

Chapter Six

Storage

**Discovering Computers
Fundamentals,
2010 Edition**

Living in a Digital World



Objectives Overview

Describe the characteristics of an internal hard disk including capacity, platters, read/write heads, cylinders, sectors and tracks, and revolutions per minute

Discuss the purpose of network attached storage devices, external and removable hard disks, and hard disk controllers

Describe the various types of flash memory storage

Describe cloud storage and explain its advantages

Objectives Overview

Describe the characteristics of optical discs

Differentiate among various types of optical discs

Identify the uses of tape, magnetic stripe cards, smart cards, microfilm and microfiche, and enterprise storage

Storage

Storage holds data, instructions, and information for future use

A **storage medium** is the physical material on which a computer keeps data, instructions, and information

Storage



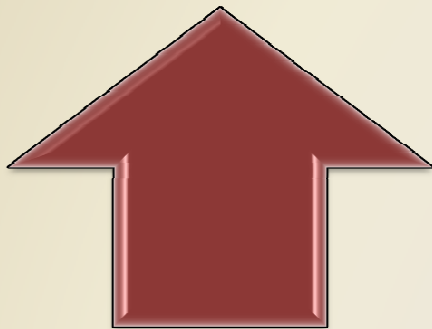
Storage

- **Capacity** is the number of bytes a storage medium can hold

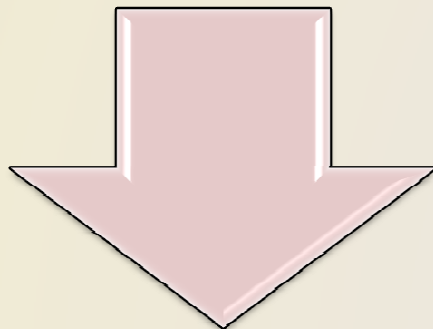
Storage Terms		
Storage Term	Approximate Number of Bytes	Exact Number of Bytes
Kilobyte (KB)	1 thousand	2^{10} or 1,024
Megabyte (MB)	1 million	2^{20} or 1,048,576
Gigabyte (GB)	1 billion	2^{30} or 1,073,741,824
Terabyte (TB)	1 trillion	2^{40} or 1,099,511,627,776
Petabyte (PB)	1 quadrillion	2^{50} or 1,125,899,906,842,624
Exabyte (EB)	1 quintillion	2^{60} or 1,152,921,504,606,846,976
Zettabyte (ZB)	1 sextillion	2^{70} or 1,180,591,620,717,411,303,424
Yottabyte (YB)	1 septillion	2^{80} or 1,208,925,819,614,629,174,706,176

Storage

- A **storage device** is the computer hardware that records and/or retrieves items to and from storage media



Reading is the process of transferring items from a storage medium into memory



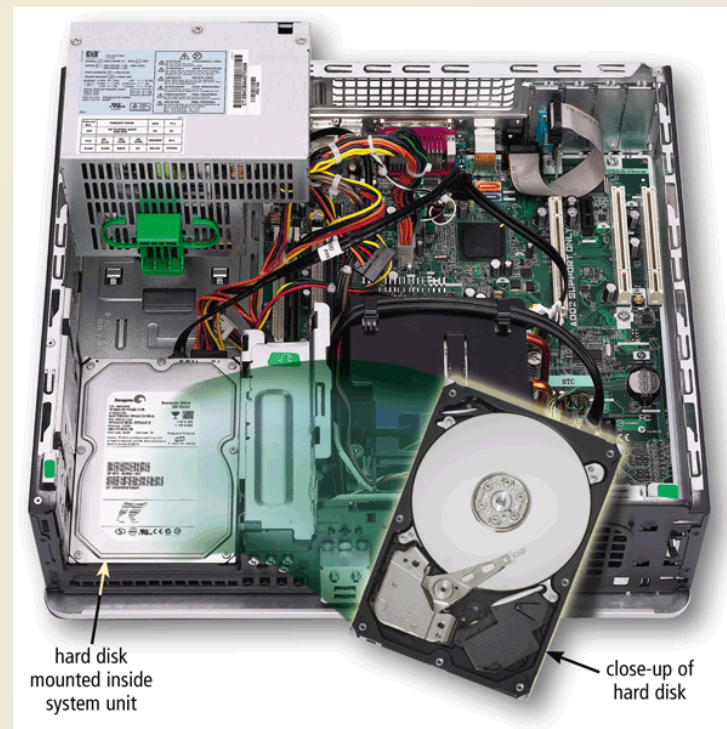
Writing is the process of transferring items from memory to a storage medium

Storage

- **Access time** measures:
 - The amount of time it takes a storage device to locate an item on a storage medium
 - The time required to deliver an item from memory to the processor

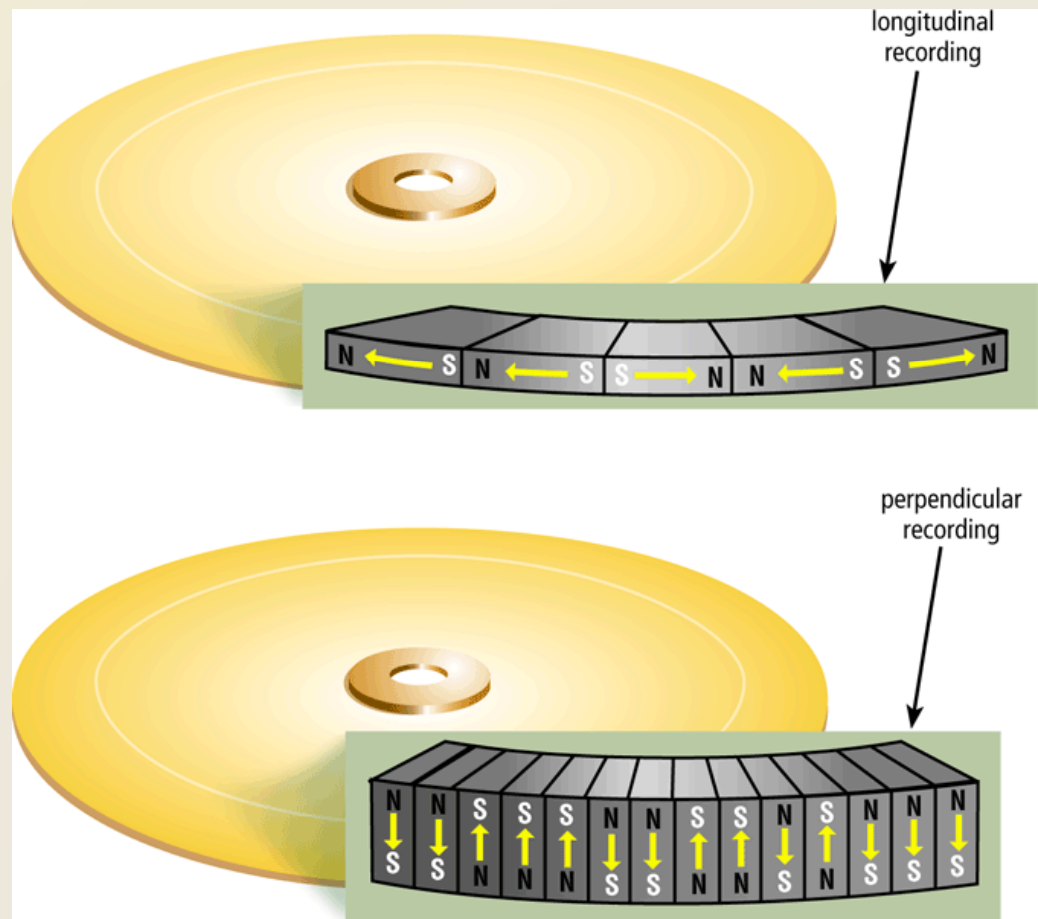
Hard Disks

- A **hard disk** contains one or more inflexible, circular platters that use magnetic particles to store data, instructions, and information



Hard Disks

- Hard disks can store data using longitudinal recording or perpendicular recording



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Hard Disks

- Characteristics of a hard disk include:

Capacity

Platters

Read/Write
Heads

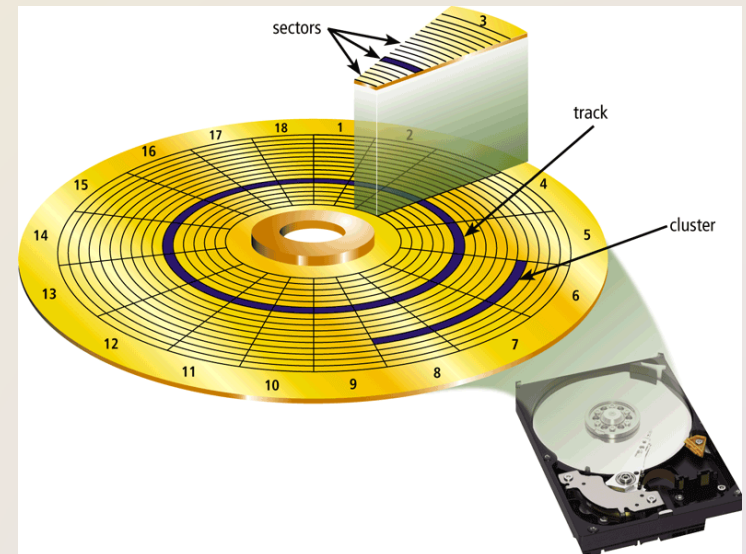
Cylinders

Sectors and
Tracks

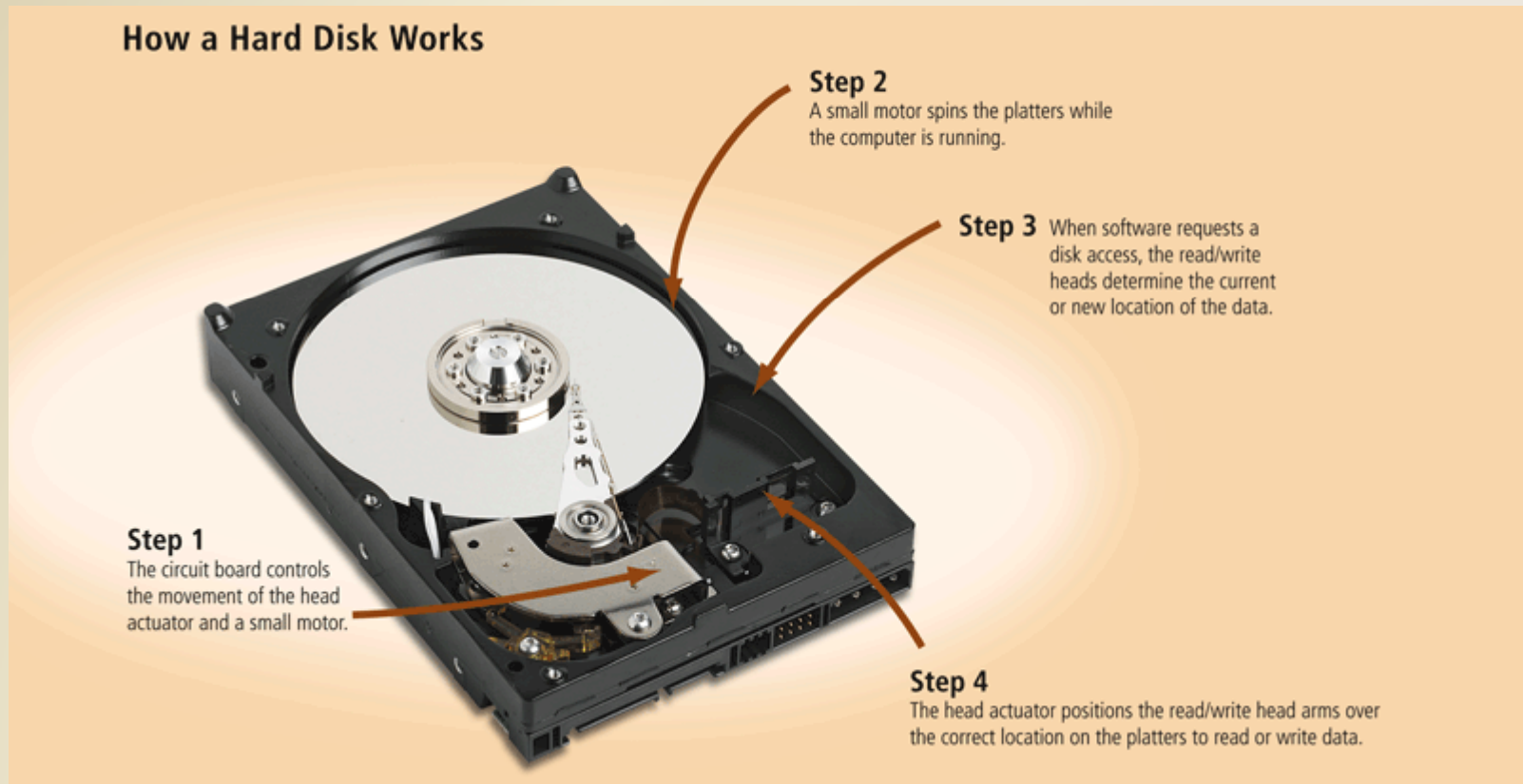
Revolutions
per Minute

Transfer
Rate

Access Time

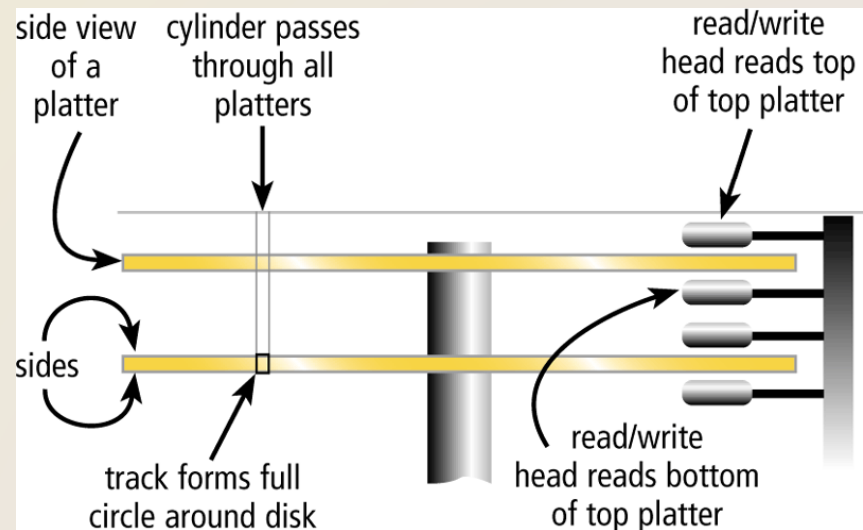


Hard Disks



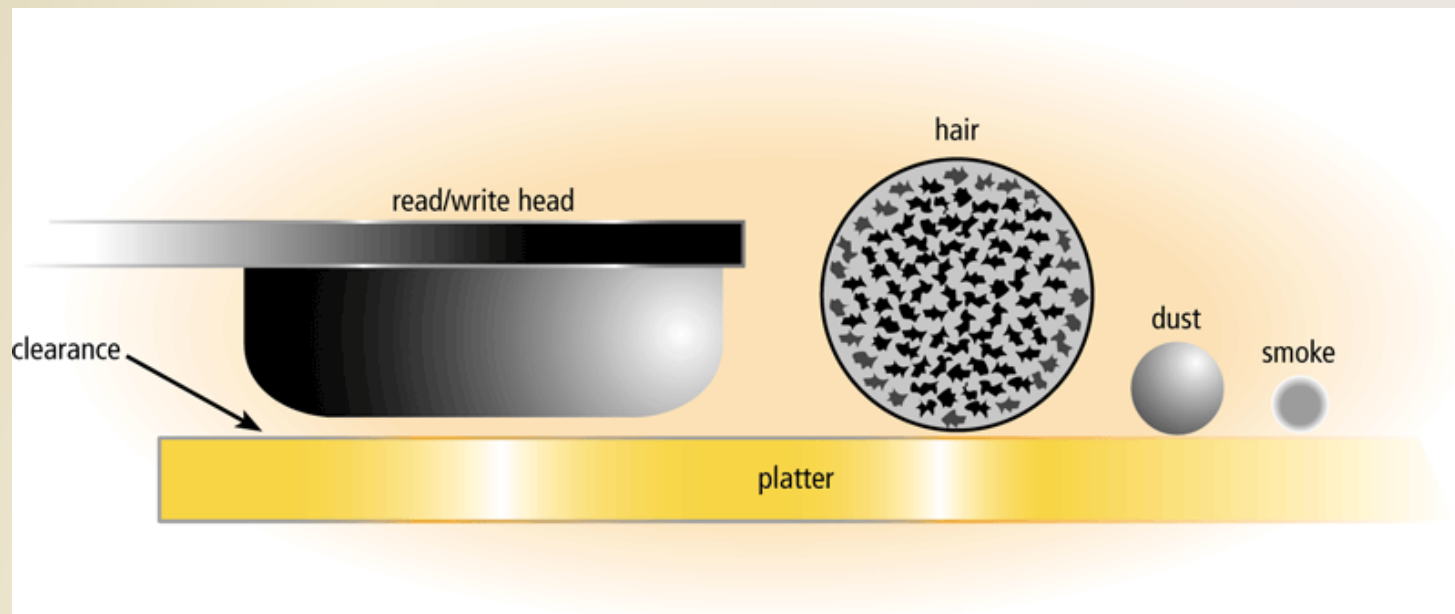
Hard Disks

- The hard disk arms move the read/write head, which reads items and writes items in the drive
 - Location often is referred to by its cylinder



Hard Disks

- A head crash occurs when a read/write head touches the surface of a platter
- Always keep a **backup** of your hard disk



Hard Disks

- **RAID** (redundant array of independent disks) is a group of two or more integrated hard disks
- A **network attached storage** (NAS) device is a server connected to a network with the sole purpose of providing storage



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Storage below Chapter 6

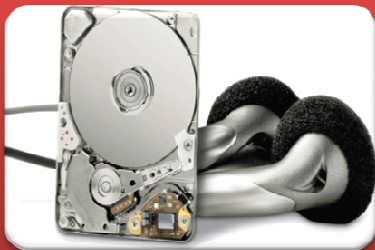
Hard Disks



An **external hard disk** is a separate free-standing hard disk that connects to your computer with a cable or wirelessly



A **removable hard disk** is a hard disk that you insert and remove from a drive



Internal and external hard disks are available in miniature sizes (**pocket hard drive**)

Hard Disks

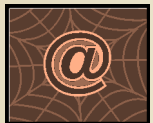
- A **disk controller** consists of a special-purpose chip and electronic circuits that control the transfer of data, instructions, and information from a disk to and from the system bus and other components of the computer

SATA

EIDE

SCSI

SAS



Click to view Web Link,
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Chapter 6

Flash Memory Storage

- Flash memory chips are a type of solid state media and contain no moving parts
- **Solid state drives (SSDs)** have several advantages over magnetic hard disks:

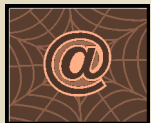
Faster access time

Faster transfer rates

Generate less heat and
consume less power

Last longer

Flash Memory Storage



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then click Solid State Drives
below Chapter 6

Flash Memory Storage

- A **memory card** is a removable flash memory device that you insert and remove from a slot in a computer, mobile device, or card reader/writer

**CompactFlash
(CF)**

**Secure Digital
(SD)**

**Secure Digital
High Capacity
(SDHC)**

microSD

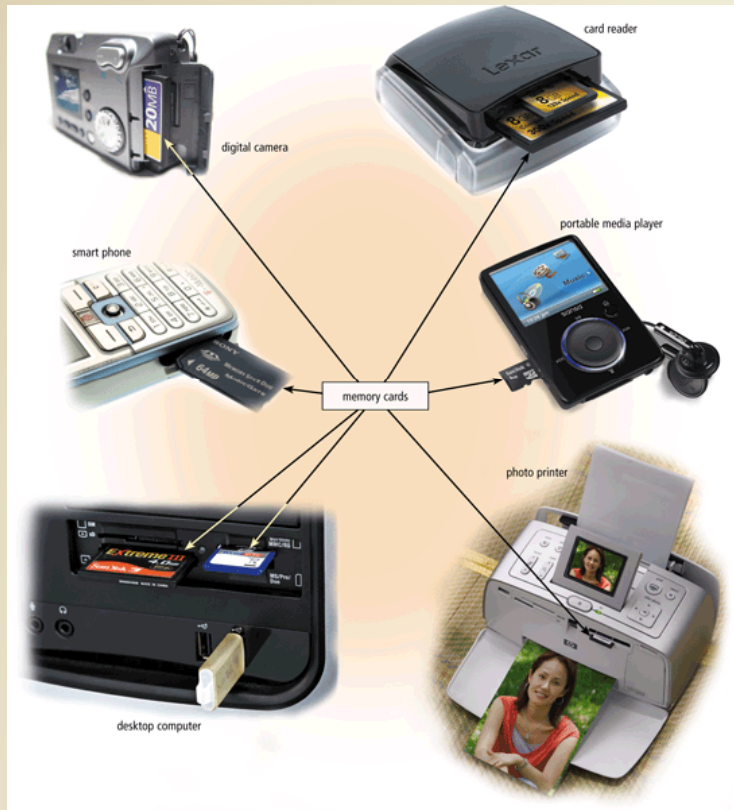
microSDHC

**xD Picture
Card**

Memory Stick

**Memory Stick
Micro (M2)**

Flash Memory Storage



Various Memory Cards			
Media Type		Storage Capacity	Use
CompactFlash (CF)		512 MB to 100 GB	Digital cameras, smart phones, PDAs, photo printers, portable media players, notebook computers, desktop computers
Secure Digital (SD)		512 MB to 8 GB	Digital cameras, digital video cameras, smart phones, PDAs, photo printers, portable media players
SDHC		4 to 32 GB	Digital cameras
microSD		1 to 2 GB	Smart phones, portable media players, handheld game consoles, handheld navigation devices
microSDHC		4 to 16 GB	Smart phones, portable media players, handheld game consoles, handheld navigation devices
xD Picture Card		256 MB to 2 GB	Digital cameras, photo printers
Memory Stick PRO Duo		1 to 16 GB	Digital cameras, smart phones, handheld game consoles
Memory Stick Micro (M2)		1 to 16 GB	Smart phones



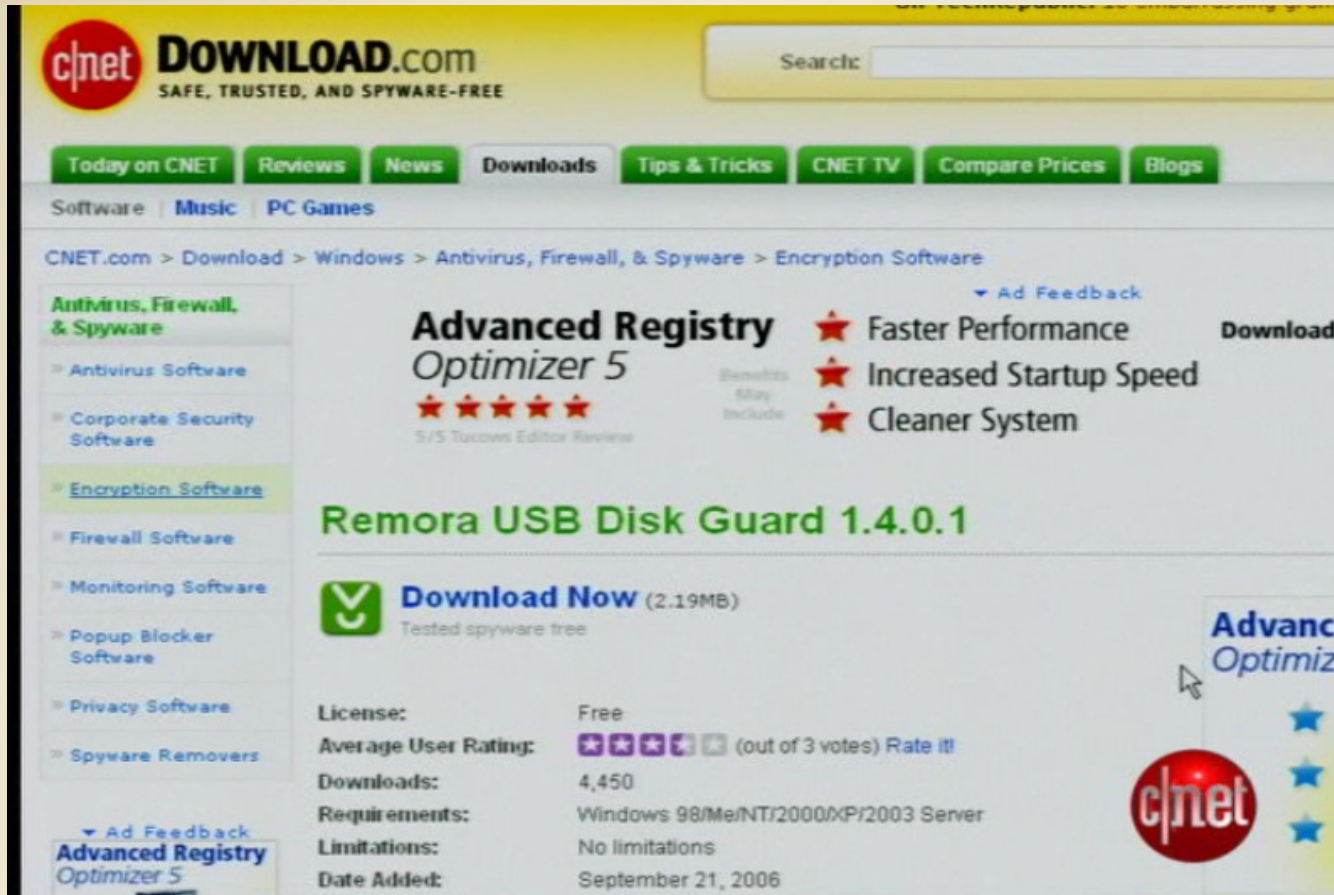
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Flash Memory Storage

- **USB flash drives** plug into a USB port on a computer or mobile device



Video: Thumb Drive (USB Flash Drive) Encryption



The screenshot shows the CNET Download.com website. The header includes the CNET logo, the text "DOWNLOAD.com SAFE, TRUSTED, AND SPYWARE-FREE", and a search bar. Below the header are navigation tabs: "Today on CNET", "Reviews", "News", "Downloads", "Tips & Tricks", "CNET TV", "Compare Prices", and "Blogs". The main content area is titled "Encryption Software" and features two software listings. The first listing is for "Advanced Registry Optimizer 5", which has a 5-star rating and lists benefits: "Faster Performance", "Increased Startup Speed", and "Cleaner System". The second listing is for "Remora USB Disk Guard 1.4.0.1", which is marked as "Download Now (2.19MB)" and "Tested spyware free". A sidebar on the left lists various software categories under "Antivirus, Firewall, & Spyware".

Advanced Registry Optimizer 5
5/5 Tucows Editor Review
★ Faster Performance
★ Increased Startup Speed
★ Cleaner System

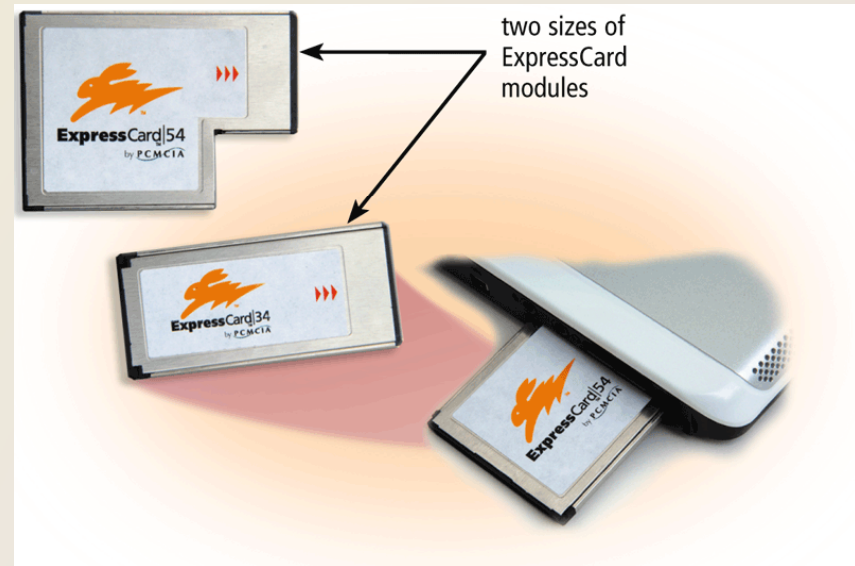
Remora USB Disk Guard 1.4.0.1
Download Now (2.19MB)
Tested spyware free

License: Free
Average User Rating: ★★★★★ (out of 3 votes) Rate it!
Downloads: 4,450
Requirements: Windows 98/Me/NT/2000/XP/2003 Server
Limitations: No limitations
Date Added: September 21, 2006

[CLICK TO START](#)

Flash Memory Storage

- An **ExpressCard module** is a removable device that fits in an ExpressCard slot
- Commonly used in notebook computers



Cloud Storage

- **Cloud storage** is an Internet service that provides storage to computer users



Cloud Storage

Cloud Storage Providers		
Web Site Names	Type of Storage Provided	Other Services
iDrive, Windows Live SkyDrive, Xdrive	Backup or additional storage for any type of file	
Flickr, Picasa	Digital photos	Photo editing and photo management
YouTube	Digital videos	
Facebook, MySpace	Digital photos, digital videos, messages, and personal information	Social networking
Google Docs	Documents, spreadsheets, presentations	Productivity suite
Gmail, Windows Live Hotmail, Yahoo! Mail	E-mail messages	
Amazon EC2, Amazon S3, Nirvanix	Enterprise-level storage	Web services, data center services

Cloud Storage

- Users subscribe to cloud storage for a variety of reasons:

Access files from any computer

Store large files instantaneously

Allow others to access their files

View time-critical data and images immediately

Store offsite backups

Provide data center functions



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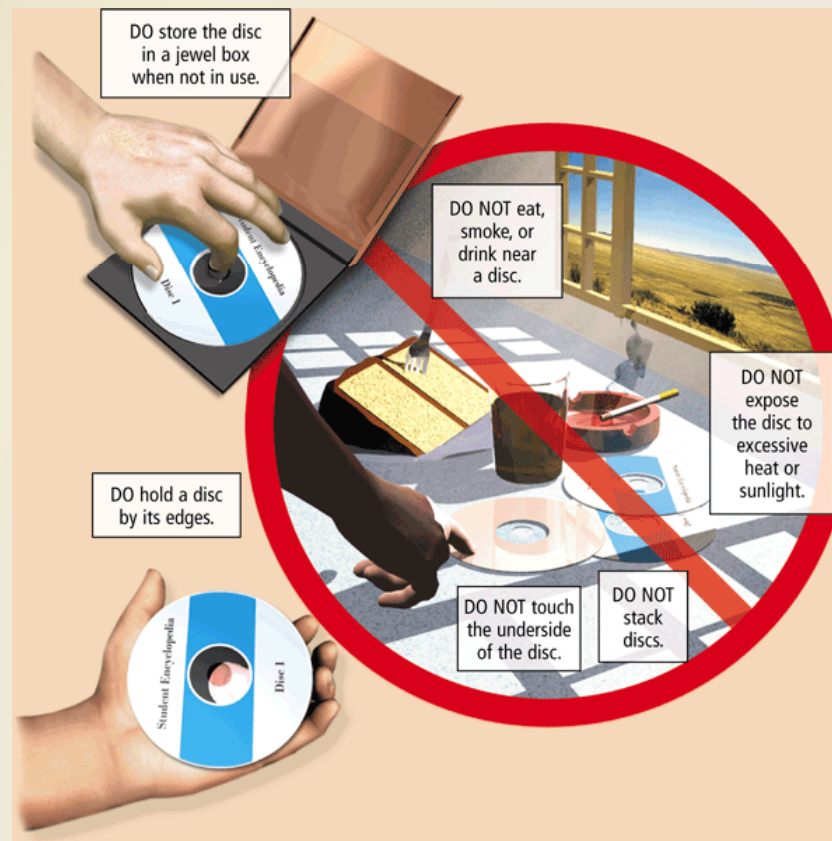
Optical Discs

- An **optical disc** consists of a flat, round, portable disc made of metal, plastic, and lacquer that is written and read by a laser
- Typically store software, data, digital photos, movies, and music
- Read only vs. rewritable

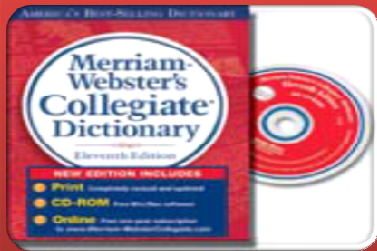


Optical Discs

- Care of optical discs



Optical Discs



A **CD-ROM** can be read from but not written to

- Read from a **CD-ROM drive** or CD-ROM player



A **CD-R** is a multisession optical disc on which users can write, but not erase



A **CD-RW** is an erasable multisession disc

- Must have a **CD-RW drive**

Optical Discs

Archive disc

- Stores photos from an online photo center
- Resolution usually is 7200 pixels per photo
- Cost is determined by the number of photos being stored

Picture CD

- Single-session CD-ROM that stores digital versions of film
- Typically uses a 1024 x 1536 resolution
- Many photo centers offer Picture CD services

Optical Discs

How an Archive Disc Works

Step 1

Upload your digital photos to a photo sharing community for others to view.



Step 2

Select the photos to be stored on the archive disc and then place your order.



Step 3

Pick up your archive disc at a designated store or receive it in the mail. At home, edit and/or print images from the archive disc on your ink-jet or photo printer, or view the images on a monitor or television screen. At a store, edit and/or print images from the archive disc at a kiosk.



Optical Discs



A **DVD-ROM** is a high-capacity optical disc on which users can read but not write or erase

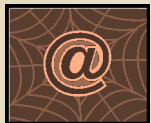
- Requires a **DVD-ROM** drive



A Blu-ray Disc-ROM (BD-ROM) has a storage capacity of 100 GB



DVD-RW, **DVD+RW**, and **DVD+RAM** are high-capacity rewritable DVD formats



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Other Types of Storage

Tape

**Magnetic stripe
cards and smart
cards**

**Microfilm and
microfiche**

Enterprise storage

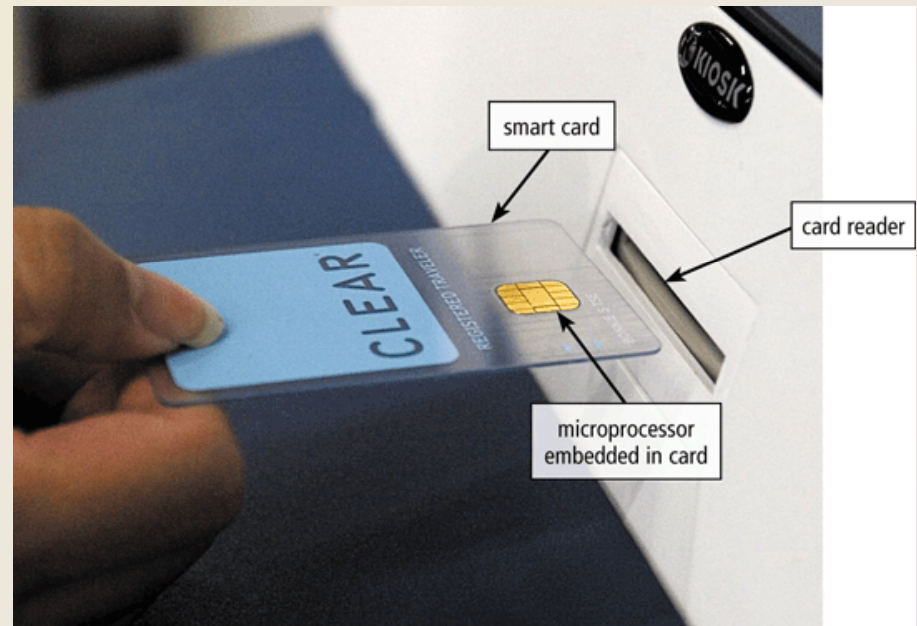
Other Types of Storage

- **Tape** is a magnetically coated ribbon of plastic capable of storing large amounts of data and information
- A **tape drive** reads and writes data and information on a tape



Other Types of Storage

- A **magnetic stripe card** contains a magnetic stripe that stores information
- A **smart card** stores data on a thin microprocessor embedded in the card



Other Types of Storage

- **Microfilm** and **microfiche** store microscopic images of documents on a roll or sheet film



Other Types of Storage

Media Life Expectancies* (when using high-quality media)

Media Type	Guaranteed Life Expectancy	Potential Life Expectancy
Magnetic disks	3 to 5 years	20 to 30 years
Optical discs	5 to 10 years	50 to 100 years
Solid state drives	50 years	140 years
Microfilm	100 years	500 years

*according to manufacturers of the media

Other Types of Storage

- Enterprise storage stores huge volumes of data and information for large businesses
 - Uses special hardware for heavy use, maximum availability, and maximum efficiency



Putting It All Together



Home user

- 320 GB hard disk
- Cloud storage
- Optical disc drive
- Card reader/writer
- USB flash drive



Small Office/Home Office user

- 1 TB hard disk
- Cloud storage
- Optical disc drive
- External hard disk for backup
- USB flash drive



Mobile

- 250 GB hard disk
- Cloud storage
- Optical disc drive
- Card reader/writer
- Portable hard disk for backup
- USB flash drive

Putting It All Together



Power User

- 2.5 TB hard disk
- Cloud storage
- Optical disc drive
- Portable hard disk for backup
- USB flash drive



Enterprise User (desktop computer)

- 1 TB hard disk
- Optical disc drive
- Smart card reader
- Tape drive
- USB flash drive



Enterprise User (server or mainframe)

- Network storage server
- 40 TB hard disk system
- Optical disc server
- Microfilm or microfiche

Summary

Various storage media and storage devices

Internal hard disks, external and removable hard disks, solid state drives, memory cards, USB flash drives, ExpressCard modules, cloud storage, CDs, DVDs, and Blue-ray Discs, tape, smart cards, and microfilm and microfiche

Chapter Six

Storage

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Chapter 6 Complete

