Linux File Systems Part 1

Panther Linux User Group

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What is a File System?

- What is a File? Abstraction consisting of 0s and 1s

- A method for storing, manipulating, and retrieval computer files

- Think of it as a database for storage mediums

How a Unix FS works

- Files are represented by inodes

- Inodes denote the blocks allocated to a file

- A folder is simply a reference to inode numbers

- Files are just inodes

Diagram
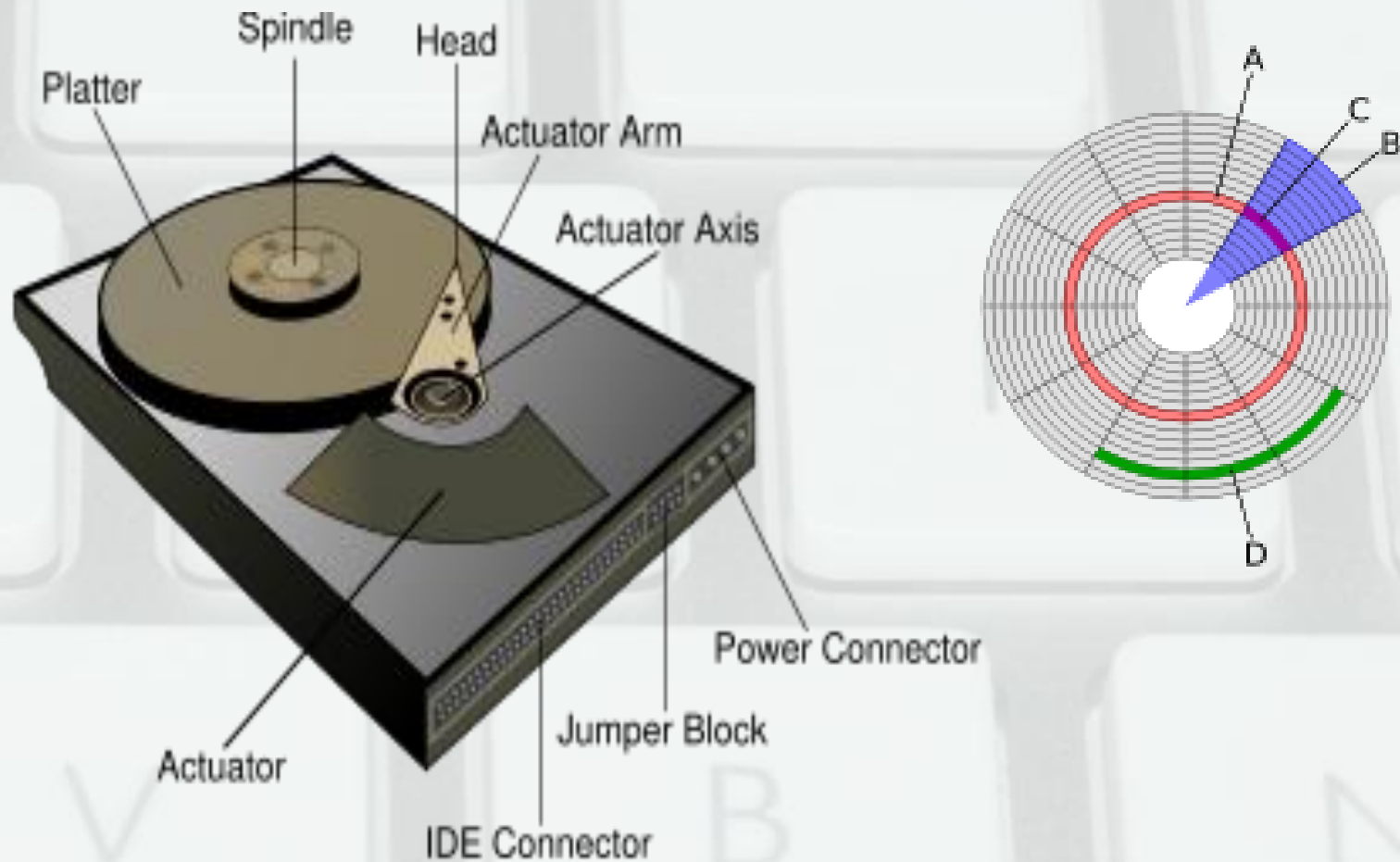
Taken from Wikipedia (http://en.wikipedia.org/wiki/Hard_disk_drive)

Now We Can Talk About FS

- Organize clusters/blocks

- Saves file information in FAT & inode

- Only the basics

- You can secure basic operations through ACL or Capabilities

- Different types for different media

- Journaling, versioning, log-structured, database, transactional, network, special purpose

Ext2

- 'The Second Extended filesystem'

- Successor to Ext1 and MinixFS

- Features:

    – Files are referenced by inodes

    – No journal

    – Rock solid—FS of choice for small installations

Ext3

- 'Third extended filesystem'

- Features:
  - Journal
  - Larger file limits than ext2

- Criticism
  - No online defrag
  - No dynamic inode allocation

Ext4

- 'Fourth extended filesystem'
- Features:
  – Larger limits and better performance over Ext3
  – Extents
- Criticism:
  – Write through hole

ReiserFS 3

Circular log

1. remove entry, delete data

Hans Reiser

Files under 4 kilobytes

Defragmentation

Online resizing, growth only

Big Kernel Lock, scaling on multicore

Fsck could destroy internal files

ReiserFS 4

- Defragmenting ability
- Tailpacking, hit performance
- Encryption support
- Faster handling of directories /w many files

New Filesystems

Tux 3

- Daniel Phillip

- Zumastor NAS project

- Snapshots & Remote Replication

Server Filesystems

XFS/JFS

- The original journaling filesystems for Linux

- Very fast for large files and very large partitions

- Features:

  – Extents

  – Dynamic allocation

  – Striping of files

ZFS

See Wikipedia...

BtrFS (*"Butter FS"*)

Dynamic inode Allocation

Online utilities for resizing etc.

Snapshots

Many similarities to zfs

Flash File Systems

- Disk file systems are not optimal on flash drives (Erase blocks first, random access(seeks), writes distributed)

JFFS2

UNDER CONSTRUCTION

SquashFS

Embedded systems

Network Filesystems

SMBFS/CIFS

- Windows Shares

ProcFS

- If the kernel was a person, this is what the person would be thinking