Storage Notes

- **Storage topology:**

- It's the arrangement or the configuration of storage devices within a network.
- Common topologies to store the data:
    1. DAS (Direct-Attached storage)
    2. NAS (Network-Attached Storage)
    3. SAN (Storage Area Network)

1. Direct-Attached storage (DAS)

- Its connected directly to the computer or server.
- It uses USB, SATA, SCSI
- Located near to the computer or server.
- It is dedicated to one server/computer.
- Limited scalability
- Used for high-performance application, data retrieval.
- Low-cost solution for small-scale organizations.
- Example:
    1. Internal HDD.
    2. External HDD.

2. Network-Attached Storage (NAS)

- Here, storage device is connected to multiple devices within the network.
- It is not directly connected to any server, but accessible on multiple devices.
- Better scalability (than DAS)
- Performance is based on hardware & band-width.
- For medium-level organizations
- Used for file sharing, backup, centralized storage, etc...

3. Storage Area Network (SAN)

- Multiple devices are connected together to share the storage devices
- It uses Fibre channel or iSCSI.
- It is connected with array of disks.
- Offers high-performance
- Manages the workload easily.
- Use for critical applications, reliability, scalability.
- For enterprise-level organizations.
- It contains 2 components:
    1. Server
    2. Network Infrastructure
    3. Storage
- SAN components
    - SAN Switches
    - SAN fabric
    - Physical disks
    - RAID group
    - Connection:
        - HBA (Host Bus Adapter)
        - Controller.

- **RAID:**

- Redundant Array of Independent disks.

or

[[- Redundant Array of Inexpensive disks.]]

- It's a low-cost solution for storing the data.

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- RAID types:
    - RAID 0 (Stripping)
        - It stripes the data into multiple disks
        - Faster write, slower read access.
        - If one drive/disk crashes, entire data is gone.
    - RAID 1 (Mirroring)
        - When data is stored in 1 disk, data is replicated immediately to another disk.
        - Fault tolerance.
    - RAID 2
    - RAID 3
    - RAID 4
    - RAID 5 (striping with parity)
    - RAID 6 (Double parity)
    - RAID 10 (Mirroring + Stripping)

❖ **Storage Spaces:**

- In Linux, we have LVM but in windows, we have storage spaces.

❖ Disk managements:
- run -> diskmgmt.msc
- win + x

- **Types:**
    1. Basic disk
        - These are static disks
        - These disks can't be expanded.
    2. Dynamic disks
        - These disks can be expanded.
            - Stripping
            - Mirroring
            - Storage spaces

❖ **Backups:**
- It is the process of creating a copy of data for availability & easy to recover.
- It is useful in case of:
    - Data loss
    - Corruption
    - Accidental deletion
    - Data protection
    - Disaster recovery
    - Business continuity
- Methods:
    1. Manual backups
    2. Automated backups

- **Enterprise-level backups**

    ex:
    - Commvault
    - Vertias Backup
    - Veeam backup

- **Small-Mid level**
    - Acronis backup
    - carbonite

- **Cloud backup**
    - AWS S3

- Azure backup
- Google Cloud Backup

- **Open source:**
  - Bacula
  - Amanda
  - Duplicati

❖ **Backup architecture components:**
  - Source system
  - Backup client
  - Backup server
  - Storage devices
  - Backup media
  - Backup policies
  - Backup methods
    - Full backup
    - Incremental backup
    - Differential backup
  - Monitoring tools
  - Disaster recovery plan