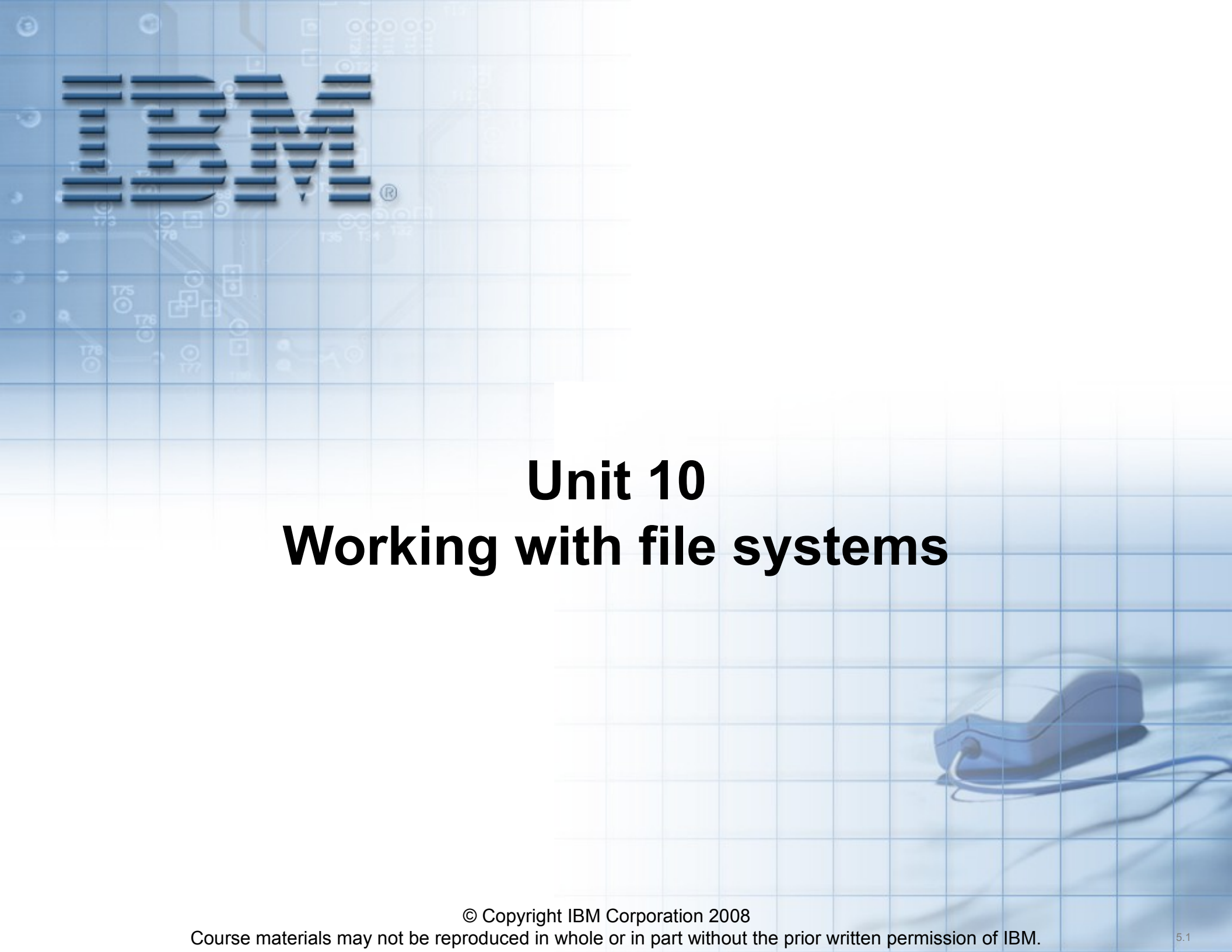

Unit 10
Working with file systems

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Unit objectives

After completing this unit, you should be able to:

- Identify the components of an AIX file system
- Add an enhanced journaled file system
- Change characteristics of a file system
- Add a RAM file system
- Add a UDF file system on a DVD-RAM

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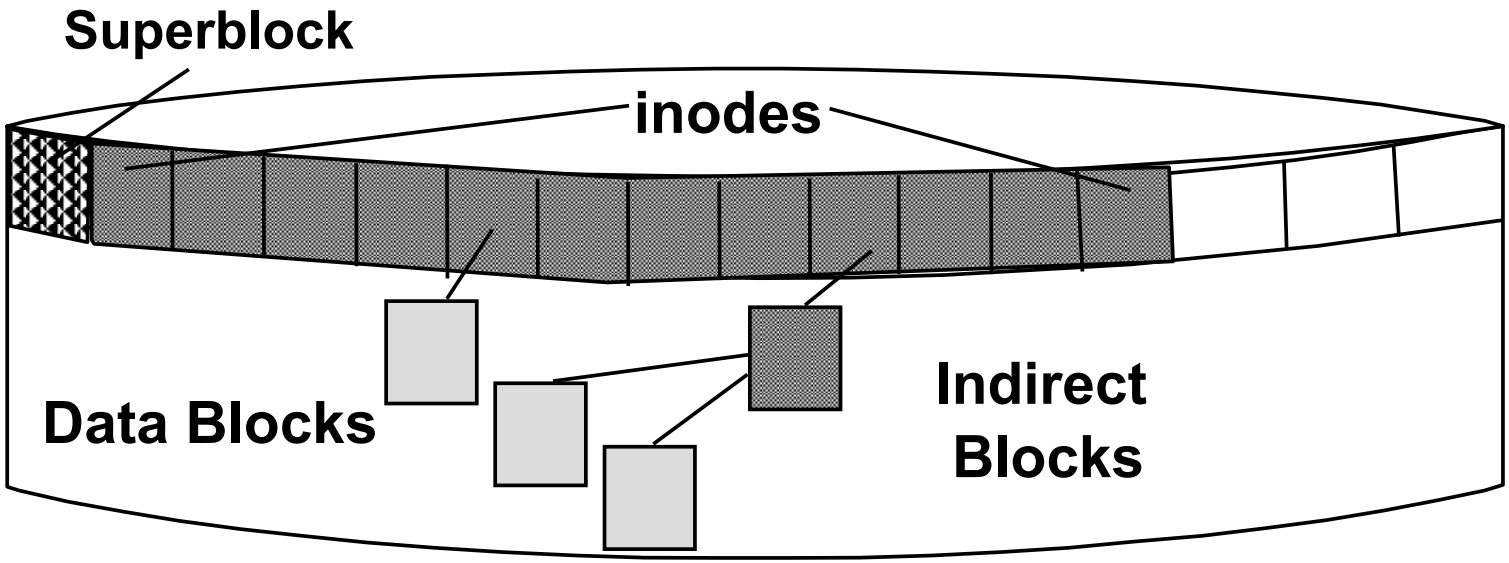
Structure of a journaled file system



- Superblock
  - File system size and identification
  - Free list, fragment size, nbpi
- inodes
  - File size, ownership, permissions, times
  - Pointers to data blocks
- Blocks
  - Data blocks contain data
  - Indirect blocks contain pointers to data blocks

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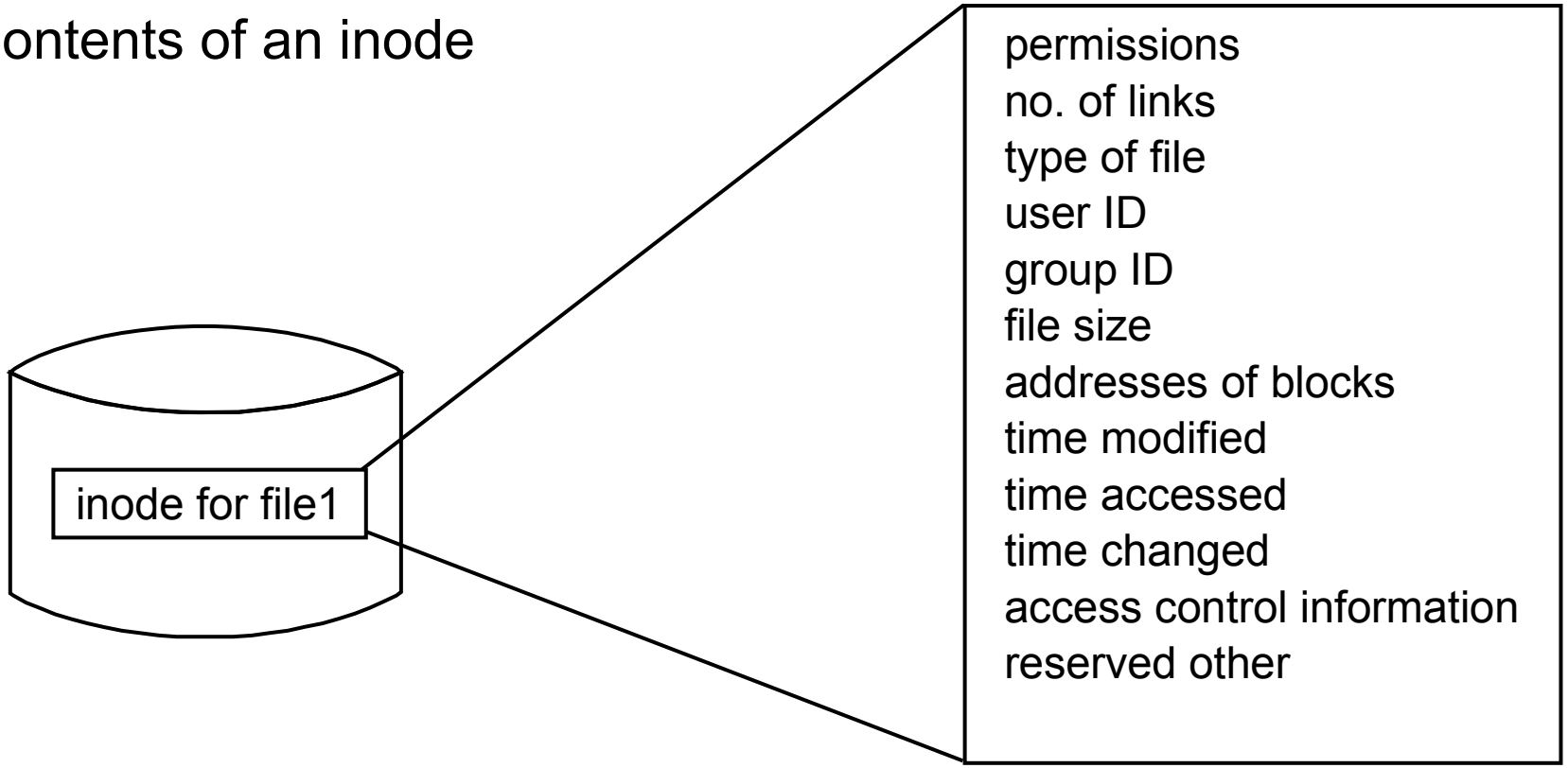
Structure of an inode

- Contents of an inode



- This information can be seen with **`ls -li`**:

```
$ ls  -li  /home/team01
2132  drwxr-xr-x  2  team01 staff 512  May 2  14:33  c
2136  drwxr-xr-x  2  team01 staff 512  May 2  14:33  doc
2141  -rw-r--r--  1  team01 staff  28  May 16 10:11  Manuals
```

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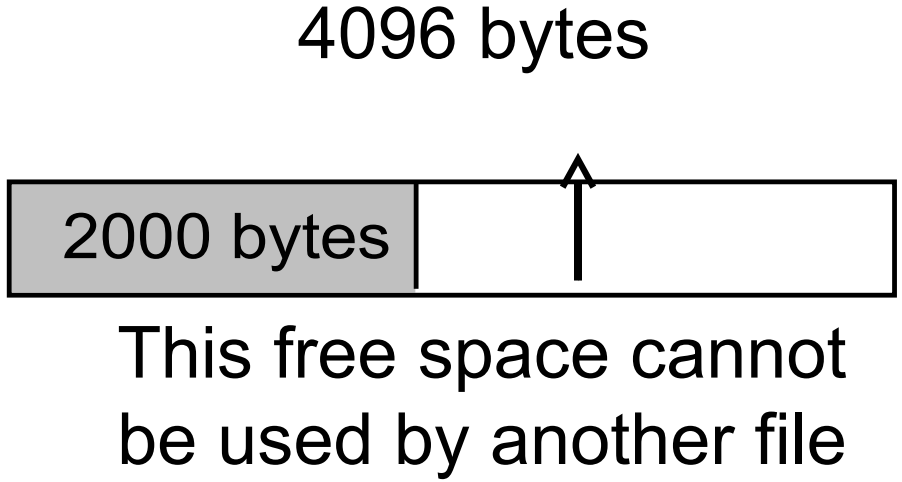
File system fragmentation

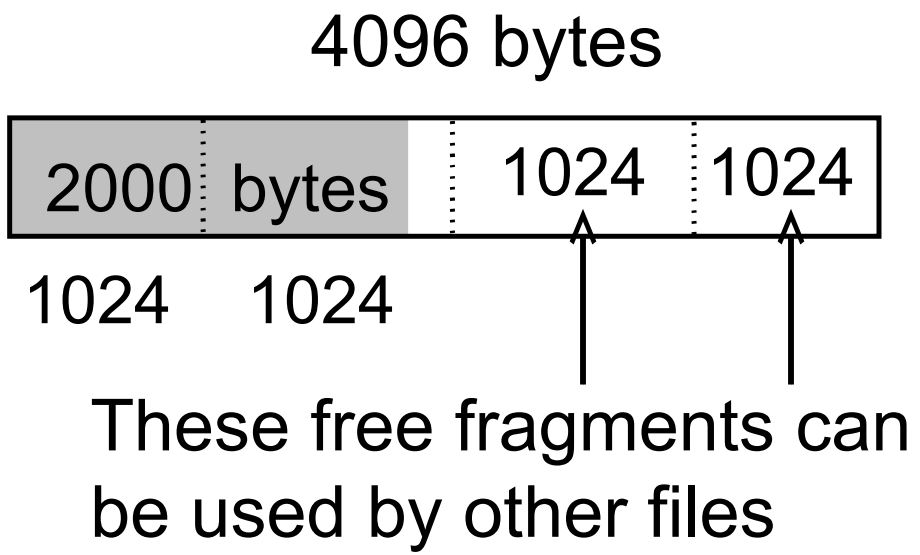
No fragmentation

File size = 2000 bytes



Fragmentation enabled

File size = 2000 bytes
Fragment size = 1024 bytes



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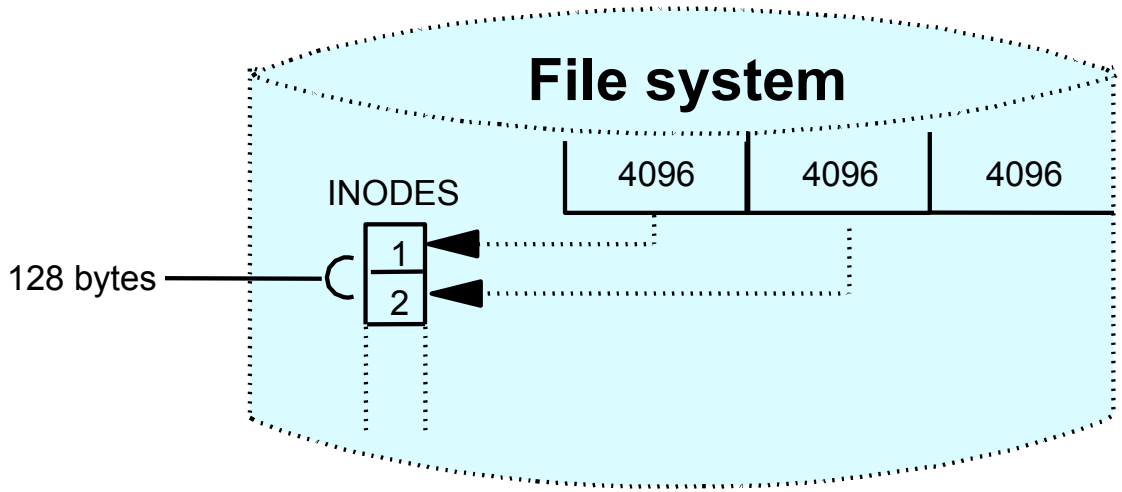
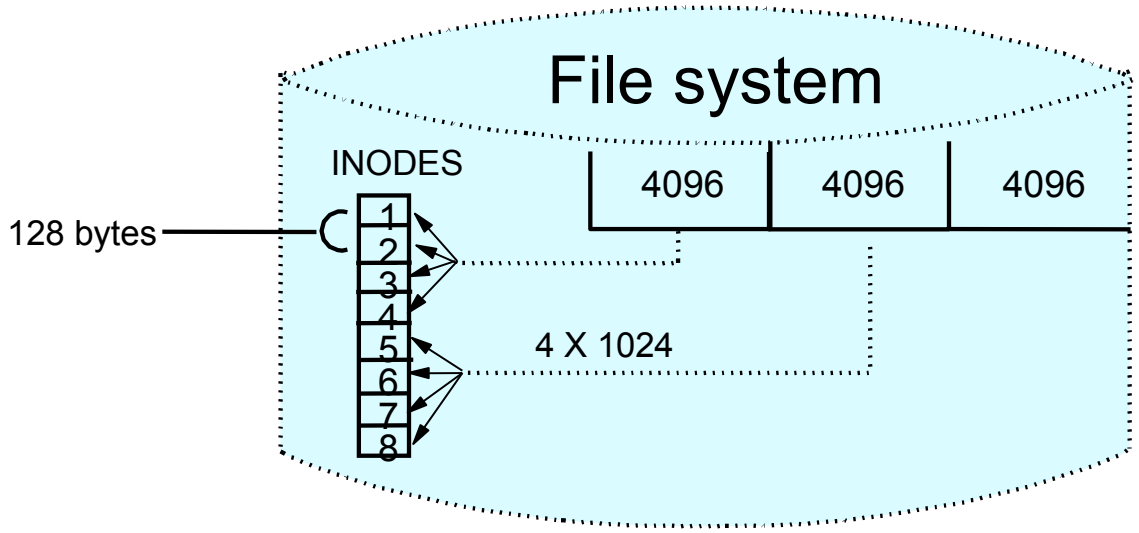
Variable number of inodes

With the default nbpi = 4096 an inode is created for every 4096 bytes of file system.



Using the value nbpi = 1024 an inode is created for every 1024 bytes of file system.



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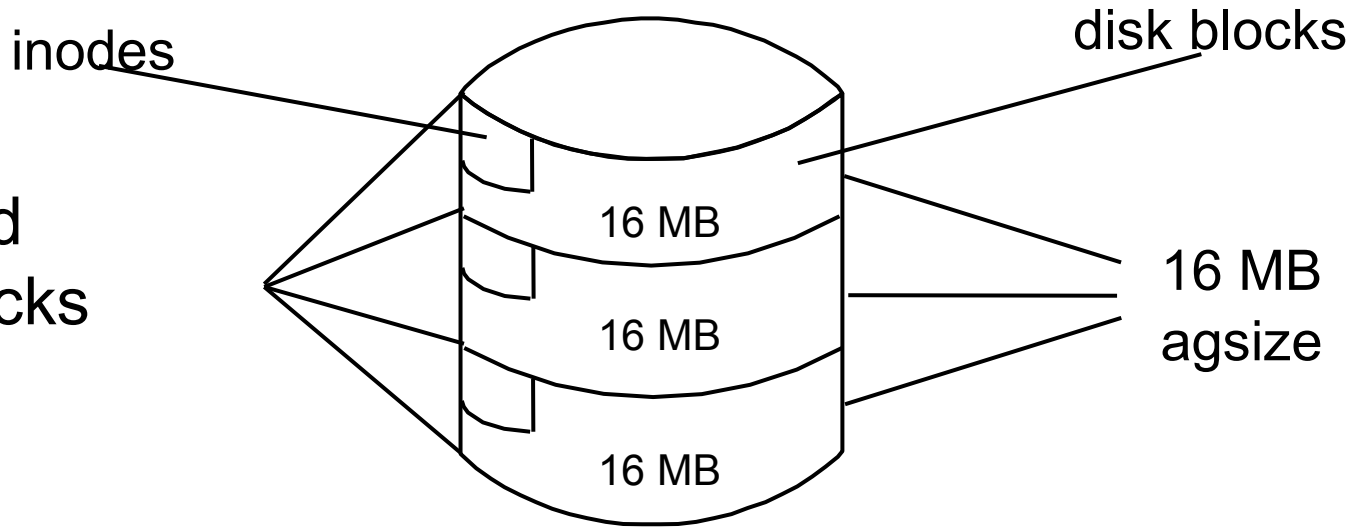
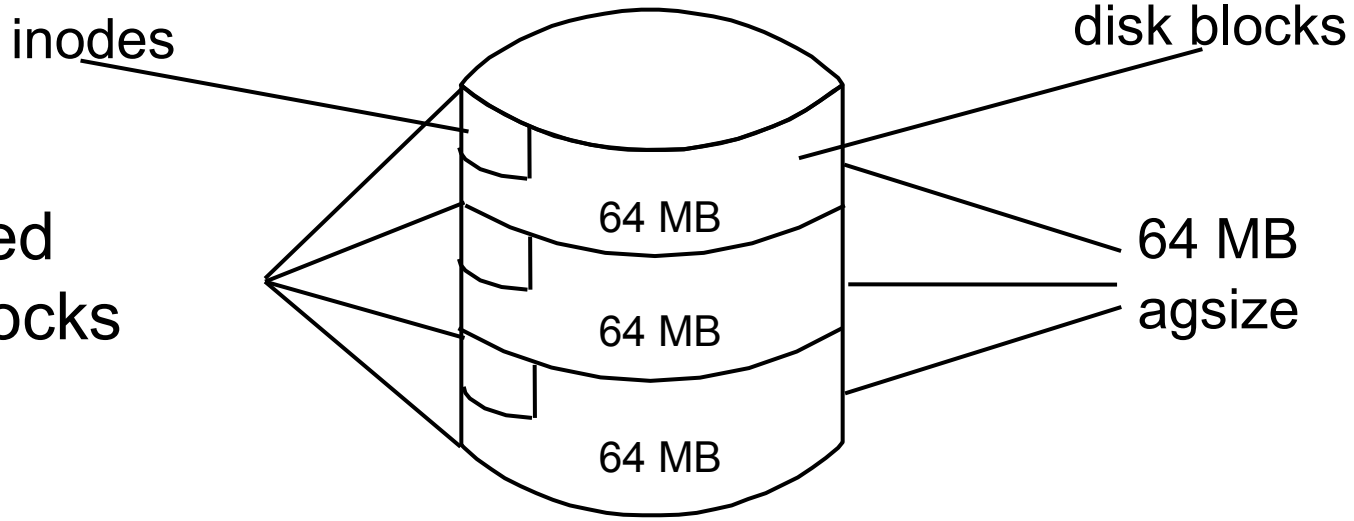
Allocation group size

Groupings of related inodes and disk blocks



Groupings of related inodes and disk blocks



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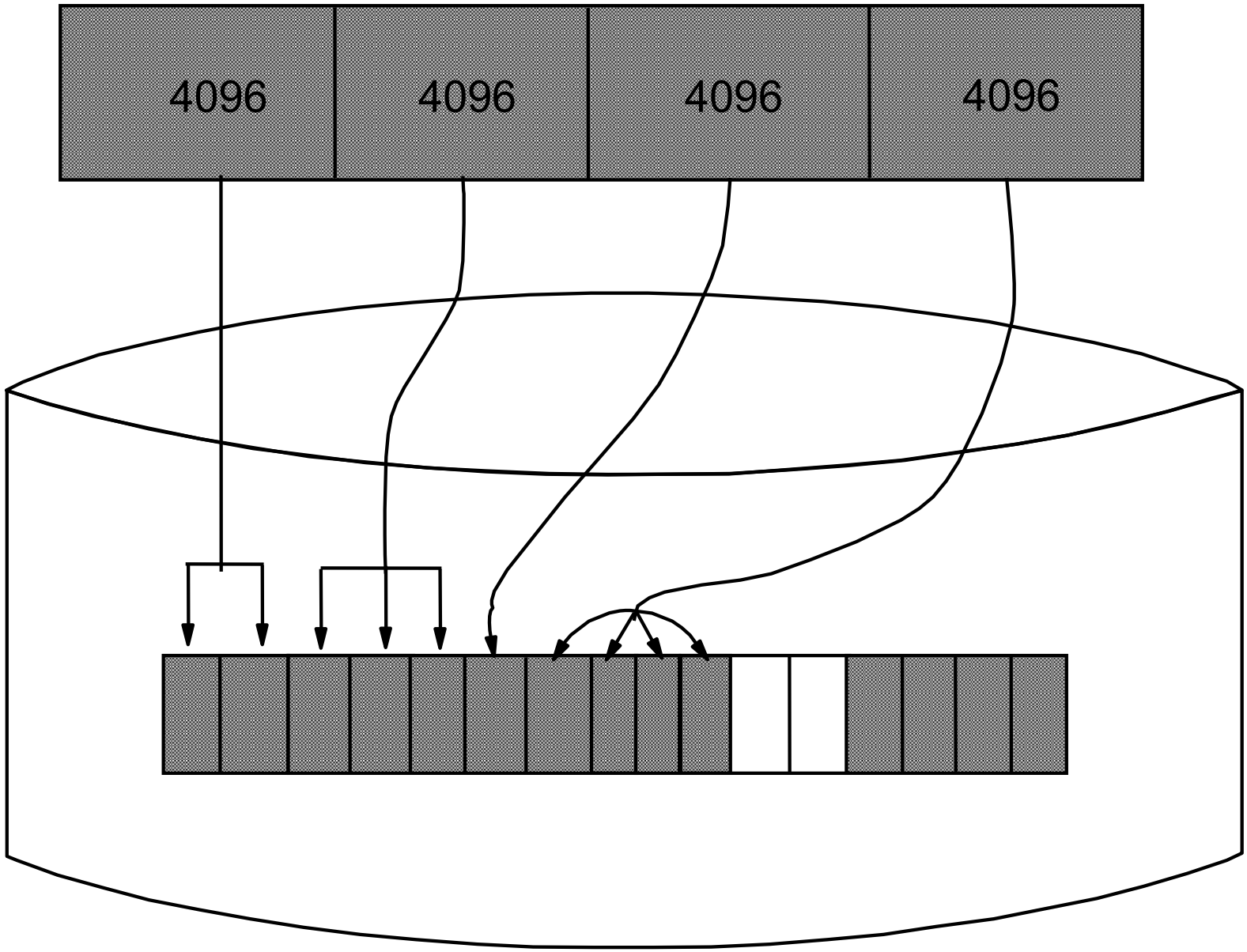
Compressed file systems

compression = LZ (yes)
fragment size = 1024



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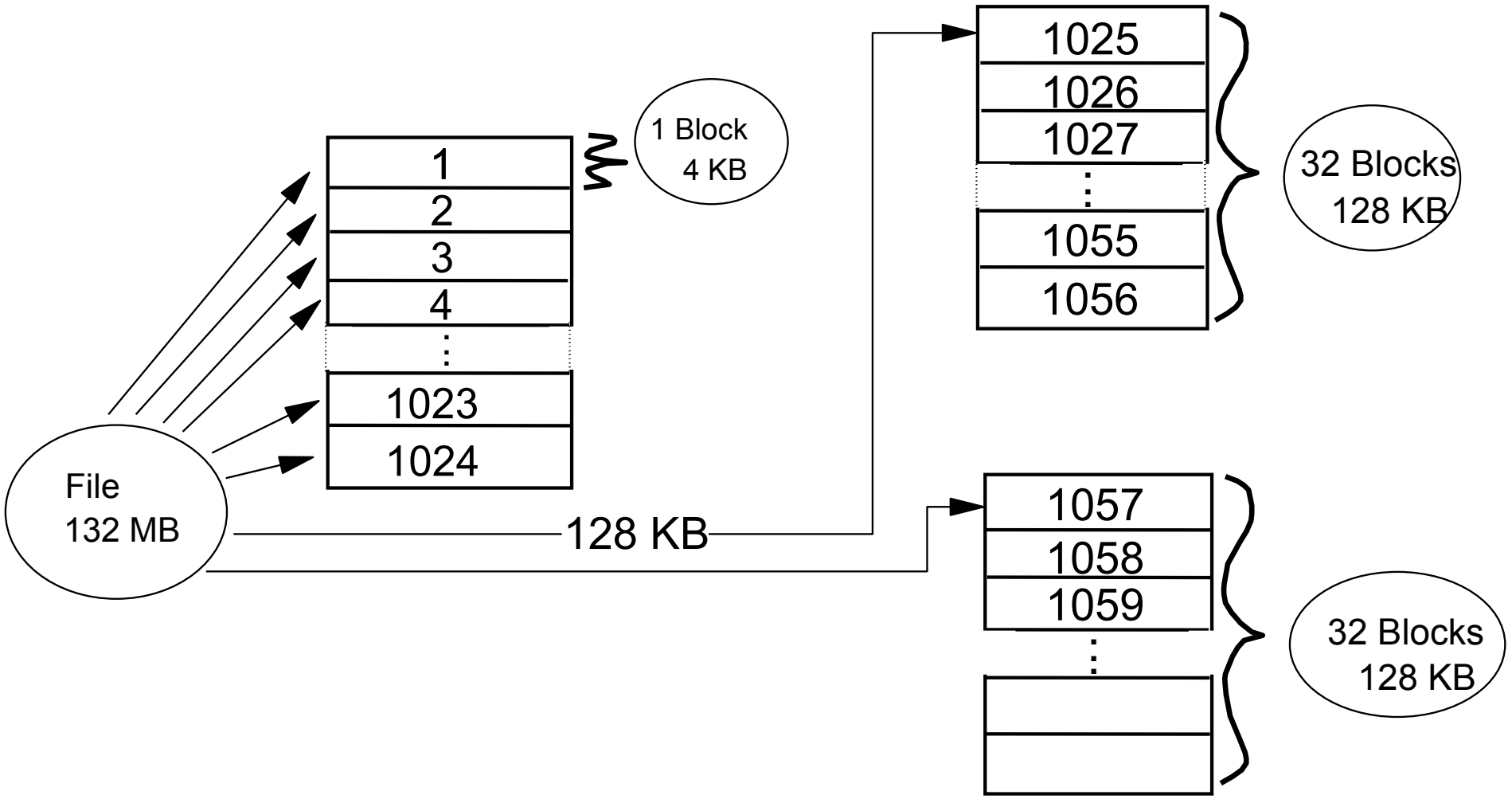
Large file enabled file systems

File = 132 MB

(1024 * 4 KB blocks) + (1024 * 128 KB blocks) = 132 MB

4 MB + 128 MB = 132 MB



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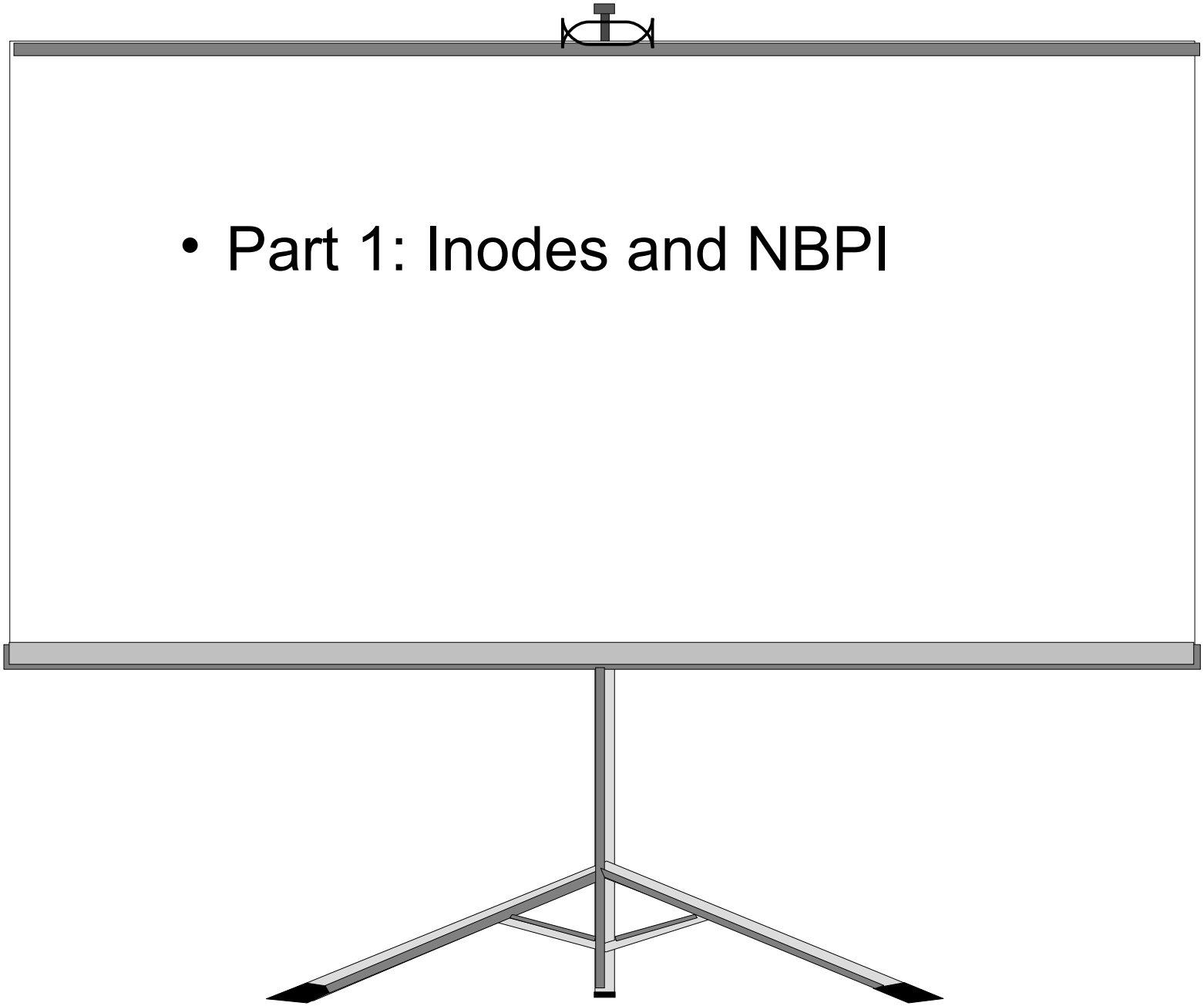
Exercise 10: Working with file systems (part 1)



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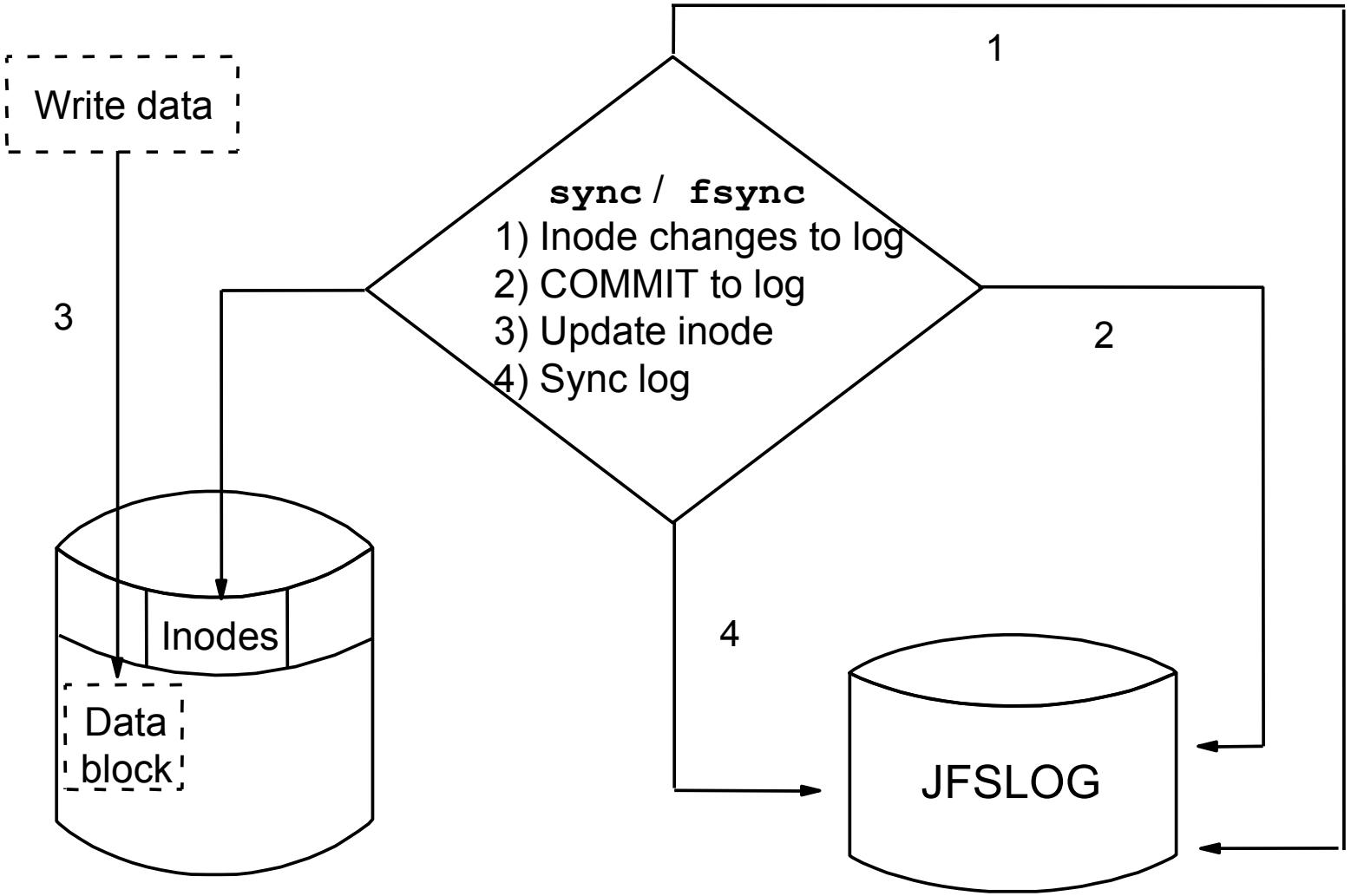
Journal log



- No journaling of data blocks - only journals inode information (and indirect block information).

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JFS versus JFS2 file systems

	JFS	JFS2
Maximum File Size Architectural / Tested	64 Gigabytes / 64 Gigabytes	1 Petabyte / 1 Terabyte
Maximum File System Size Architectural / Tested	1 Terabyte / 1 Terabyte	4 Petabytes / 1 Terabyte
Inode Size	128 Bytes	512 Bytes
Number of inodes	Fixed, set at creation	Dynamic
Directory File Access	Sequential	B-tree
Journal Log support	External JFSlog only	Inline or External JFS2log
Compression	Yes	No
Quotas	Yes	AIX 5L V5.3 and later

JFS2 uses extent based allocation for high performance and large file size.

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Extended attributes (EA)

- Extensions to regular attributes
- Two versions
  - AIX 5L V5.2 or earlier supported only EAv1
  - EAv1 used for local file permission ACLs
  - EAv2 improved (more and larger attributes)
  - JFS2 under AIX 5L V5.3 and later support both versions
- NFS V4 ACLs stored in JFS2 with EAv2
- User defined information may be in EAv2

```
$ getea   HenryVIII
EAName:   Author
EAValue:  Shakespeare
```

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File Systems

```
# smit fs
```

```
                        File Systems

Move cursor to desired item and press Enter

List All File Systems
List All Mounted File Systems
Add/Change/Show/Delete File Systems
Mount a File System
Mount a Group of File Systems
Unmount a File System
Unmount a Group of File Systems
Verify a File System
Backup a File System
Restore a File System
List Contents of a Backup
Create and backup a snapshot
```

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Listing file systems

```
# lsfs

Name              Nodename   Mount Pt   VFS      Size      Options         Auto

/dev/hd4           __         /          jfs2     294912    __              yes
/dev/hd1           __         /home      jfs2     32768     __              yes
/dev/hd2           __         /usr       jfs2     3309568   __              yes
/dev/hd9var        __         /var       jfs2     65536     __              yes
/dev/hd3           __         /tmp       jfs2     131072    __              yes
/proc              __         /proc      procfs   __        ro              yes
/dev/hd10opt       __         /opt       jfs2     163840    __              yes
/dev/hd11admin     __         /admin     jfs2     262144    __              yes
/budget            sys4       /reports   nfs2     __        bg,hard,intr
/dev/cd0           __         /cdrom     cdrfs    __        ro               no
```

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List all mounted file systems

```
# mount

node   mounted        mounted over    vfs       date           options
       /dev/hd4       /               jfs2    Jul 11 20:14   rw,log=/dev/hd8
       /dev/hd2       /usr            jfs2    Jul 11 20:15   rw,log=/dev/hd8
       /dev/hd9var    /var            jfs2    Jul 11 20:15   rw,log=/dev/hd8
       /dev/hd3       /tmp            jfs2    Jul 11 20:15   rw,log=/dev/hd8
       /dev/hd1       /home           jfs2    Jul 11 20:16   rw,log=/dev/loglv00
       /proc          /proc           procfs  Jul 11 20:16   rw
       /dev/hd10opt   /opt            jfs2    Jul 11 20:16   rw,log=/dev/hd8
       /dev/hd11admin /admin          jfs2   Jul 11 20:16  rw,log=/dev/hd8
sys4   /budget        /reports        nfs     Jul 11 20:16   rw,hard,bg,intr
       /dev/ramdisk   /ramdisk        jfs     Jul 11 20:17   rw,nointegrity
       /dev/project   /project        jfs2    Jul 11 20:18   rw,log=INLINE
       /dev/cd0       /cdrom          cdrfs   Jul 11 20:19   ro
```

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Add/Change/Show/Delete File Systems

```
# smit manfs
```

```
      Add / Change / Show / Delete File Systems

Move cursor to desired item and press Enter

Enhanced Journaled File Systems
Journaled File Systems
CDROM File Systems
Network File Systems (NFS)
```

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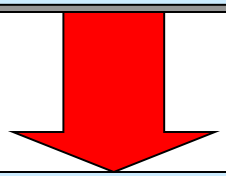
Working with journaled file systems in SMIT

```
                          Journaled File Systems
Move cursor to desired item and press Enter.

Add a Journaled File System
Add a Journaled File System on a Previously Defined Logical Volume
Change / Show Characteristics of a Journaled File System
Remove a Journaled File System
Defragment a Journaled File System
```



```
Add a Journaled File System on a Previously Defined Logical Volume
Move cursor to desired item and press Enter.

Add a Standard Journaled File System
Add a Compressed Journaled File System
Add a Large File Enabled Journaled File System
```

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Add a standard journaled file system on a previously defined logical volume

```
                    Add a Standard Journaled File System

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                                      [Entry Fields]
*  LOGICAL VOLUME name                                                +
*  MOUNT POINT                                        [ ]
   Mount AUTOMATICALLY at system restart?              no             +
   PERMISSIONS                                         read/write     +
   Mount OPTIONS                                      [ ]             +
   Start Disk Accounting ?                             no             +
   Fragment Size (bytes)                               4096           +
   Number of bytes per inode                           4096           +
   Allocation Group Size (MBytes)                      8              +
   Logical Volume for Log                             [ ]             +


  F1=Help       F2=Refresh        F3=Cancel         F4=List
  F5=Reset      F6=Command        F7=Edit           F8=Image
  F9=Shell      F10=Exit          Enter=Do
```

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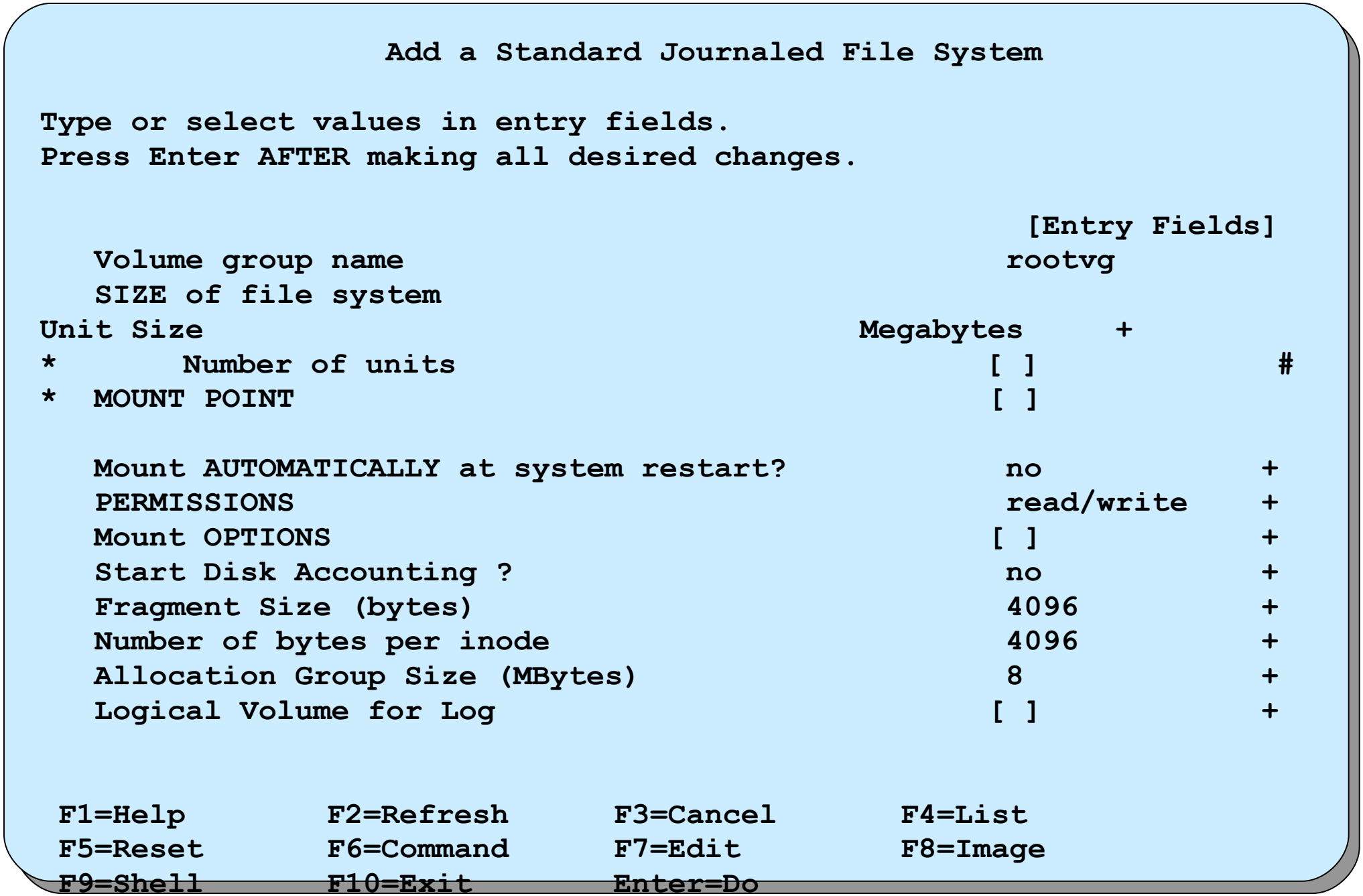
Add a Standard Journaled File System



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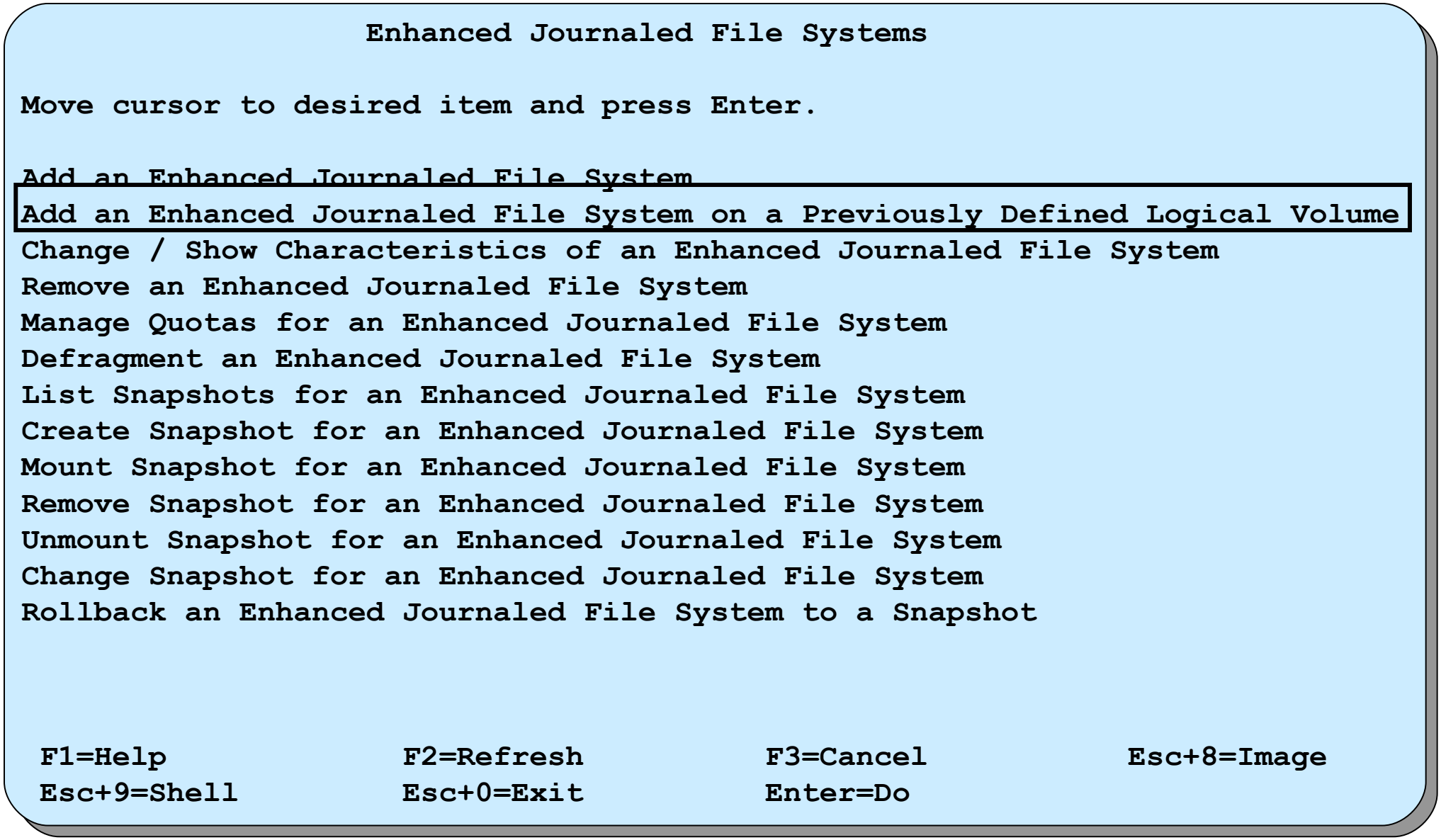
Working with enhanced journaled file systems (JFS2) in SMIT



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Add an enhanced journaled file system (JFS2) on a previously defined logical volume

```
                Add an Enhanced Journaled File System
Type or select values in entry fields.
Press Enter AFTER making all desired changes.
                                                  [Entry Fields]
*  LOGICAL VOLUME name                                          +
*  MOUNT POINT                                   [ ]
   Mount AUTOMATICALLY at system restart?         no            +
   PERMISSIONS                                    read/write    +
   Mount OPTIONS                                 [ ]            +
   Block Size (bytes)                             4096          +
   Logical Volume for Log                        [ ]            +
   Inline Log size (MBytes)                      [ ]             #
   Extended Attribute Format                      Version 1     +
   Enable Quota Management                        no            +
   Enable EFS?                                    no           +
   Allow internal snapshots?                      no            +

 F1=Help       F2=Refresh       F3=Cancel       F4=List
 F5=Reset      F6=Command       F7=Edit         F8=Image
 F9=Shell      F10=Exit         Enter=Do
```

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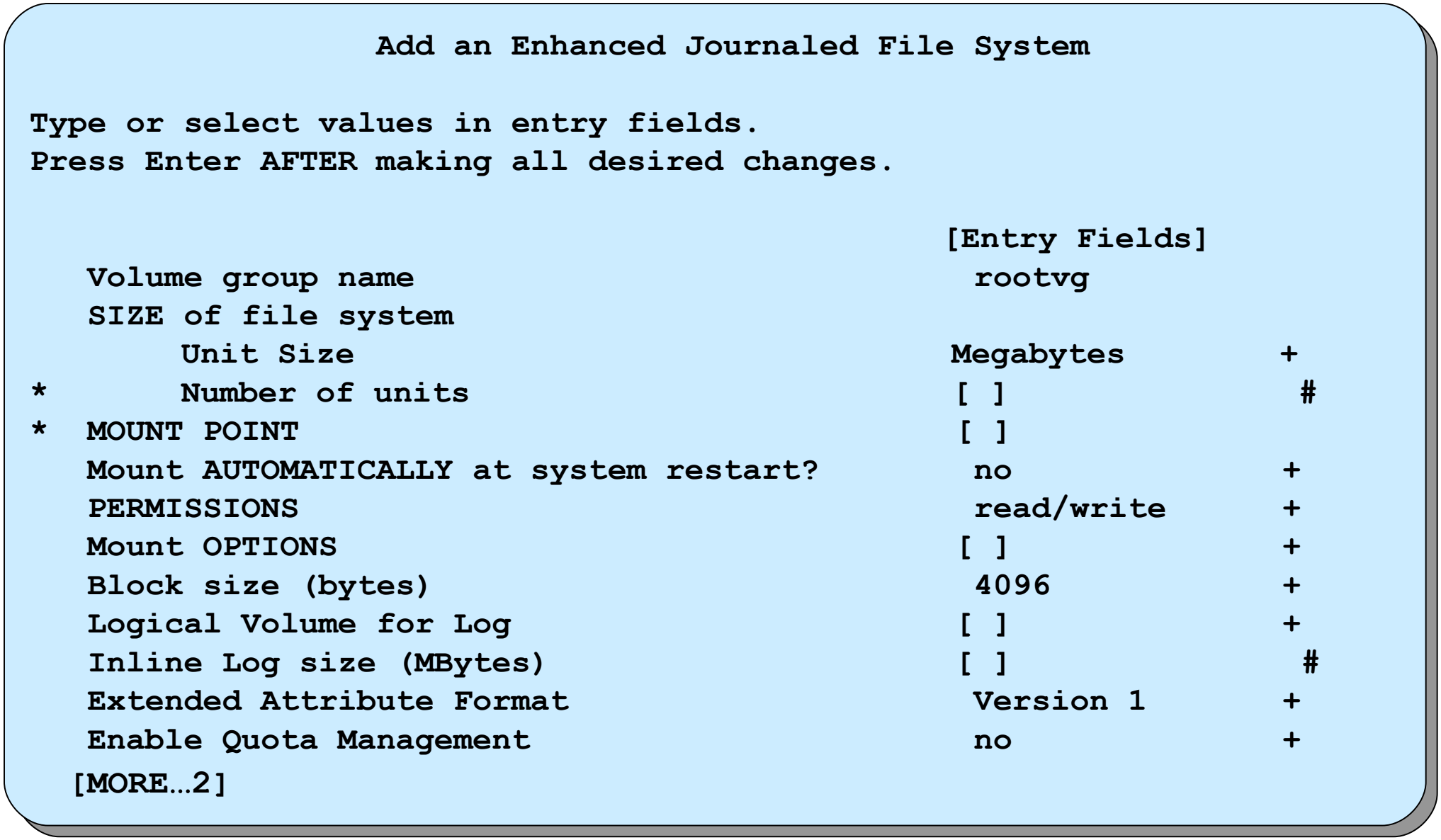
Add an Enhanced Journaled File System (JFS2)



```
                    Add an Enhanced Journaled File System

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                                      [Entry Fields]
   Volume group name                                   rootvg
   SIZE of file system
        Unit Size                                     Megabytes        +
*       Number of units                               [ ]               #
*  MOUNT POINT                                        [ ]
   Mount AUTOMATICALLY at system restart?              no               +
   PERMISSIONS                                         read/write       +
   Mount OPTIONS                                      [ ]               +
   Block size (bytes)                                  4096             +
   Logical Volume for Log                             [ ]               +
   Inline Log size (MBytes)                           [ ]                #
   Extended Attribute Format                           Version 1        +
   Enable Quota Management                             no               +
  [MORE...2]
```

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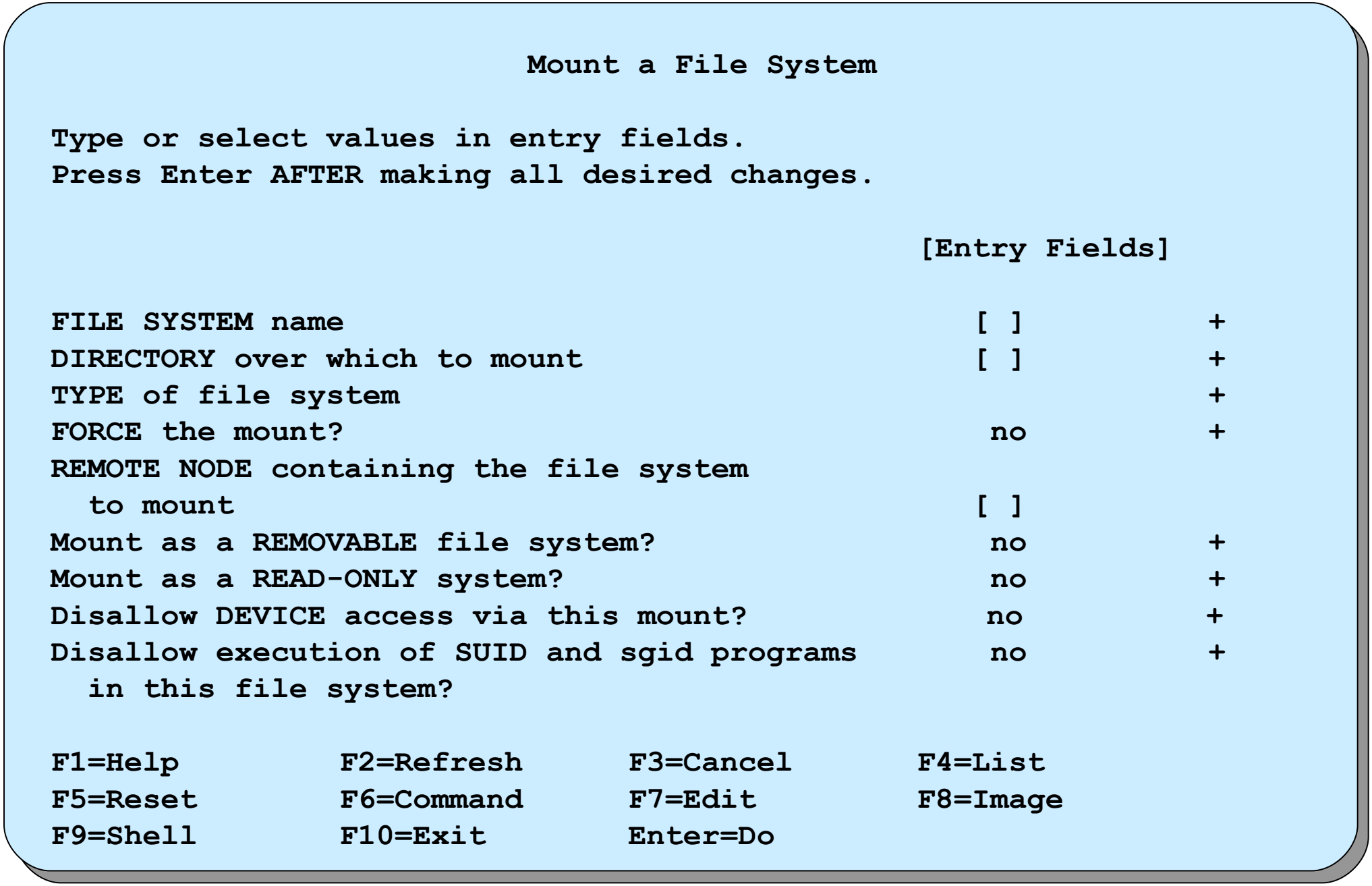
Mount a File System



```
                          Mount a File System

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                                [Entry Fields]

FILE SYSTEM name                                   [ ]          +
DIRECTORY over which to mount                      [ ]          +
TYPE of file system                                             +
FORCE the mount?                                    no          +
REMOTE NODE containing the file system
  to mount                                         [ ]
Mount as a REMOVABLE file system?                   no          +
Mount as a READ-ONLY system?                        no          +
Disallow DEVICE access via this mount?              no          +
Disallow execution of SUID and sgid programs        no          +
  in this file system?

F1=Help          F2=Refresh       F3=Cancel        F4=List
F5=Reset         F6=Command       F7=Edit          F8=Image
F9=Shell         F10=Exit         Enter=Do
```

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Change/Show Characteristics of a Journaled File System

```
          Change/Show Characteristics of a Journaled File System

Type or select values in entry fields.
Press Enter AFTER making all desired changes.
                                                  [Entry Fields]
   File system name                                /var
   NEW mount point                                [/var]
   SIZE of file system (in 512-byte blocks)
        Unit Size                                  512bytes       +
*       Number of units                           [65536]          #
   Mount GROUP                                    [bootfs]
   Mount AUTOMATICALLY at system restart ?         yes            +
   PERMISSIONS                                     read/write     +
   MOUNT OPTIONS                                  [ ]             +
   Start Disk Accounting ?                         no             +
   Fragment Size (bytes)                           4096
   Number of bytes per inode                       4096
   Compression algorithm                           no
   Large File Enabled                              true
   Allocation Group Size (MBytes)                  16
```

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Change/Show Characteristics of an Enhanced Journaled File System

```
   Change / Show Characteristics of an Enhanced Journaled File System
    Type or select values in entry fields.
    Press Enter AFTER making all desired changes.
                                                [Entry Fields]
   File system name                              /home
   NEW mount point                              [/home]
   SIZE of file system
        Unit Size                                512bytes            +
*       Number of units                         [32768]               #
   Mount GROUP                                  [ ]
   Mount AUTOMATICALLY at system restart ?       yes                 +
   PERMISSIONS                                   read/write          +
   MOUNT OPTIONS                                [ ]                  +
   Start Disk Accounting?                        no                  +
   Block size (bytes)                            4096
   Inline Log?                                   no
   Inline Log size (MBytes)                     [ ]
   Extended Attribute Format                    [v1]                 +
   Enable Quota Management                       no                  +
   Allow Small Inode Extents                     no                  +
   Enable EFS?                                   no                  +
```

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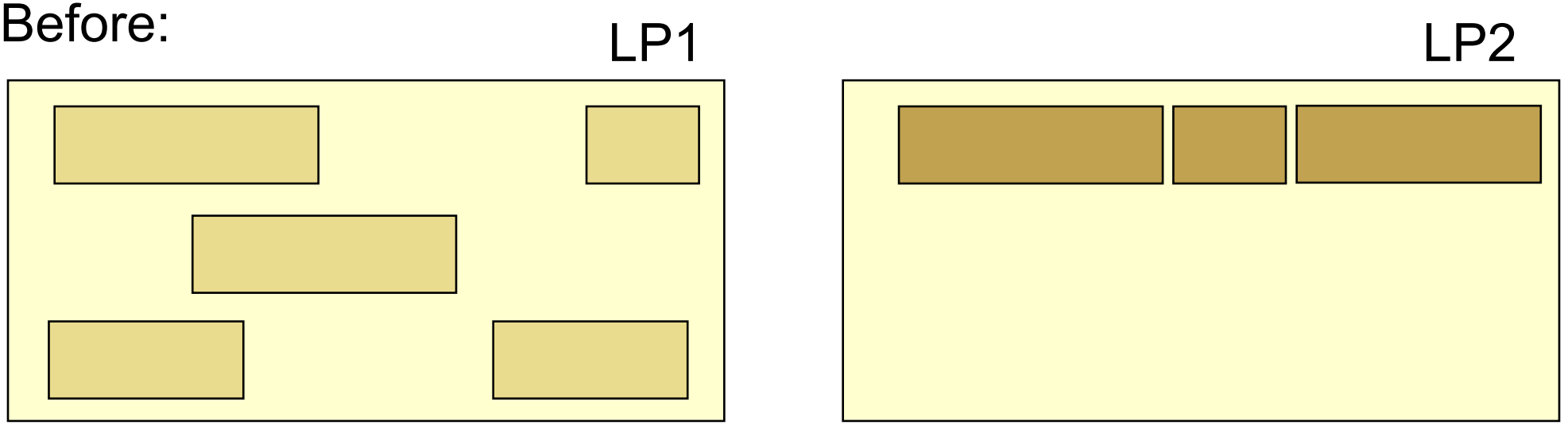
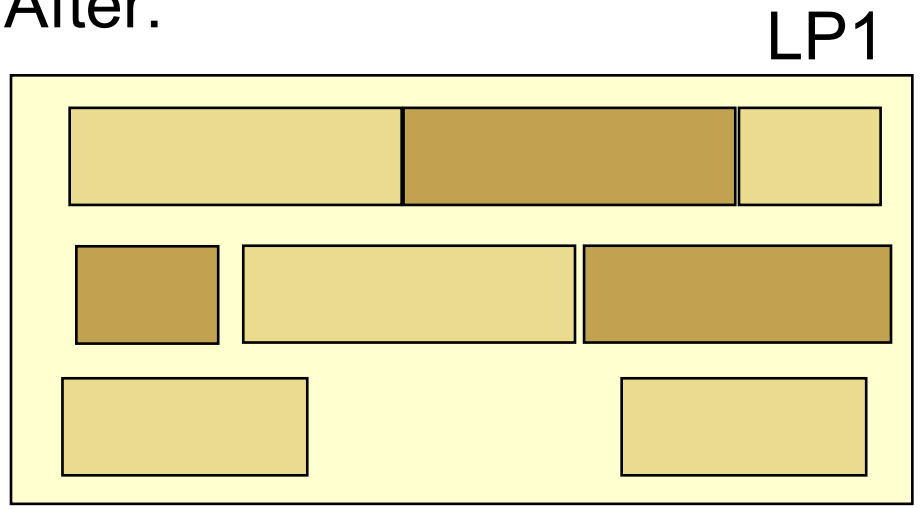
Dynamically shrinking a JFS2 file system

Before:



After:




```
# chfs  -a size="-16M"  /myfs
```

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Remove a Journaled File System

```
                    Remove a Journaled File System

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                                [Entry Fields]
FILE SYSTEM name                                                +
Remove Mount Point                              no              +









F1=Help          F2=Refresh       F3=Cancel        F4=List
F5=Reset         F6=Command       F7=Edit          F8=Image
F9=Shell         F10=Exit         Enter=Do
```

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Add a RAM file system

- Create a RAM disk of 4 MB

```
# mkramdisk 4M
/dev/rramdisk0
```

- Create a JFS file system on this RAM disk

```
# mkfs -V jfs /dev/ramdisk0
mkfs: destroy /dev/ramdisk0 (yes)? y
```

- Create mount point

```
# mkdir /ramdisk
```

- Mount RAM file system

```
# mount -V jfs -o nointegrity /dev/ramdisk0 /ramdisk
```

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Add a UDF file system on a DVD-RAM

- Create a UDF file system

```
# udfcreate -d /dev/cd0
```

- Change the label on a UDF file system

```
# udflabel -d /dev/cd0 -l testdvd
```

- Create a mount point

```
# mkdir /dvddisk
```

- Mount a UDF file system

```
# mount -V udfs -o rw /dev/cd0 /dvddisk
```

- Check a UDF file system

```
# udfcheck -d /dev/cd0
```

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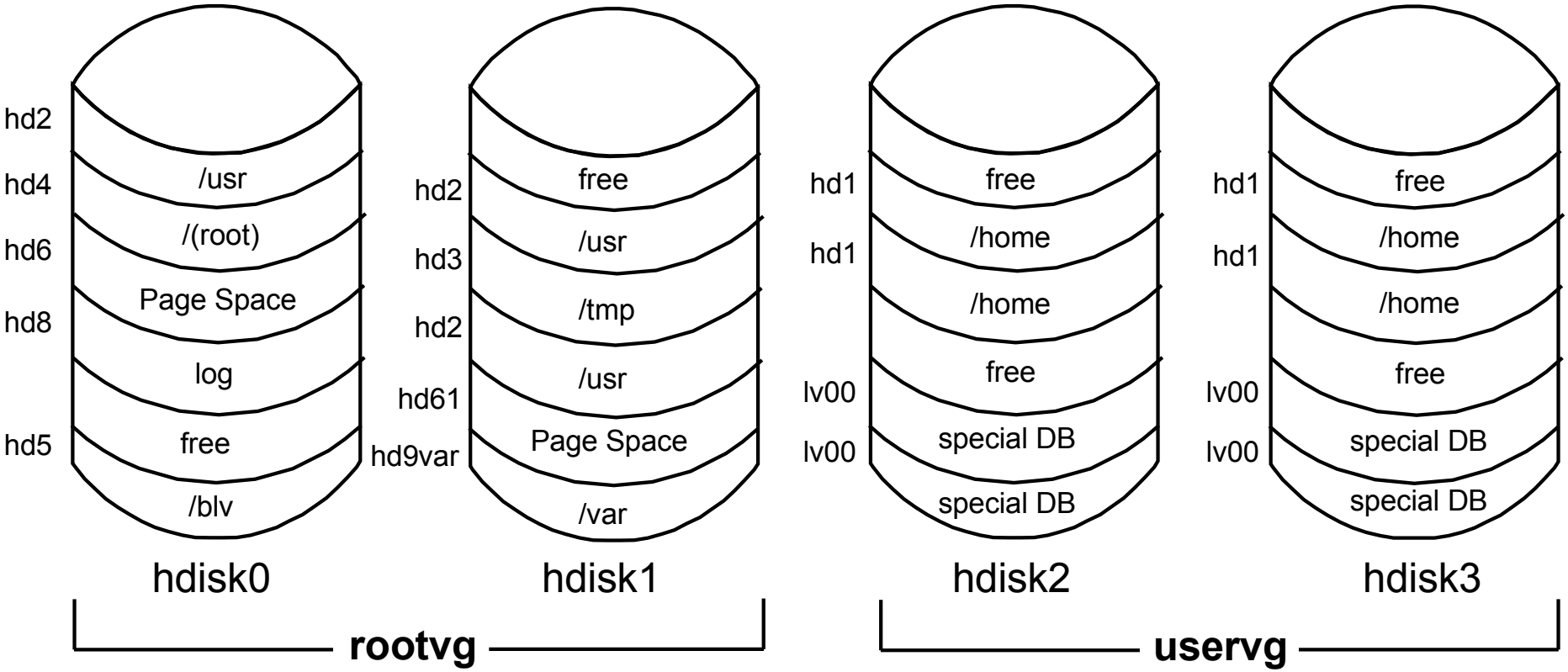
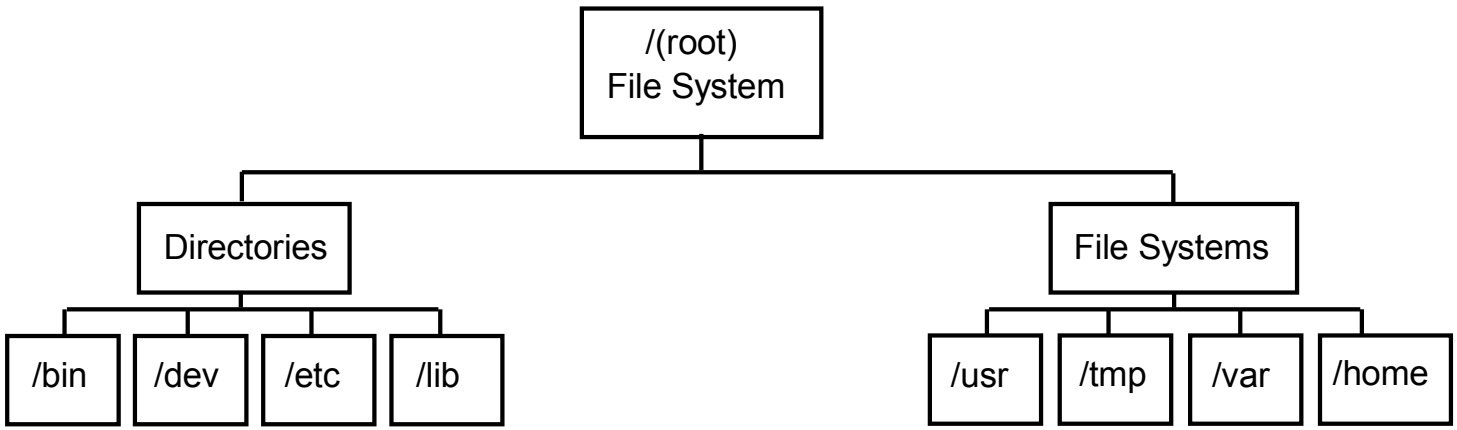
System storage review

Logical Volume Structure



File Systems



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Checkpoint

1. Does the size of the file system change when the size of the logical volume it is on is increased? _____

3. If a file system is the same size as the logical volume on which it sits, does the size of the logical volume increase when the size of the file system that is residing on it increases? _____

5. If you remove a logical volume, is the file system that is residing on it removed as well?

   _____

   _____

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Checkpoint solutions

- Does the size of the file system change when the size of the logical volume it is on is increased? No

- If a file system is the same size as the logical volume on which it sits, does the size of the logical volume increase when the size of the file system that is residing on it increases? Yes

5. If you remove a logical volume, is the file system that is residing on it removed as well?

   The contents are removed, but the information about the file system that is contained in **/etc/filesystems** is not removed.

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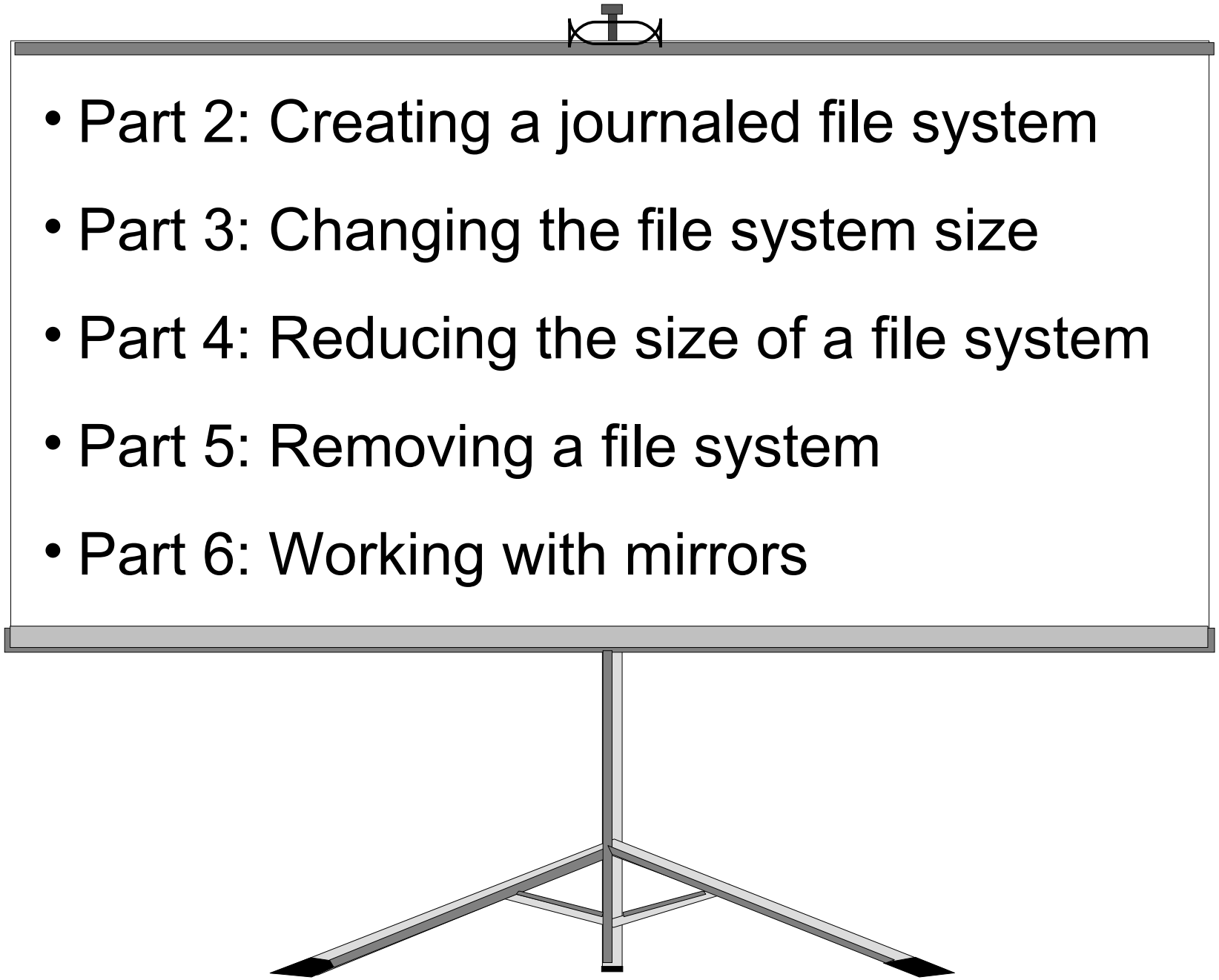
Exercise 10: Working with file systems (parts 2-6)



- Part 2: Creating a journaled file system
- Part 3: Changing the file system size
- Part 4: Reducing the size of a file system
- Part 5: Removing a file system
- Part 6: Working with mirrors

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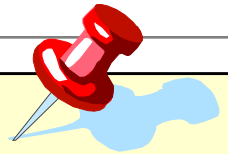
Unit summary



- The components of a JFS file system are the superblock, inodes, data blocks, and indirect blocks.
- Important issues to consider when creating a journaled file system are: fragment size, NBPI, allocation group size, compression, and whether it should be large file enabled.
- JFS2 supports large files, large file systems, and improves performance.
- File systems can be added and removed from the system, and their characteristics can also be changed, all through SMIT.

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