Operating System: File System

Alex Chi

Update: April 16, 2020

Contents

1 Access Lists and Groups

- 761
- owner, group, public
- read, write, execute: 4+2+1

2 A Typical File-system Organization

- disk is divided into partition
- logical partition can span multiple disks

2.1 Directory

2.1.1 Single-Level Directory

- only one level directory
- efficiency
- naming
- protection
- grouping

2.1.2 Two-level

- first level = user

2.1.3 Tree-Structured

- UNIX, Linux, Windows

2.2 File Allocation

2.2.1 Contiguous Allocation

- simple
- best performance
- fragmentation, requires compaction offline / online
- similar to memory management

2.2.2 Linked Allocation

- similar to `malloc` (user memory management)
- each file is a linked list of disk blocks

- no external fragmentation
- improve efficiency by clustering (cause internal fragmentation)
- reliability (if a block breaks, all following blocks can't be found)
- location a block take many I/O and seeks

2.2.3 FAT (file allocation table)

- beginning of volume has a table, indexed by block number
- just like inverted page table
- new block allocation is simple
- lost table = lost all files

2.2.4 Indexed Allocation

- each file has its own index block
- index block saves blocks for this file
- just like multi-level paging
- example: UNIX I-node
  - direct blocks
  - single indirect, points to an index block
  - double indirect, points to an index block of an index block
  - triple indirect
  - (similar to xv6 file system lab)