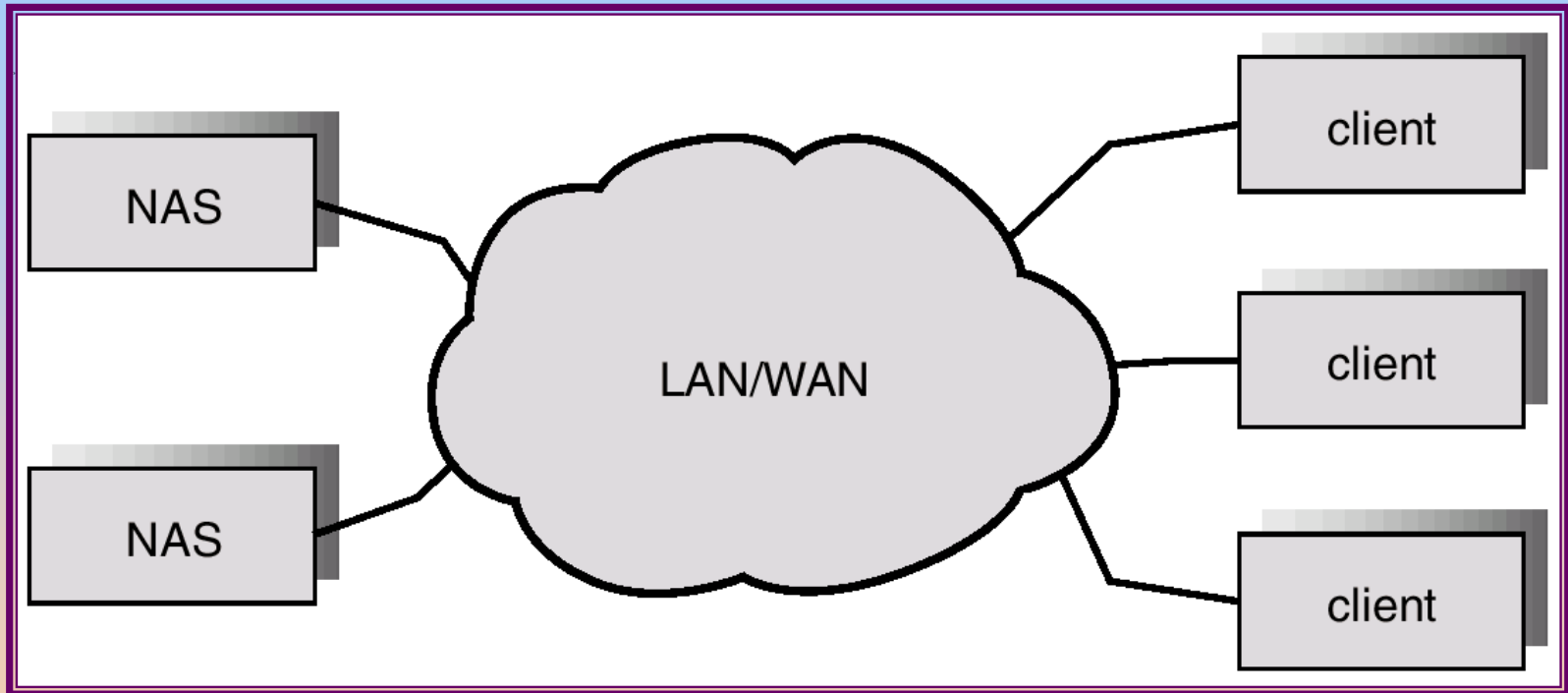# Disk Attachment

☐ Disks may be attached one of two ways:
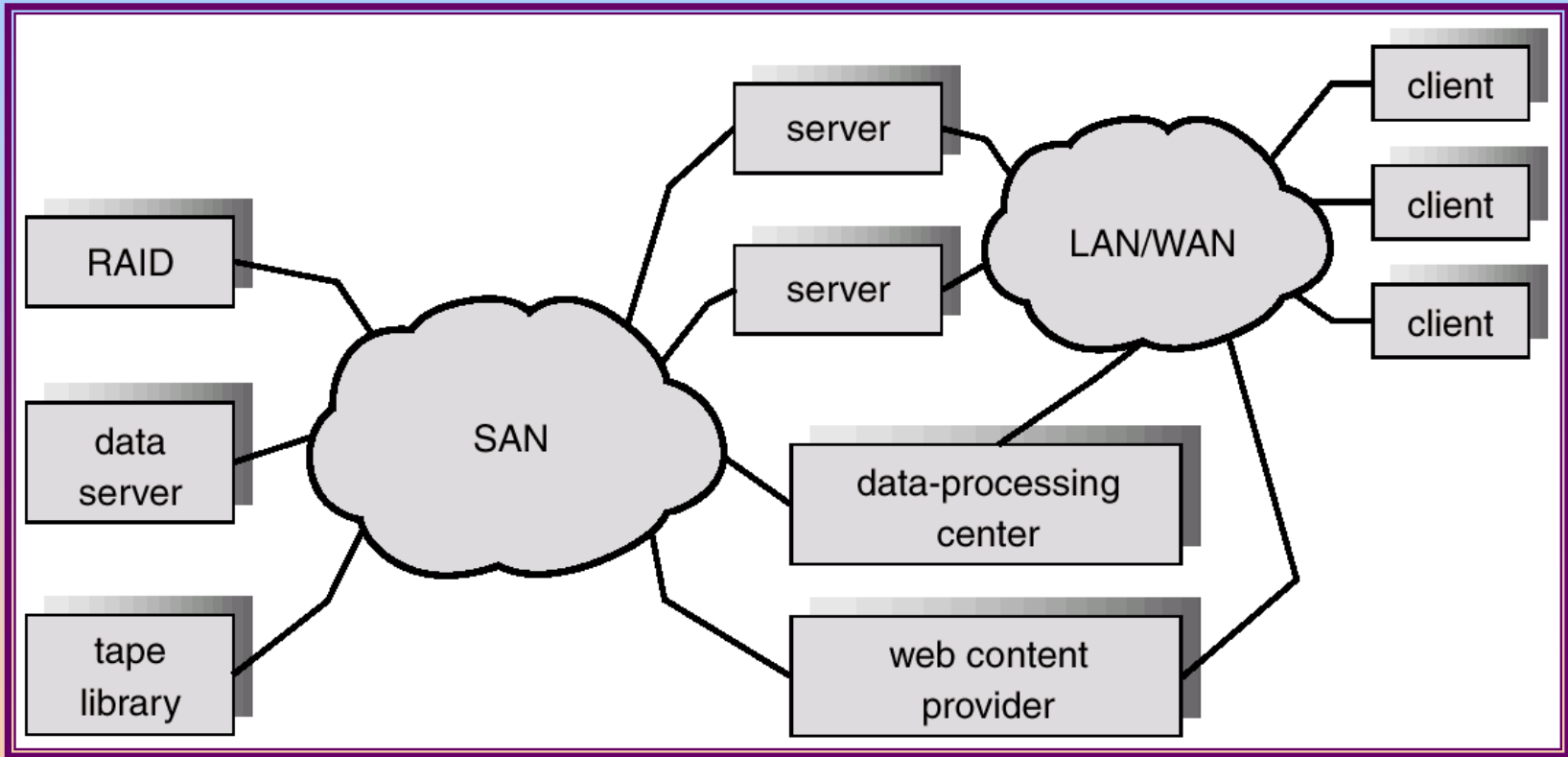
1. **Host attached** via an I/O port

2. **Network attached** via a network connection

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Network-Attached Storage

Storage-Area Network

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Stable-Storage Implementation

☐ Write-ahead log scheme requires stable storage.

☐ To implement stable storage:

  ☐ Replicate information on more than one nonvolatile storage media with independent failure modes.

  ☐ Update information in a controlled manner to ensure that we can recover the stable data after any failure during data transfer or recovery.

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Tertiary Storage Devices

- Low cost is the defining characteristic of tertiary storage.

- Generally, tertiary storage is built using *removable media*

- Common examples of removable media are floppy disks and CD-ROMs; other types are available.

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Removable Disks

- Floppy disk — thin flexible disk coated with magnetic material, enclosed in a protective plastic case.

  - Most floppies hold about 1 MB; similar technology is used for removable disks that hold more than 1 GB.
  - Removable magnetic disks can be nearly as fast as hard disks, but they are at a greater risk of damage from exposure.

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Removable Disks (Cont.)

- A magneto-optic disk records data on a rigid platter coated with magnetic material.
    - Laser heat is used to amplify a large, weak magnetic field to record a bit.
    - Laser light is also used to read data (Kerr effect).
    - The magneto-optic head flies much farther from the disk surface than a magnetic disk head, and the magnetic material is covered with a protective layer of plastic or glass; resistant to head crashes.

- Optical disks do not use magnetism; they employ special materials that are altered by laser light.

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WORM Disks

- The data on read-write disks can be modified over and over.
- WORM ("Write Once, Read Many Times") disks can be written only once.
- Thin aluminum film sandwiched between two glass or plastic platters.
- To write a bit, the drive uses a laser light to burn a small hole through the aluminum; information can be destroyed by not altered.
- Very durable and reliable.
- *Read Only* disks, such ad CD-ROM and DVD, com from the factory with the data pre-recorded.

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