FACULTY OF ENGINEERING AND TECHNOLOGY
UNIVERSITY OF LUCKNOW
LUCKNOW

Operating System
AI-602

Dr. Zeeshan Ali Siddiqui
Assistant Professor
Deptt. of C.S.E.

MISCELLANEOUS

DISK MANAGEMENT

Disk Management 1/3

- Low-level formatting, or physical formatting — Dividing a *disk* into sectors that the disk controller can read and write
  - Each *sector* can hold header information, plus data, plus error correction code (ECC)
  - Usually 512 bytes of data can be selectable

Disk Management 2/3

- To use a disk to hold files, the *operating system* still needs to record its own data structures on the disk.
  - *Partition* the disk into one or more groups of cylinders, each treated as a logical disk.
  - Logical formatting or "making a file system".
  - To increase efficiency most file systems group blocks into *clusters*
    - Disk I/O done in blocks
    - File I/O done in clusters

Disk Management 3/3

- *Boot* block initializes system
  - The bootstrap is stored in ROM.
  - Bootstrap loader program stored in boot blocks of boot partition.

- Methods such as *sector sparing* used to handle bad blocks.

SWAP-SPACE MANAGEMENT

Swap-Space Management 1/3

- *Swap-space management* is another low-level task of the operating system.

- Virtual memory uses disk space as an *extension* of main memory.

- Since disk access is much slower than memory access, using swap space significantly *decreases* system performance.

- The main *goal* for the design and implementation of swap space is to provide the best throughput for the virtual memory system.

Swap-Space Management 2/3

- **Swap-Space Use:** Solaris, for example, suggests setting swap space equal to the amount by which virtual memory exceeds pageable *physical memory*.

- In the past, Linux has suggested setting swap space to *double* the amount of physical memory.

- Today, that limitation is gone, and most Linux systems use considerably *less* swap space.

- Some operating systems—including Linux—allow the use of *multiple* swap spaces, including both files and dedicated swap partitions.

Swap-Space Management 3/3

- **Swap-Space Location:** A swap space can reside in one of two places:
  - it can be carved out of the normal file system, or
  - it can be in a separate disk partition.

- **Homework**: Swap-Space Management: An Example

DISK RELIABILITY

Disk Reliability 1/2

- Having a large number of disks in a system offers the potential for improving the reliability of data storage, because *redundant information can be stored on multiple disks*.

- Thus, failure of one disk does not lead to loss of data.

- A variety of disk-organization techniques, collectively called ***redundant arrays of independent disks (RAID),*** are commonly used to address the performance and reliability issues.

Disk Reliability 2/2

- Improvement of Reliability via Redundancy:
  - The simplest (but most expensive) approach to introducing redundancy is to duplicate every disk.
  - This technique is called *mirroring*.
  - With mirroring, a logical disk consists of two physical disks, and every write is carried out on both disks. The result is called a mirrored volume.
  - If one of the disks in the volume fails, the data can be read from the other.
  - Data will be lost only if the second disk fails before the first failed disk is *replaced*.

Homework

- RAID levels (0 to 6).

- I/O Management
  - I/O devices
  - I/O subsystems
  - I/O buffering.

References

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley.

2. William Stallings, “Operating Systems: Internals and Design Principles”, 6th Edition, Pearson Education.

3. D M Dhamdhere, “Operating Systems: A Concept based Approach”, 2nd Edition, TMH.

Thank You.