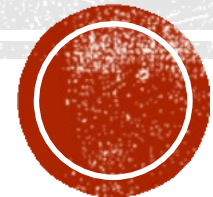
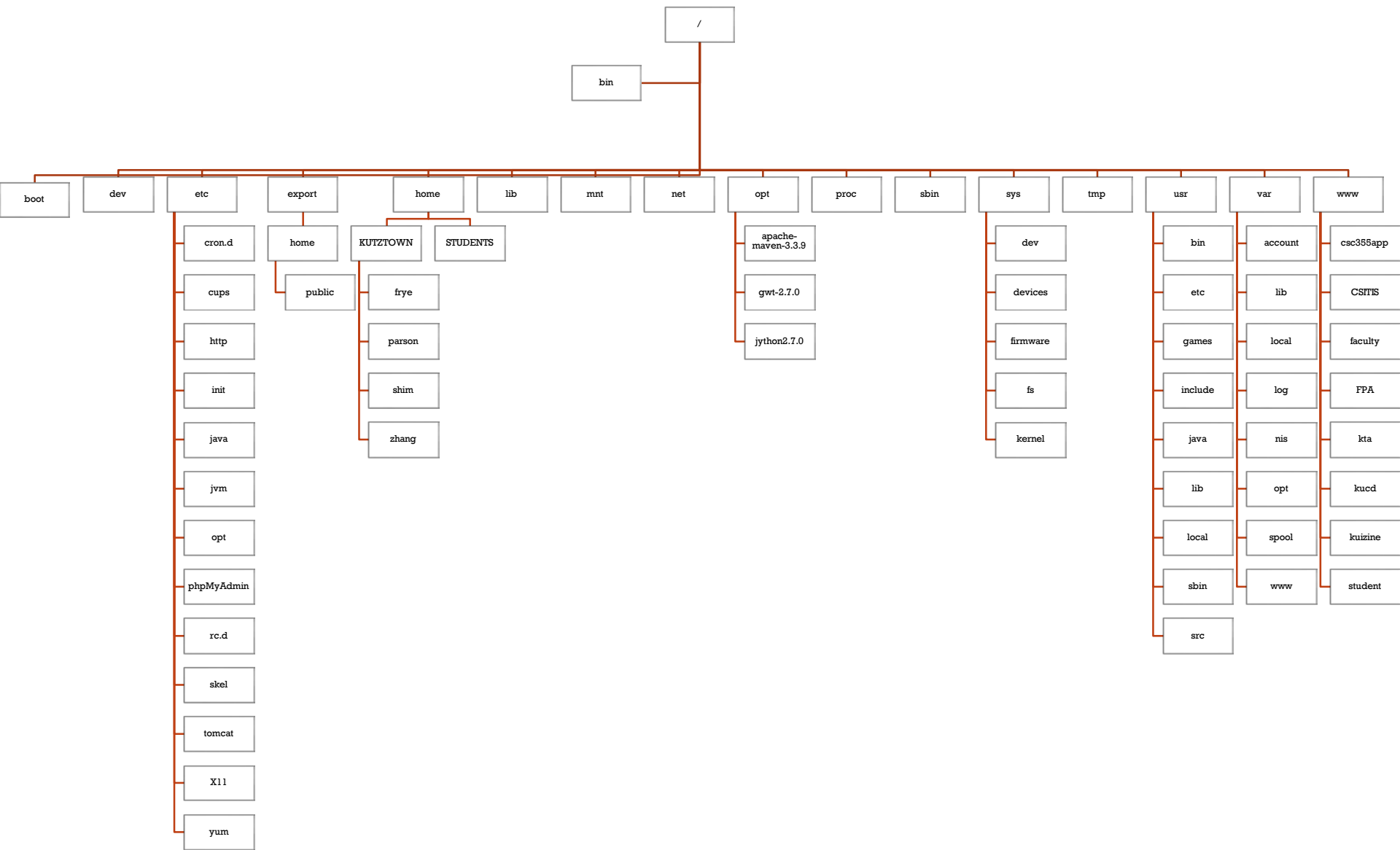


CSC252 – UNIX

FILES



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FILENAMES

- Filenames
 - Absolute
 - Relative

- Tilde ~



DIRECTORIES

- Special directories
 - .
 - ..
- pwd
- cd
- mkdir
- rmdir



LS COMMAND

- **File type**
 - - regular file
 - d directory
 - l symbolic link
 - c character device file
 - b block device file
 - s socket
 - p named pipe
- **Permissions**
- **Number links/subdirectories**
- **Owner or user**
- **Group**
- **Size**
- **Modification time**
- **Name**



PERMISSIONS

- **Permissions for running Processes**
 - Real user ID
 - Effective user ID
 - Real group ID
 - Effective group ID
- **Commands**
 - chown
 - chgrp
 - chmod



SPECIAL PERMISSION BITS

- Set UID
 - 4xxx
 - u+s
- Set GID
 - 2xxx
 - g+s
- Sticky bit
 - 1xxx
 - +t
- umask



ACCESS CONTROL LISTS (ACLs)

- Finer-grained control
- Reduce performance
- Set of rules
- Must be enabled
 - 'acl' in /etc/fstab



LINKS

- **Types**
 - Hard
 - Symbolic

- **Commands**
 - ln
 - ls -il

DEREFERENCING SYMBOLIC LINKS

- Follow link to target file
- Pointer to the file

- No-dereference

- Utilities



BASIC FILE COMMANDS

- `file`
- `cat`
- `more`
- `less`
- `head`
- `tail`
- `wc`



PRINTING COMMANDS

- `lp`
- `enscript`
- `lph`
- `ansiprint`
- `lpstat`



ADVANCED FILE COMMANDS

- touch
- grep
- uniq
- sort
- cmp
- comm
- diff
- cut
- find



MORE ADVANCED COMMANDS

- `cpio`
- `tar`
- `bzip2` / `bunzip2`
- `bzcat`
- `gzip` / `gunzip`
- `compress` / `uncompress`
- `tr`
- `unix2dos` / `dos2unix`



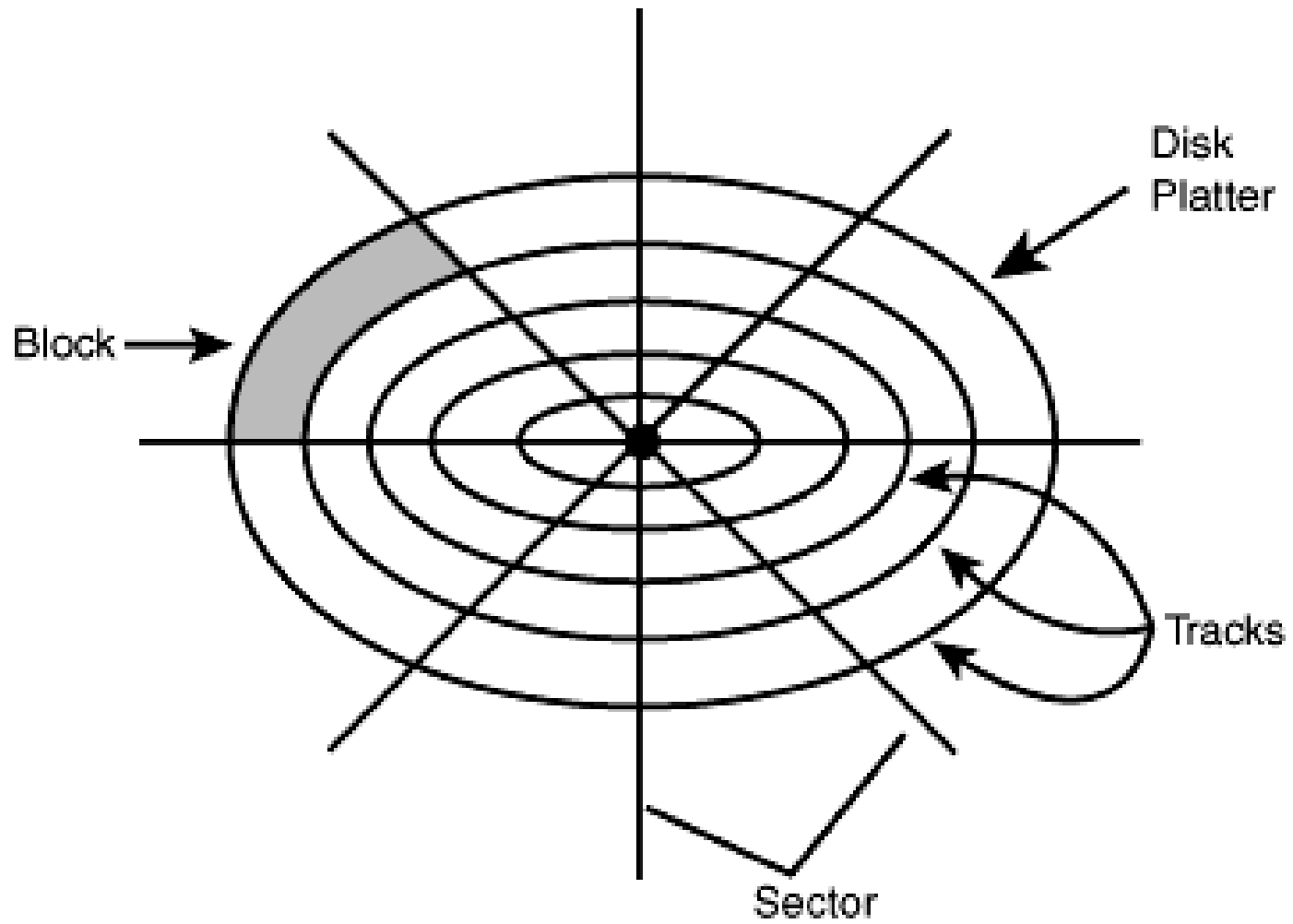
FILESYSTEM COMMANDS

- du
- df
- fuser
- quota

ARCHIVES

- Group similar objects (.a)
- ar command
 - Add file r
 - Append file q
 - Table of contents t
 - Delete file d
 - Copy files x
- nm command
- Shared library





DISK INFORMATION

- Inodes
 - Inode list (i-list)
 - Inode table
- Boot block
- Superblock



DEVICES

- Block device
- Character device

- Device numbers
 - Major
 - Minor

- Partitions
- Filesystem



RAID

- Parity
- Striping
- Mirroring
- Hot Spare
- Hot Swappable

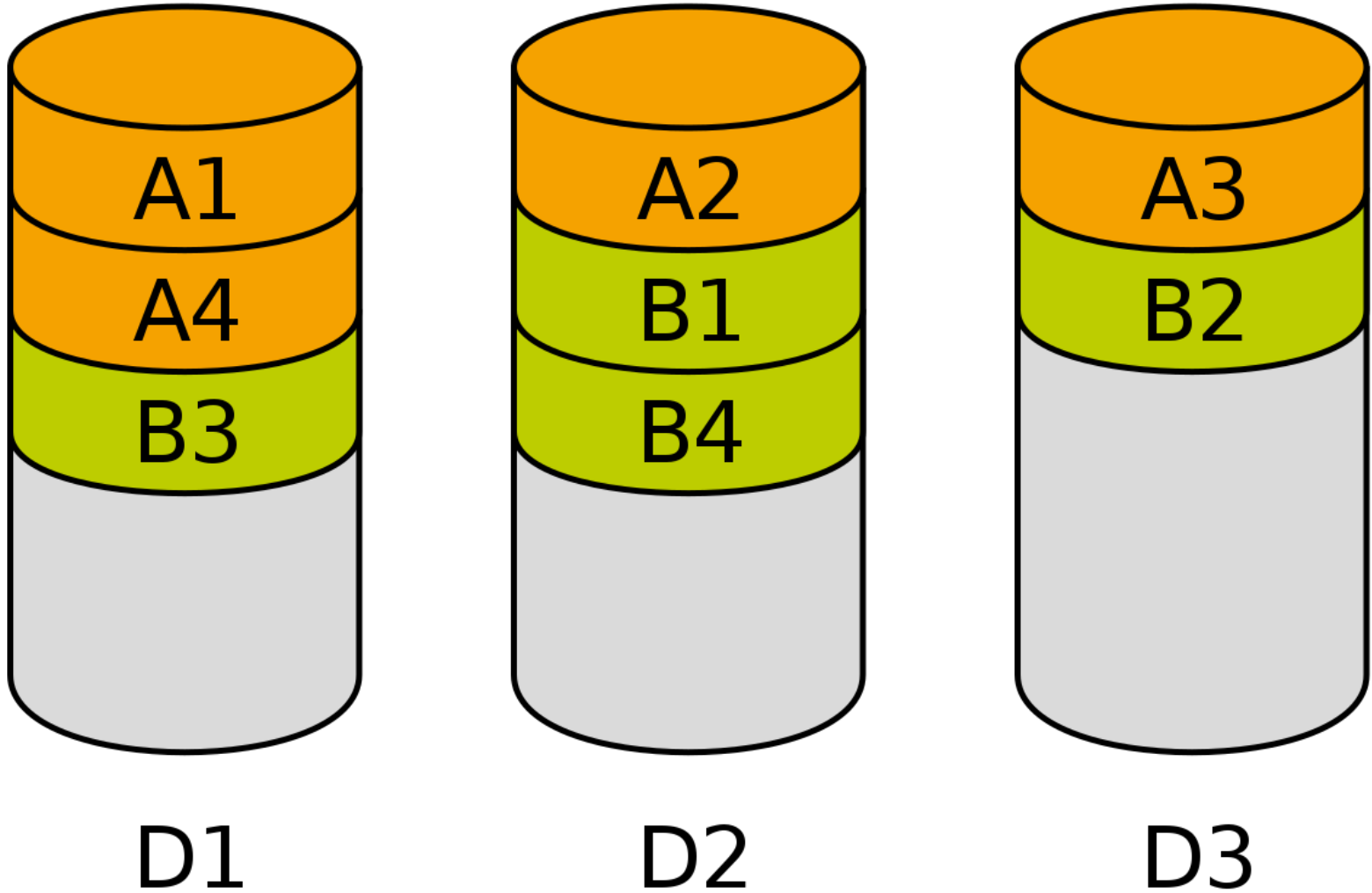


RAID

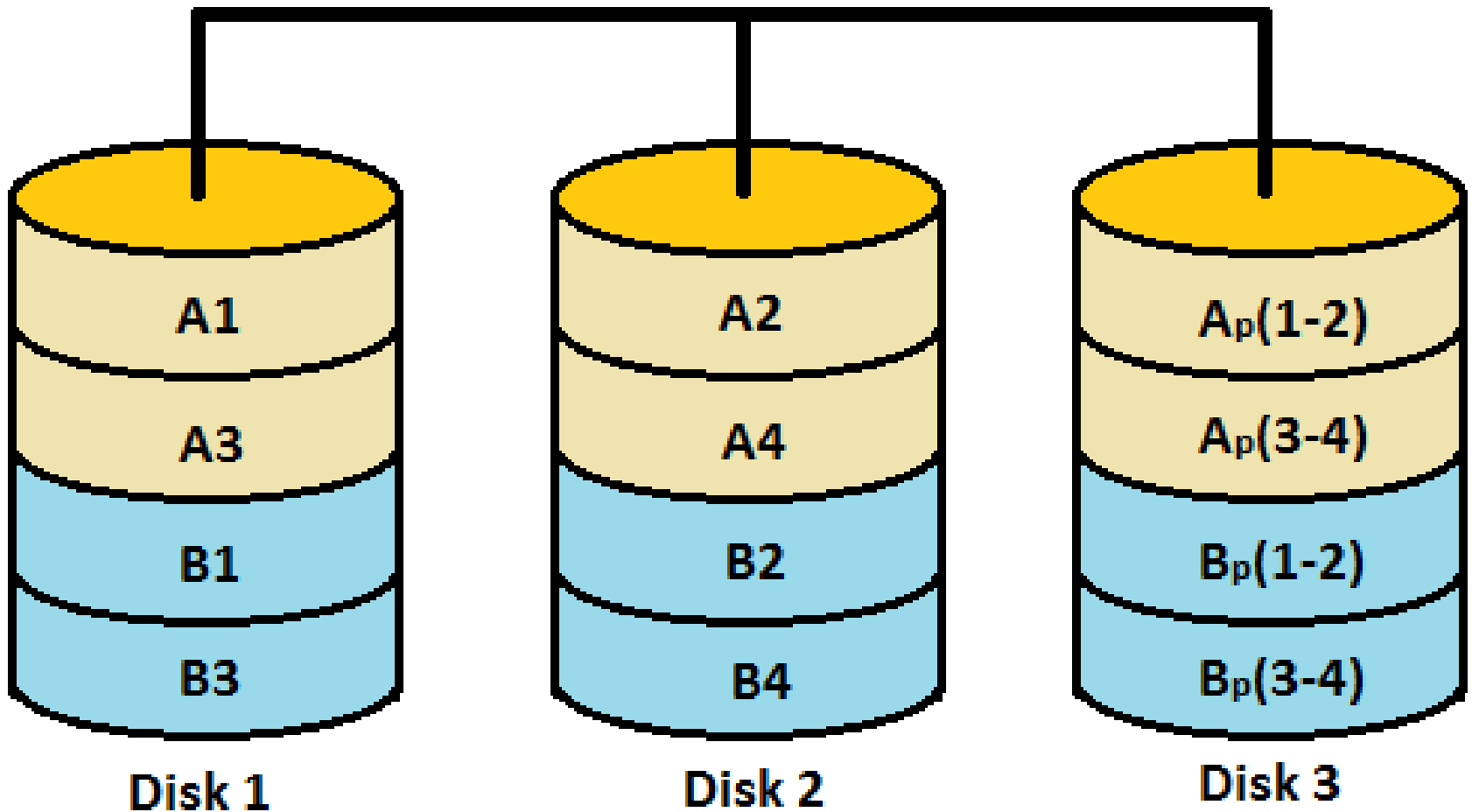
- 0 – striping
- 1 – mirroring
- 2 – bit-level striping with parity
- 3 – byte-level striping with parity disk
- 4 – block-level striping with parity disk
- 5 – RAID3 with multiple parity disks
- 6 – RAID5 with two parity blocks
- 0+1 – Striping and mirroring
- 1+0 (RAID 10) – Mirroring and Striping



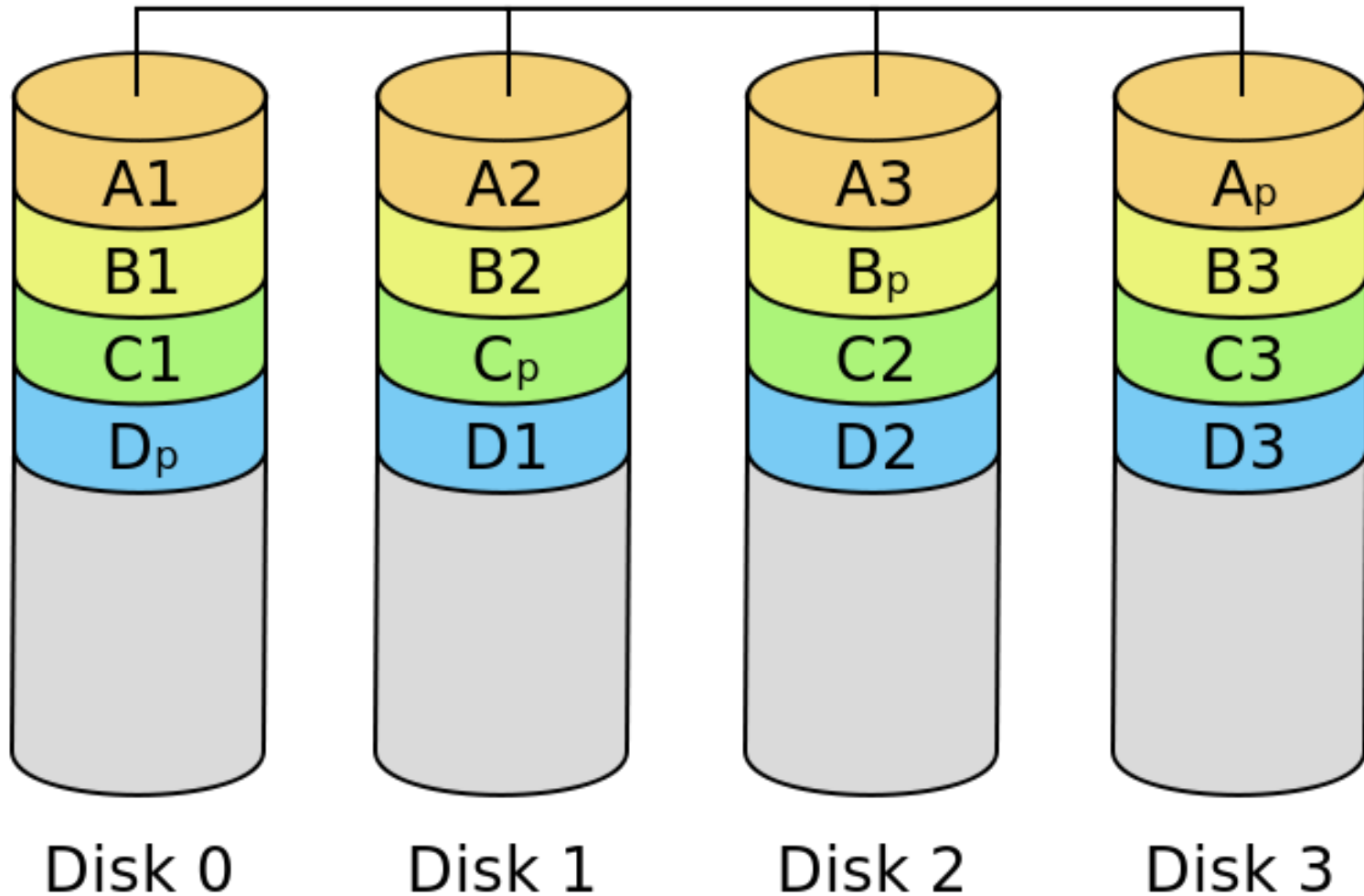
Striping



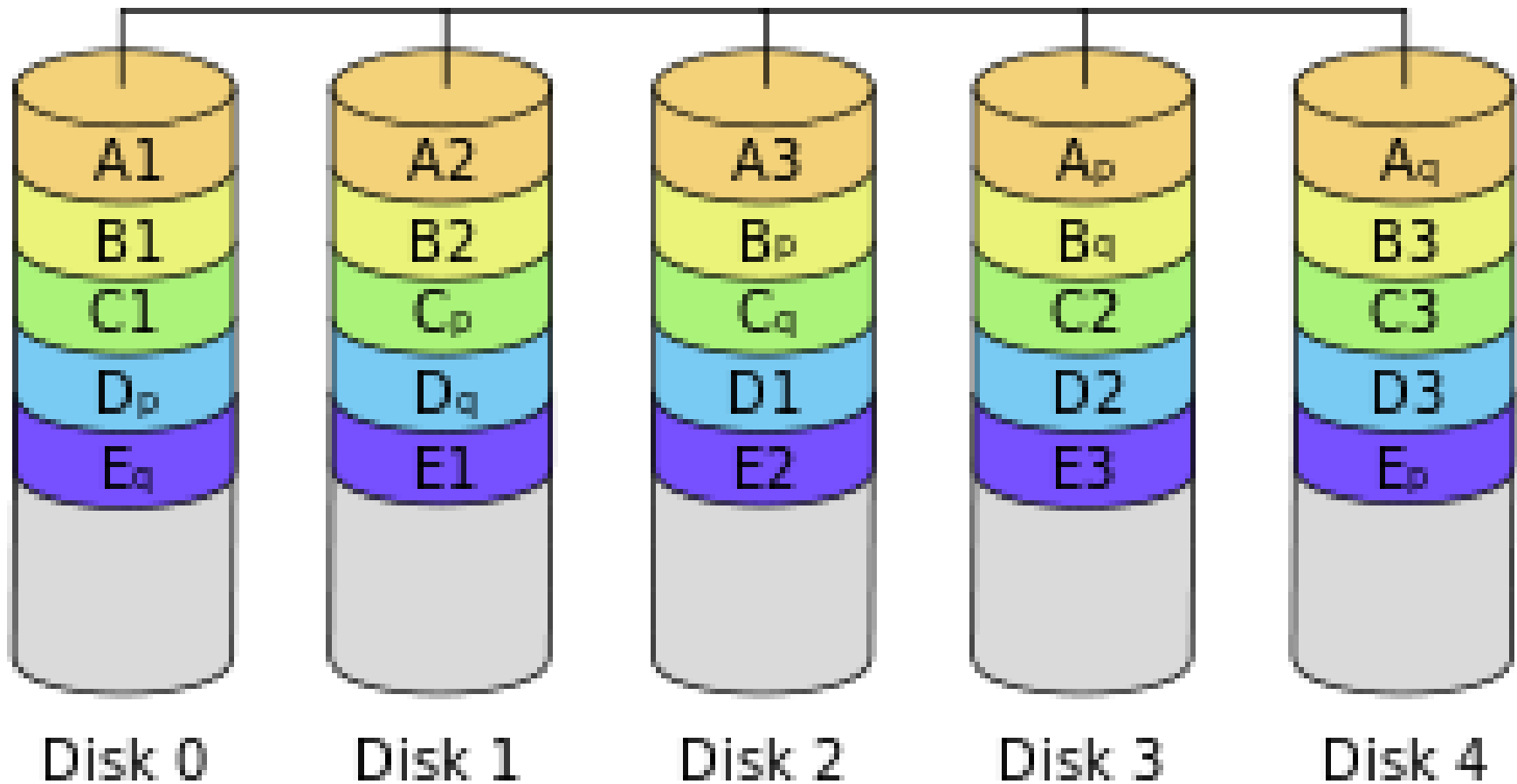
RAID 3



RAID 5



RAID 6

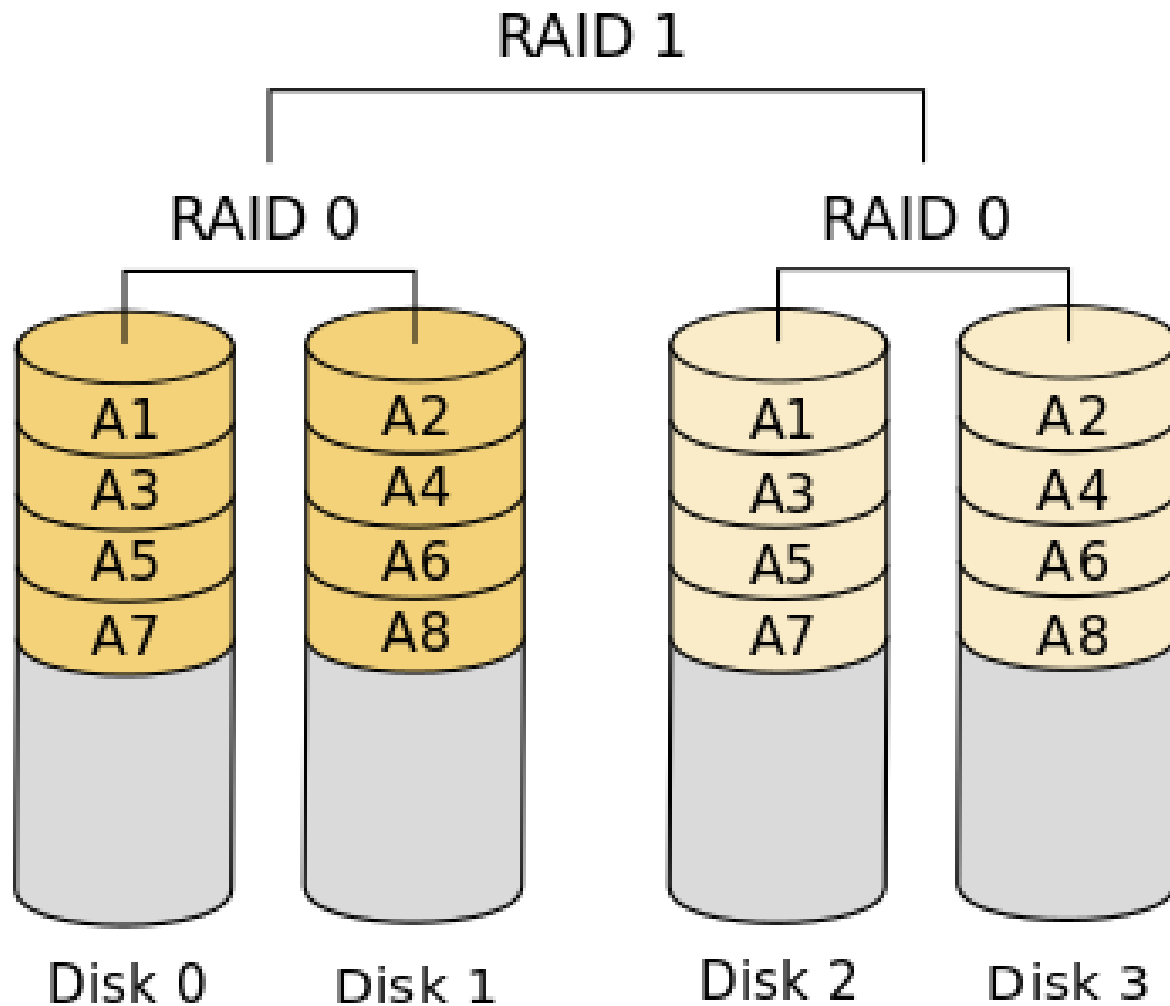


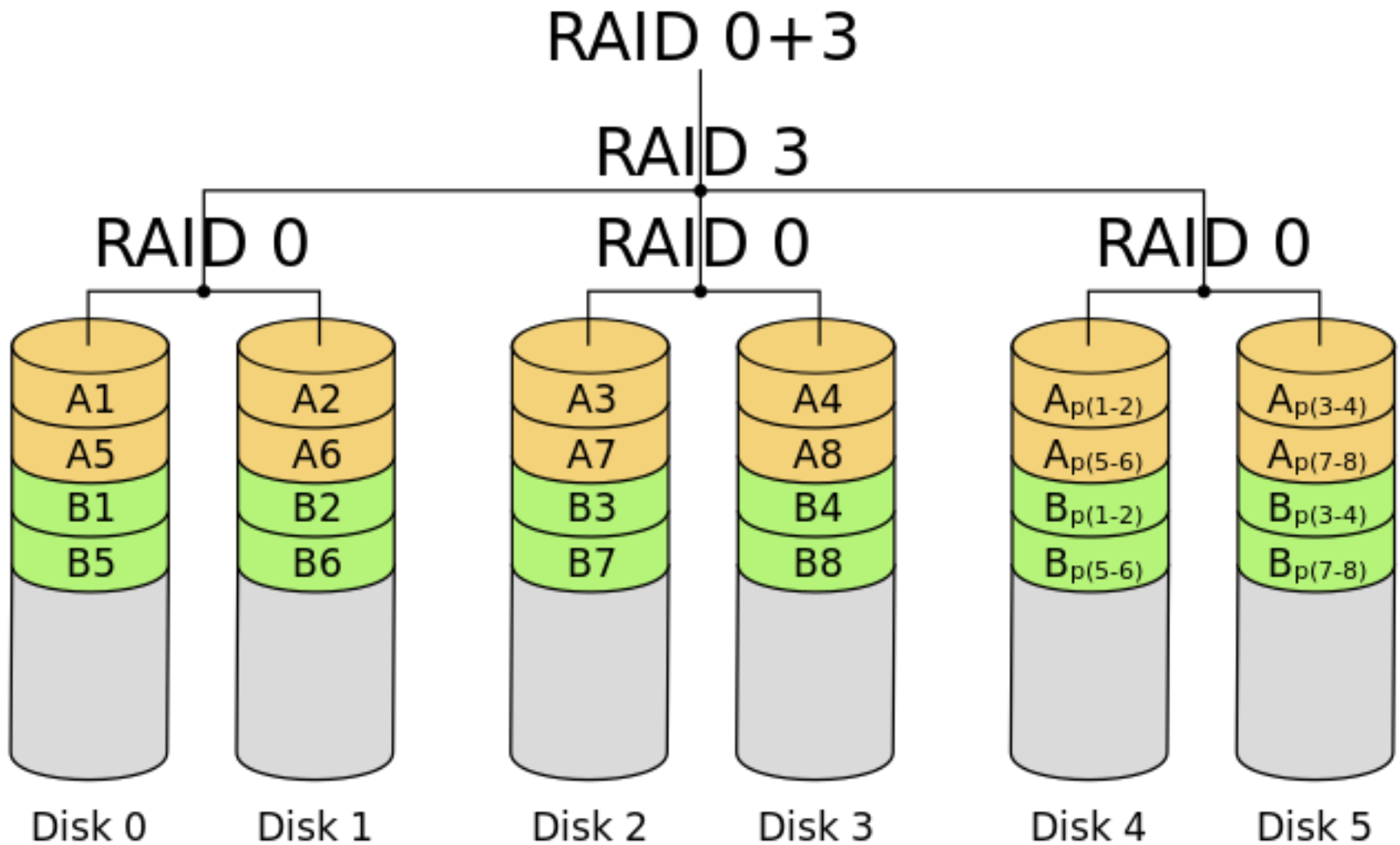
Nested RAID

- 0+1 – Striping and mirroring
- 0+3 – Byte-level striping with dedicated parity disk
- 1+0 (10) – Mirroring and Striping
- 5+0 (50) – Block-level striping with distributed parity
- 6+0 (60) – Block-level striping with distributed double parity
- 10+0 (100) – Stripe of RAID 10 arrays



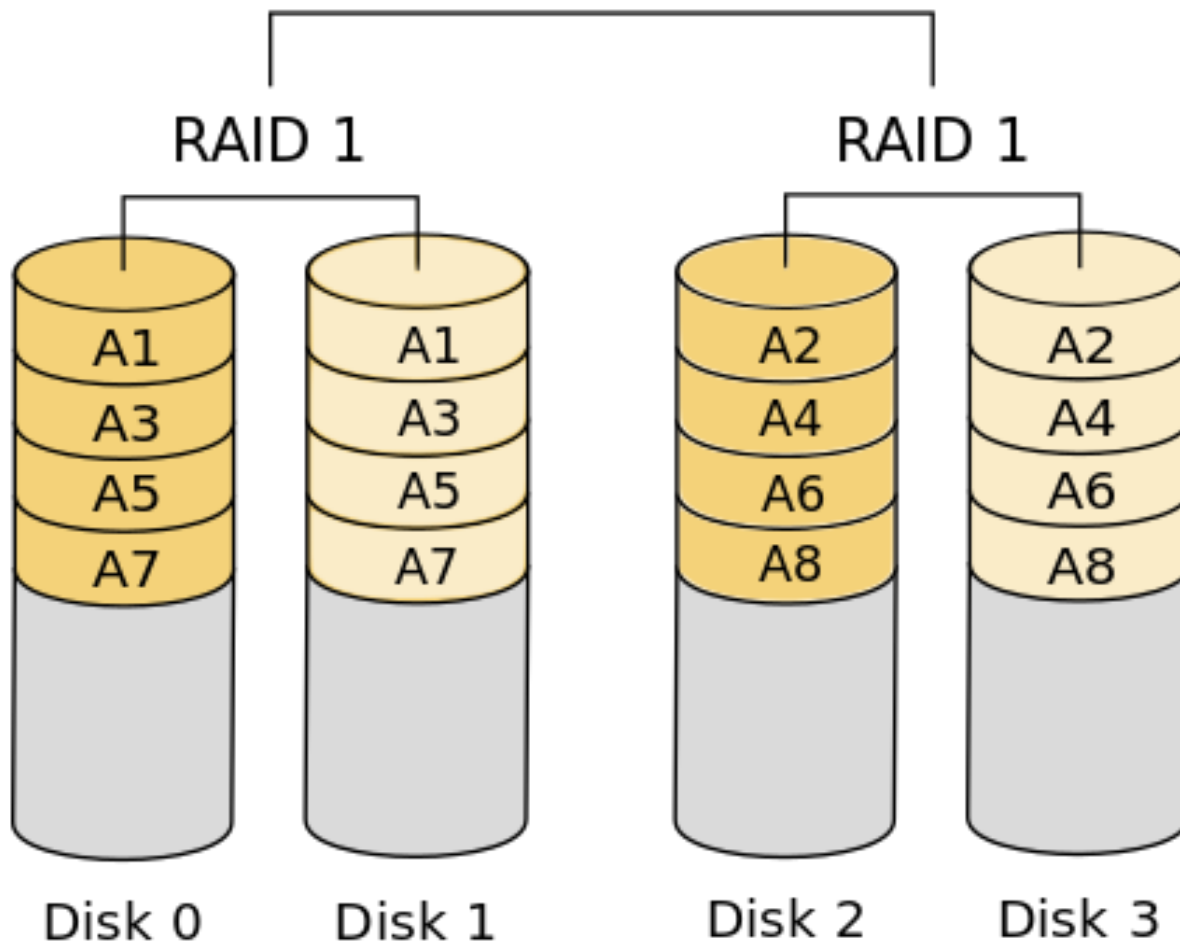
RAID 0+1



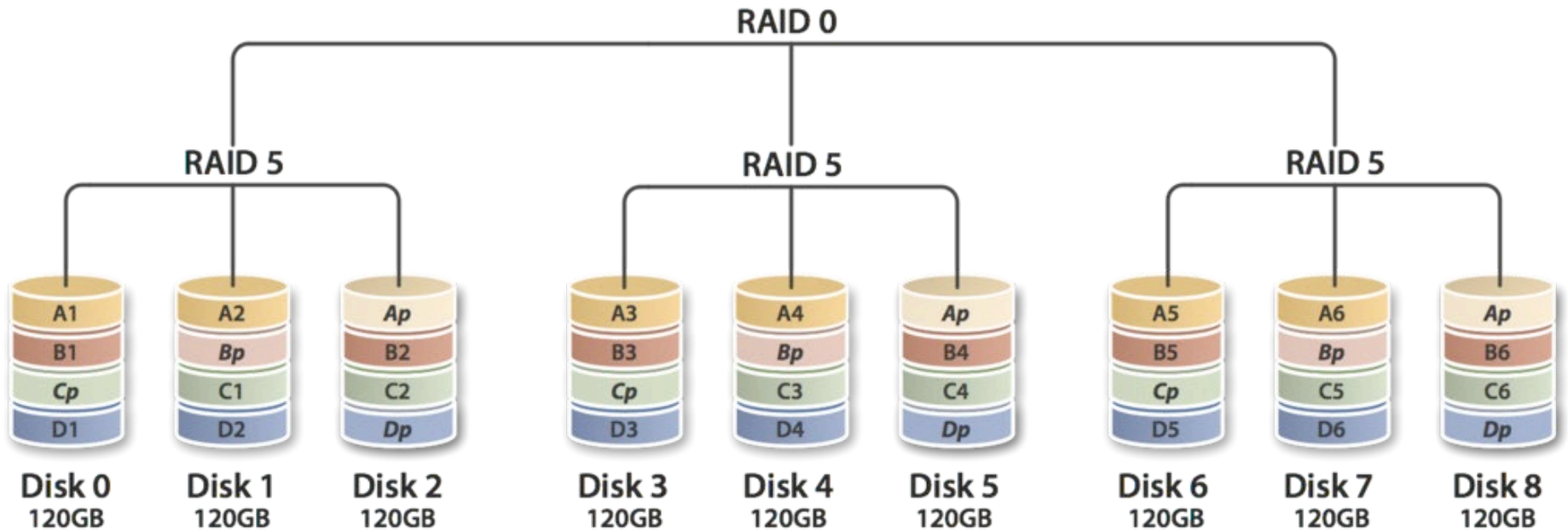


RAID 1+0

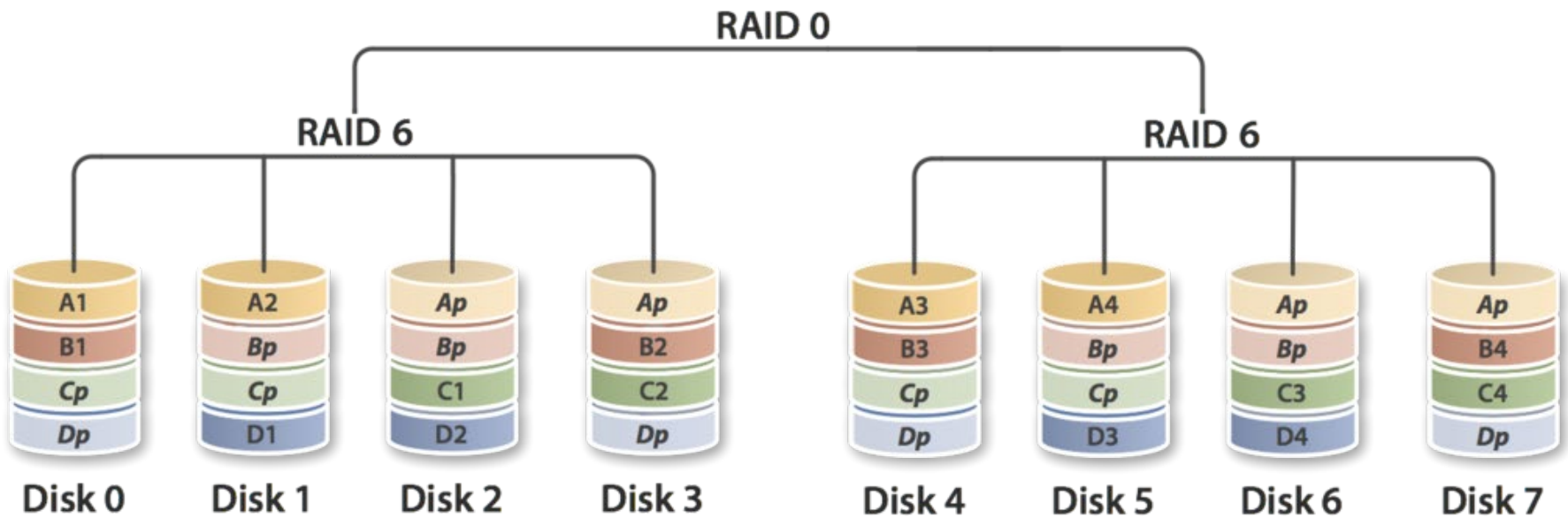
RAID 0



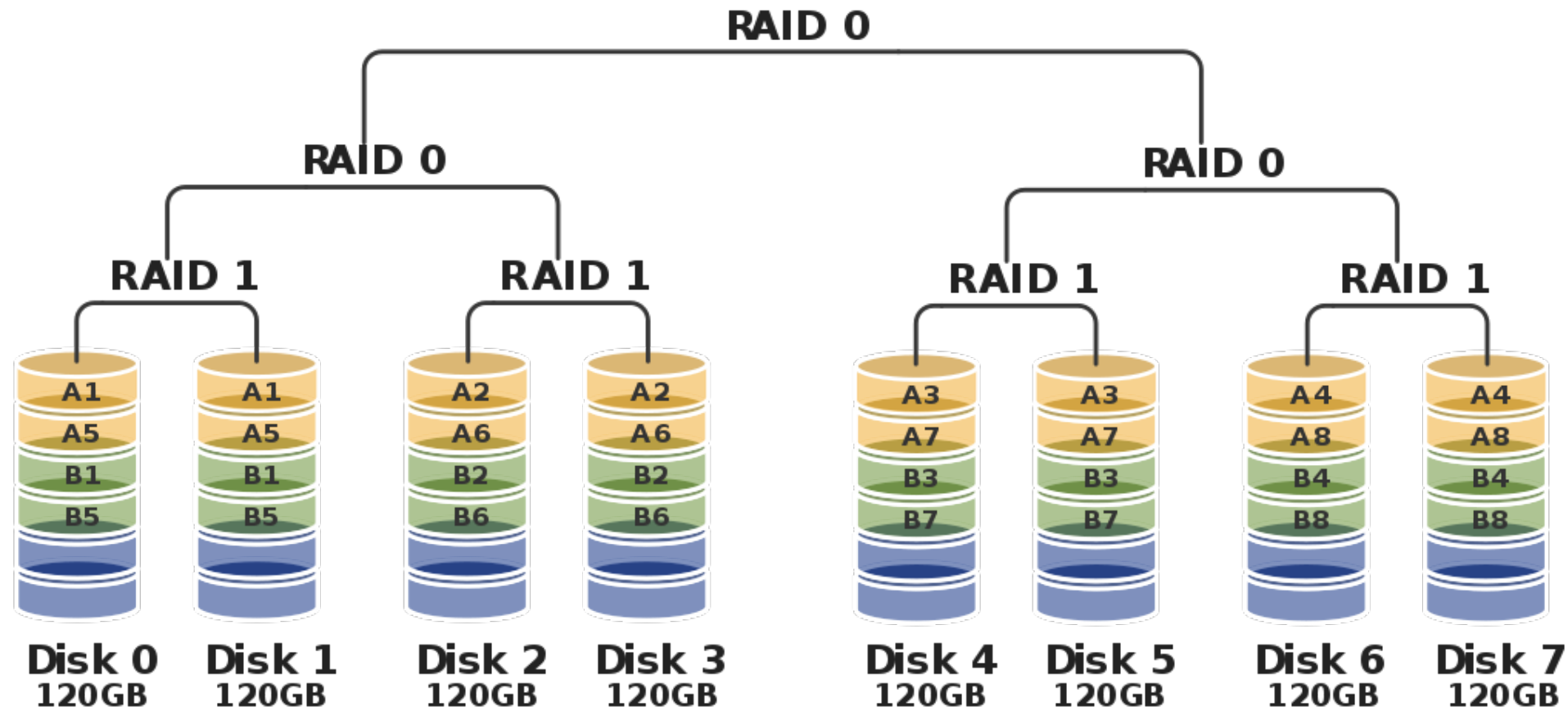
RAID 50



RAID 60



RAID 100

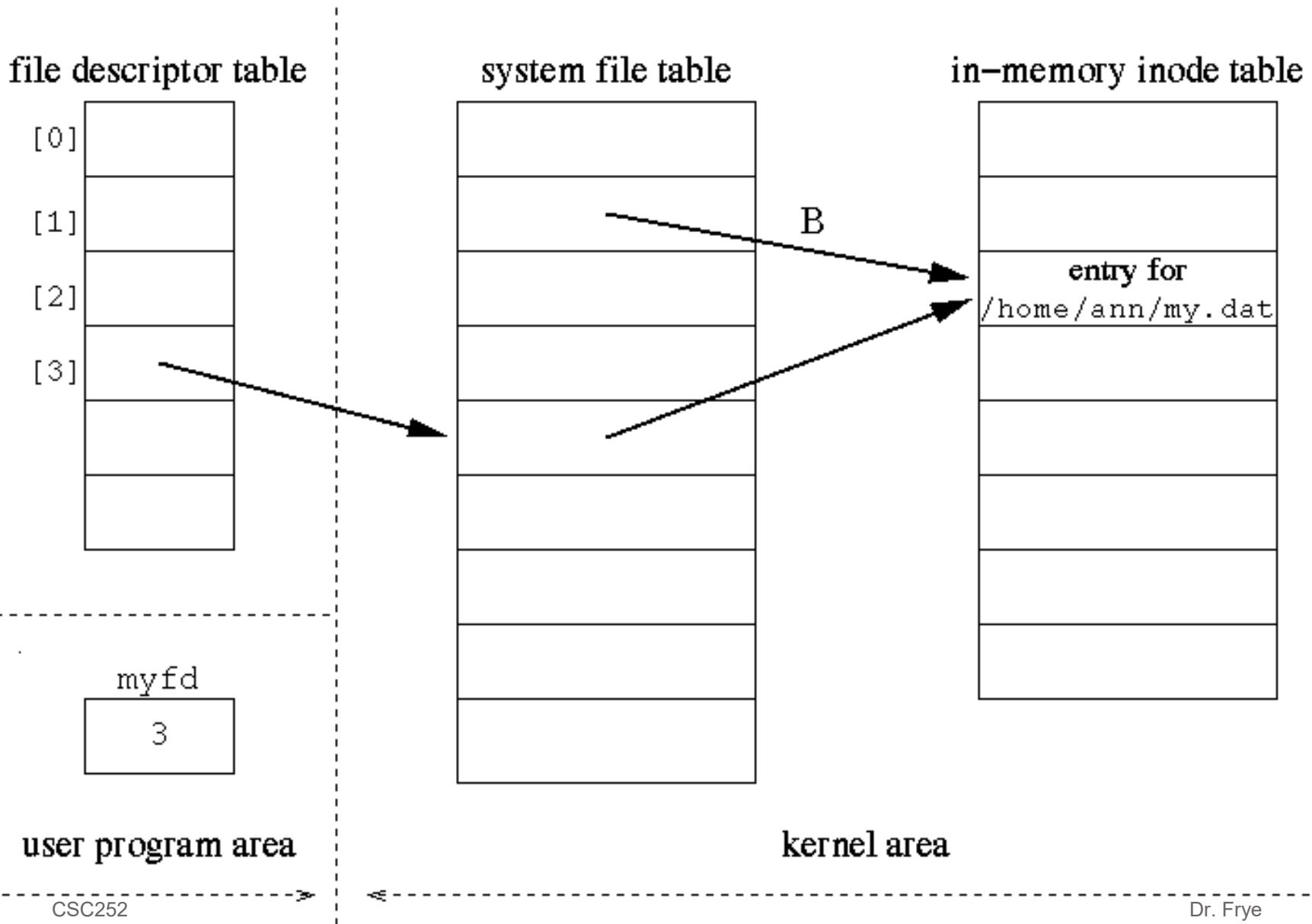


I/O INTERNALS

- Buffer pool
- Buffer freelist
- Least Recently Used (LRU) algorithm
- sync command



- `fd = open("/home/ann/my.dat", O_RDONLY);`



FILE I/O IN A PROGRAM

- Create a file
- Read from a file
- Write to a file
- `lseek()`



CLOSING A FILE

- Only process with file open
- Multiple processes with file open
 - Reference count



SUPERBLOCK

- Filesystem size
- Length of disk block
- Inode table size and location
- Disk block map
- Empty and filled blocks
- Other informatin

