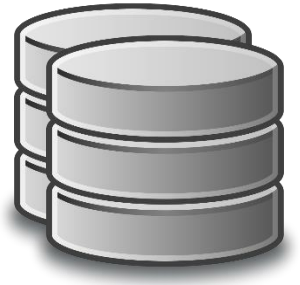
Welcome to Section 8

Storage

By: Imran Afzal
www.utclisolutions.com

What is Computer Storage?



- Computer storage is a technology consisting of computer components and recording media that are used to retain digital data. It is a core function and fundamental component of computers

- Operating system of any computer is installed on a storage

- Storage is needed to store short term and long-term data

We will learn…

- How to identify our computer storage (HDD and RAM) in Windows and Linux
- Storage mapping and partitioning.

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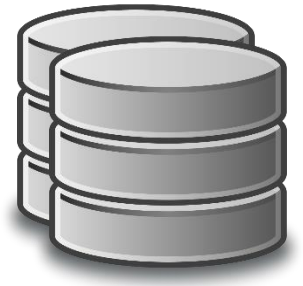
How Computer Storage is Calculated

- 0 and 1 = bits
- 8 bits = 1 Byte
- 1024 Byte = 1 KB
- 1024 KB = 1 MB
- 1024 MB = 1 GB
- 1024 GB = 1 TB
- 1024 TB = 1 PB
- Then Exabyte, Zettabyte and Yottabyte



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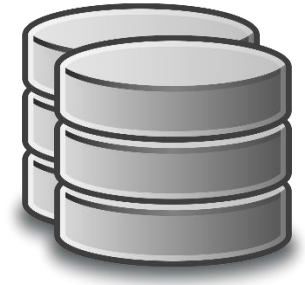
Types of Computer Storage

- There are **4 different type** of computer storage:

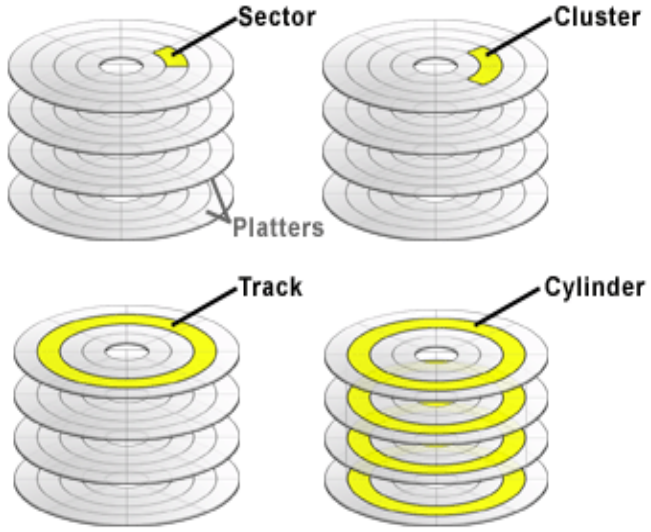


- Local Storage
- Direct Attach Storage (DAS)
- Storage Area Network (SAN)
- Network Attached Storage (NAS)

1. Local storage

- Floppy disk 
- CD/DVD disk 
- RAM 
- Hard disk 

Disk is also referred to as a diskette, is a hard round, flat, and magnetic platter capable of having information read from and written to it



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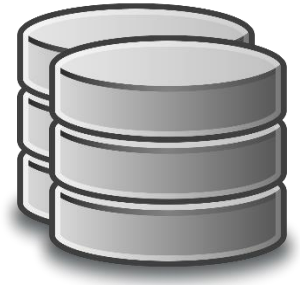
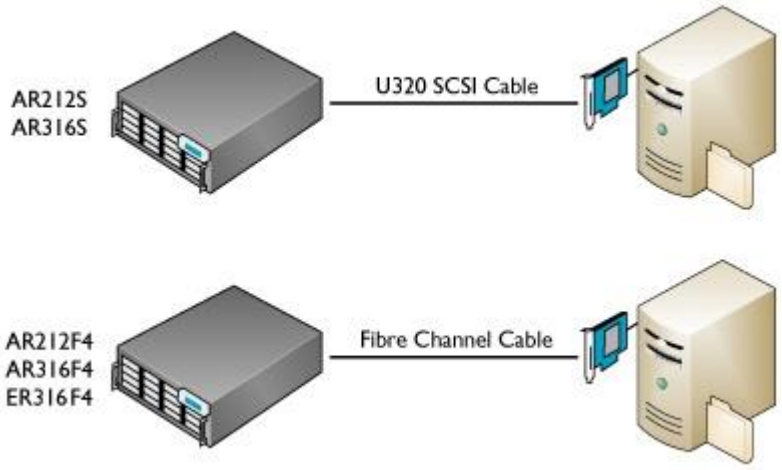
Types of Computer Storage - 2



- 2nd Type of Storage

2. Direct Attached Storage

- Tape drive 
- External disk 
- USB flash drive 
- Storage Array 



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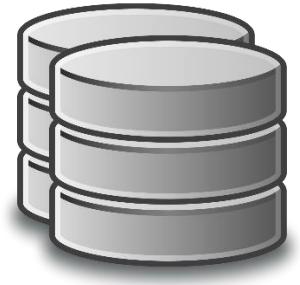
Types of Computer Storage - 3



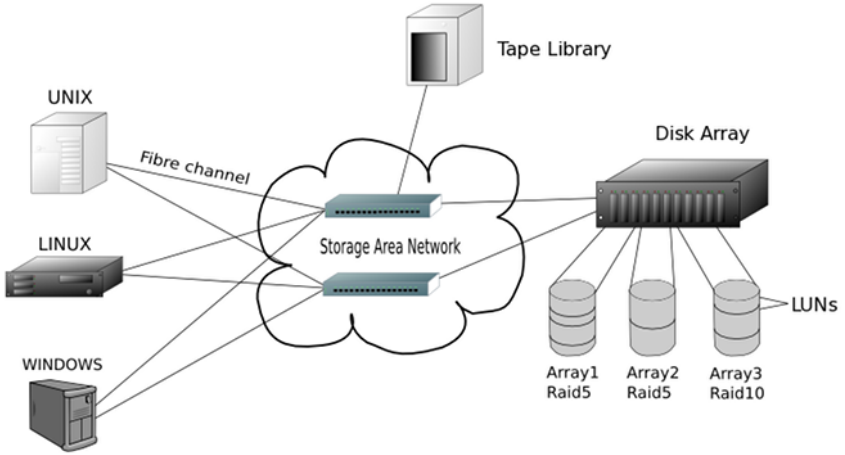
- Third Type of Storage

3. SAN (Storage Area Network)

- SANs are primarily used to enhance storage devices, such as disk arrays and tape libraries, accessible to servers so that the devices appear to the operating system as locally attached devices
- Mostly the SAN storage is attached over:
  - iSCSI
  - Fiber Channel

iSCSI

Fiber



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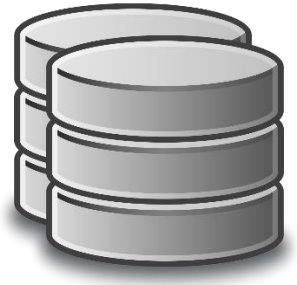
Types of Computer Storage - 4



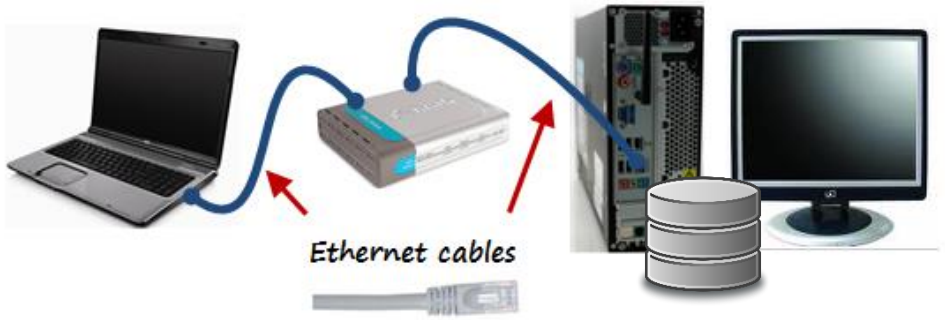
- Forth Type of Storage

4. NAS (Network Attached Storage)

- Network-attached storage is a file-level computer data storage server connected to a computer network providing data access to a heterogeneous group of clients. NAS is specialized for serving files either by its hardware, software, or configuration

- In simple words: NAS allows computer to attach external storage over network (TCP/IP)

- Example of NAS storage:
  - Samba
  - NFS



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Difference Between RAM, SWAP, Virtual Memory and Cache

- RAM = Random access memory
  - It is a computer's short-term memory

- SWAP
  - The term swap came from English language as "an act of exchanging one thing for another" and in computer world it is swapping of one memory to another
  - Swap space is storage space that is used as temporary memory capacity, when physical memory space is already exhausted
  - SWAP is sliced out of hard disk drive and not as fast as RAM.

- Virtual Memory
  - Virtual memory is essentially another name of SWAP. The term "Virtual memory" is mostly used in Microsoft Windows whereas "SWAP" is used in Unix world.

- Cache
  - Cache memory is a chip-based computer component that makes retrieving data from the computer's memory more efficient
  - It acts as a temporary storage area that the computer's processor can retrieve data from easily.

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Hard Disk and Solid-State Drives

Hard Disk Drive

- HDD is a data storage device that stores and retrieves digital data using magnetic storage on one or more rotating platters coated with magnetic material

Solid State Drive

- SSD is a newer, faster type of data storage device that stores and retrieves digital data on instantly-accessible flash memory chips

HDD

SSD

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Hard Disk and Solid-State Drives

Which one to choose?

SSD

- ✓ Faster
- ✓ Reliable
- ✓ Better multi-tasking
- ✓ Require less cooling
- ✓ Lessor moving parts
- ✓ Lighter
- ✓ Compact
- ✓ Does not make any spinning noise.

HDD

- ✓ If you need more storage without spending a lot of $$$.

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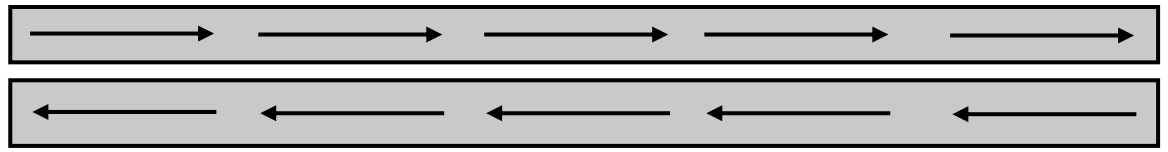
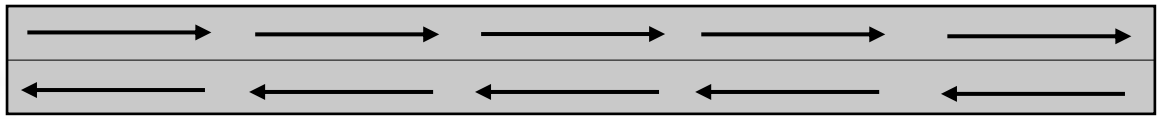
SATA and SAS

- **SATA** Stands for Serial Advanced Technology Attachment and **SAS** stands for Serial Attached SCSI (SCSI Stands for Small Computer System Interface, typically pronounced as “scuzzy”)
- Both SAS and SATA utilize serial communication. Serial communication means that the highway has both lanes

Parallel communication



Serial communication



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SATA and SAS

- The main difference between them is that SAS drives are faster and more reliable than SATA drives

- SAS is generally more expensive, and it's better suited for use in servers or in processing-heavy computer workstations. SATA is less expensive, and it's better suited for desktop file storage

- In a SATA cable, all 4 wires are placed within the same cable. In a SAS cable, the 4 wires are separated into 2 different cables

Why divide the wires between 2 cables???

- So you can connect more devices to one another. With a SATA cable, you can only link the motherboard and the storage drive. You could hook up an expansion device, but that takes up valuable room inside your computer.
- With a SAS cable, you can hook up the motherboard to both a storage drive and another piece of hardware that has SAS connectors.

Here's what the highways look like, metaphorically:

- **SATA cable:** Los Angeles to San Francisco
- **SAS cable:** Los Angeles to San Francisco or Los Angeles to Las Vegas

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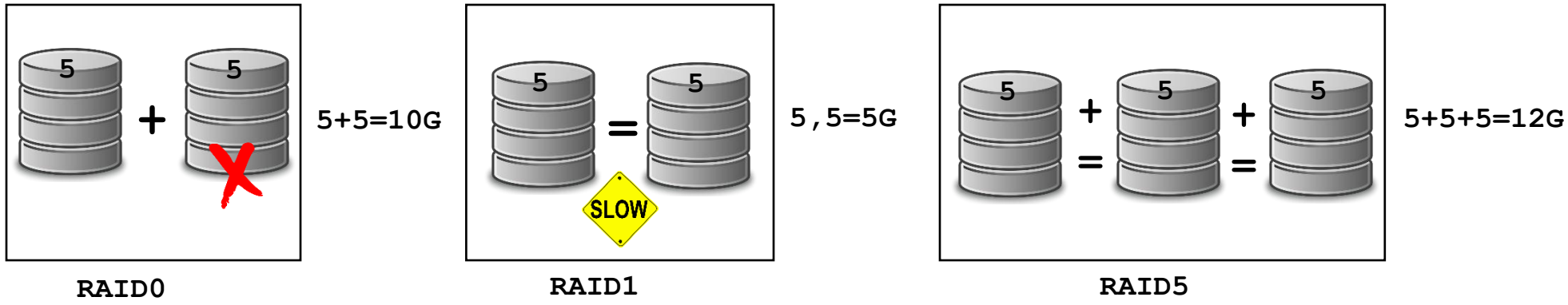
RAID

- RAID (Redundant Array of Independent Disks)

- Type of RAID
  - **RAID0**
  - **RAID1**
  - **RAID5**



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Hardware vs. Software RAID

- Hardware RAID
  - Vendor controls the hardware RAID through their own firmware and their controller
  - You will need 2+ disks
  - More reliable and protects against hardware failures
  - More expense.

- Software RAID
  - Controlled by operating system
  - Inexpensive
  - Software RAID takes up a portion of the host processor
  - Easier to install.

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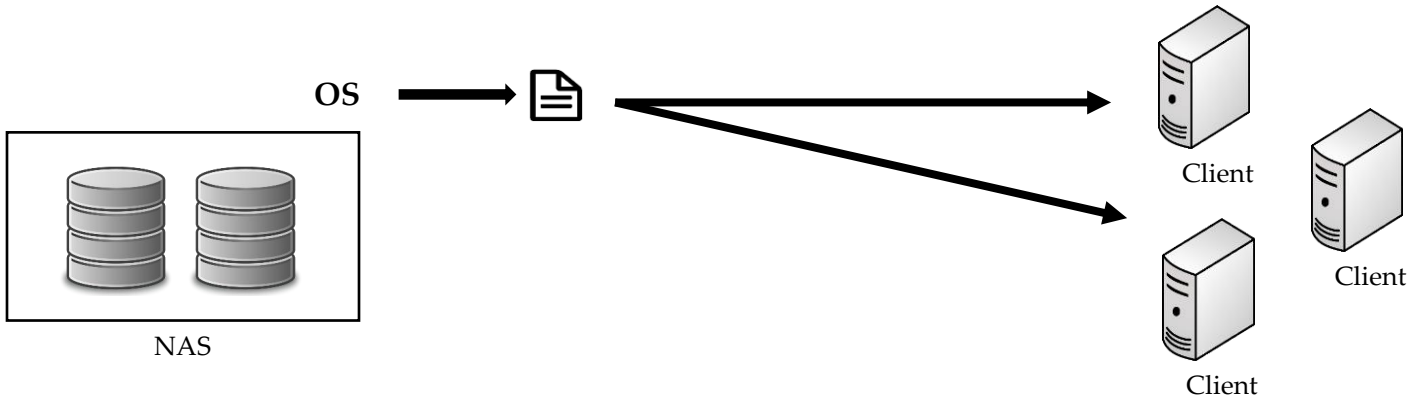
NAS Device for Filesystem Sharing

- NFS/Samba or any NAS service can be setup through a dedicated NAS device



NAS Device for Filesystem Sharing

- In this video we will learn…
  - Physical layout of a NAS device
  - Setup, configure and manage NAS device
  - Create shared filesystem (NFS and Samba)
  - Mount shared folder from the NAS device to Linux and Windows

Top Data Storage Vendors

- Dell EMC is an American multinational corporation headquartered in Hopkinton, Massachusetts and Round Rock, Texas, United States

- EMC had been the world data storage market-share leader for 12 straight years until Dell acquired it in October 2015 for $67 billion

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- HPE is an American multinational enterprise information technology company based in Houston, Texas, United States

- HPE Storage is now partnering with Chinese networker H3C, which is the exclusive provider of HPE servers, storage and associated technical services in China

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Top Data Storage Vendors

- NetApp, Inc. is an American hybrid cloud data services and data management company headquartered in Sunnyvale, California

- NetApp, long ago considered simply a "good little file-server company," is now a full-service data management platform for cloud and on-premises systems

- It is the largest pure-play independent storage company on the planet.

- Hitachi, Ltd. is a Japanese multinational company headquartered in Chiyoda, Tokyo, Japan

- Hitachi Data Systems (HDS) was a provider of modular mid-range and high-end computer data storage systems, software and services. Its operations are now a part of Hitachi Vantara located in Santa Clara, California, U.S

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Top Data Storage Vendors

- International Business Machines Corporation is an American multinational technology company headquartered in Armonk, New York, with operations in over 170 countries. (*Wikipedia)*

- A few years ago, IBM announced a major initiative into NVMe-based (non-volatile memory-based) storage in a bid to keep moving the enterprise storage performance forward

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Other Storage Vendors

- Oracle
- Huawei
- IBM
- Pure Storage
- Veritas
- Infinidat
- Kaminario
- Nutanix.

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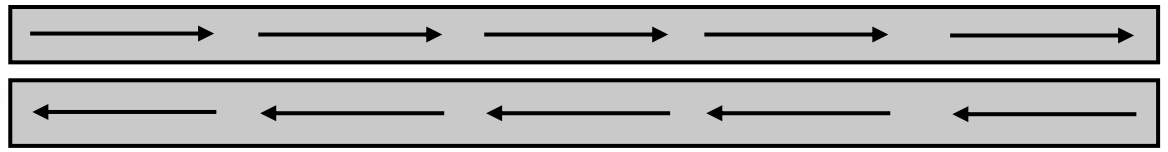

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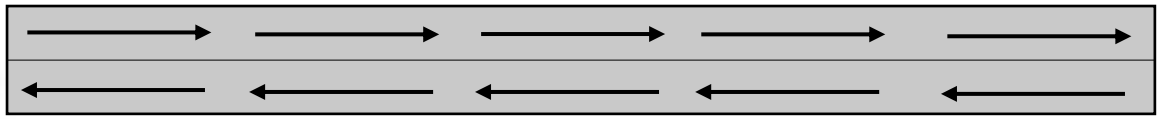

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