COMPUTER SYSTEMS

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Objectives

- 1. Identify the essential hardware components of a computer.
- 2. List key peripherals attached to most computers.
- 3. Describe the four basic operations of the central processing unit (CPU).
- 4. Explain how power is measured for computers.

Objectives

- 5. Describe common computer input, output, and storage devices.
- 6. List the names for six types of computers and describe how they are different.
- 7. Describe computer network hardware devices and their functions.

COMPUTER SYSTEMS

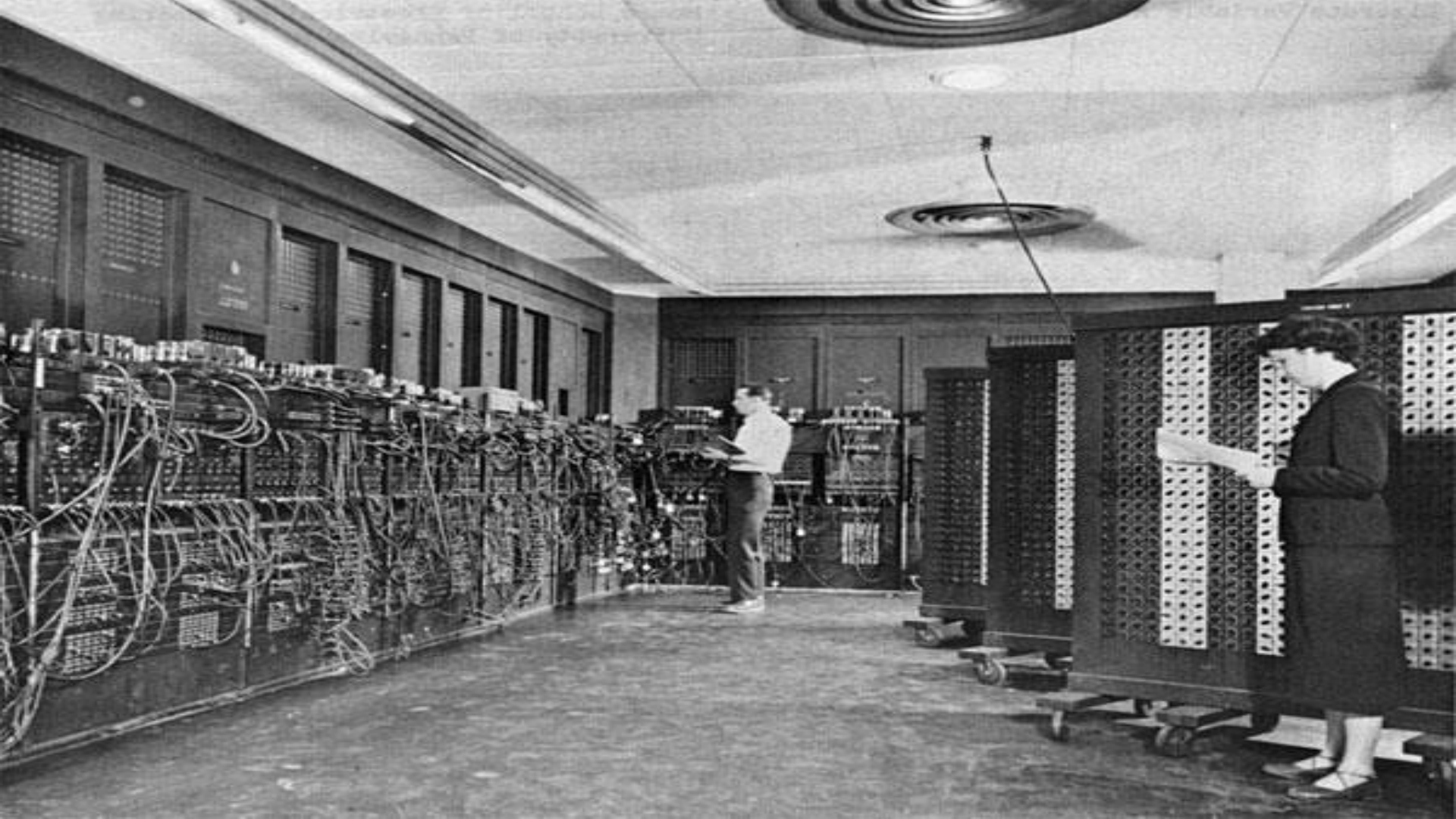
- Computer Hardware
- Software System
- Open Source and Free Software
- Data Assessment
- Personal, Professional and Educational Informatics

Computer Hardware

- A computer is a machine that uses electronic components and instructions to the components to perform:
  a. Calculations
  b. Repetitive and complex procedures
  c. Process text
  d. Manipulate data and signals

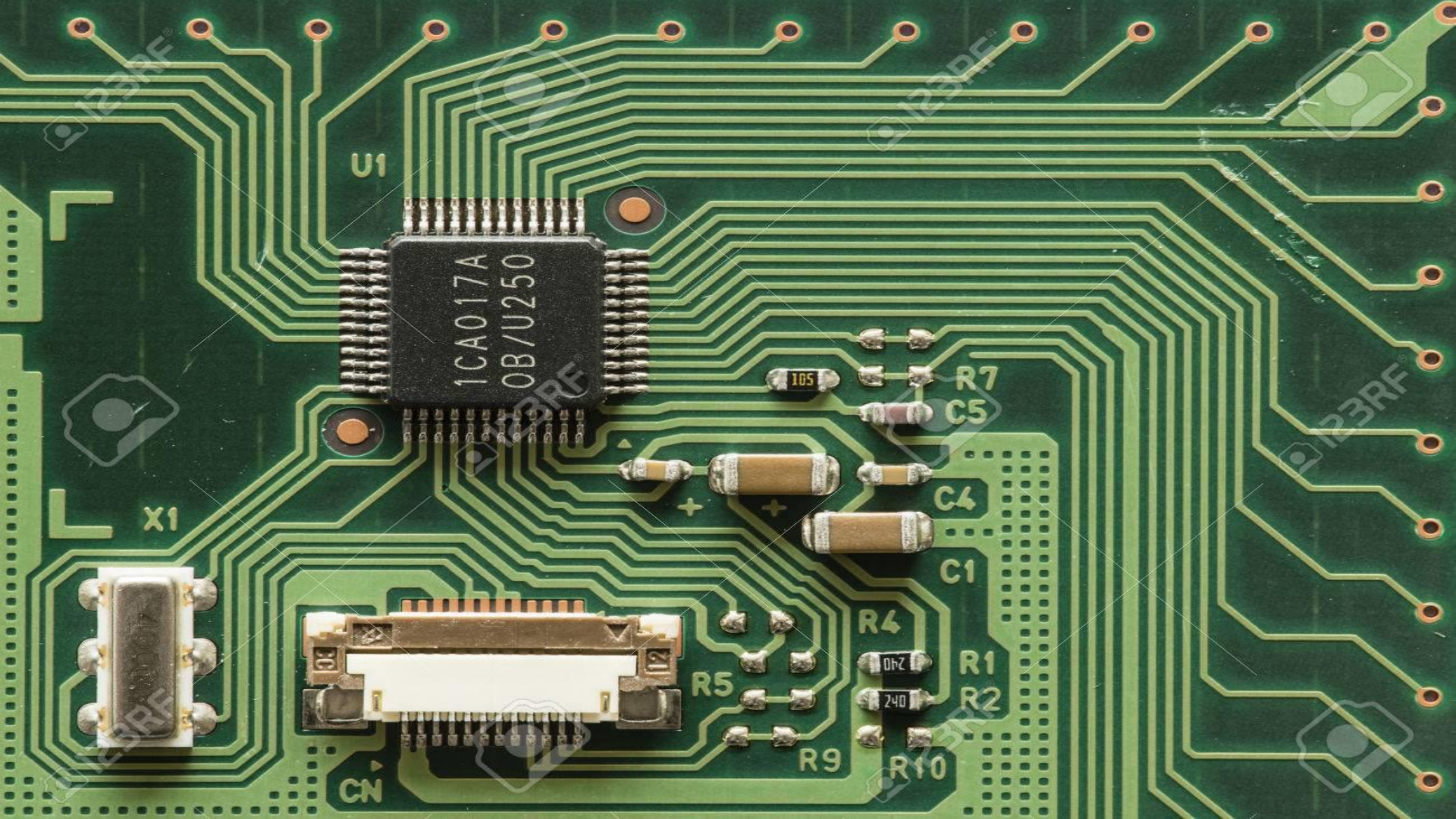
Computer Hardware

- Computer technology has evolved from huge, room-sized electronic calculators developed with military funding during World War II to palm-sized machines.



Computer Hardware

- The basic hardware of a computer composes the computer's architecture, and includes:
    a. Electronic circuits
    b. Microchips, processors
    c. Random Access Memory (RAM)
    d. Read-Only Memory (ROM)
    e. Graphic and sound cards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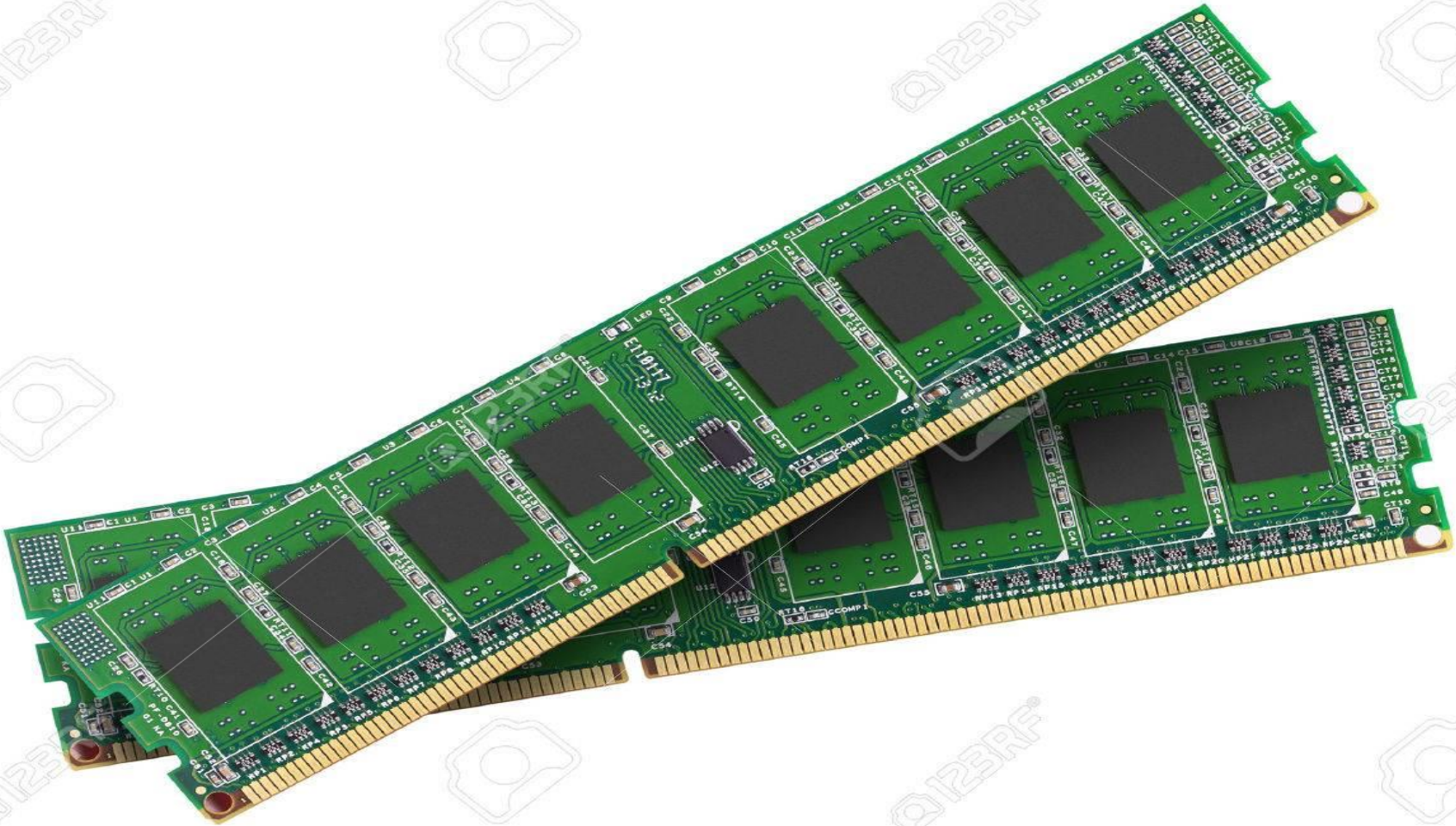


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AMD MOTHERBOARD
A320M PRO-VD/S V2
RYZEN
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SOCKET AM4
A320
PCI Express® 3.0 | Microsoft® Windows® 10-Ready | Microsoft® DirectX® 12-Ready
msi
A320M PRO-VD/S V2
A320M PRO-VD/S V2

Computer Hardware

- These are attached to a component called a motherboard, a square or rectangular board with circuits into which are plugged the main electronics of the computer.

Computer Hardware

- Devices that may be inside the computer case but are not part of the architecture include:
  - **a.** Main storage device which is usually an internal hard drive
  - **b.** Cooling system
  - **c.** Modem
  - **d.** Ethernet connectors

Computer Hardware

e. Optical drives

f. Universal Serial Bus (USB) connectors

g. Multi-format media card readers

Computer Hardware

- Devices attached or linked to a computer that are peripheral to the main computer box are part of the system's hardware:

Computer Hardware

a. Input and output devices, including the keyboard, touch screen, mouse, printer, and fax

b. Storage components such as external hard drives, thumb drives, floppy drives, tape drives, sound systems (earphones, microphones, speakers, subwoofers)

c. Computer monitor

Computer Hardware

- The group of required and optional hardware items that are linked together to make up a computer system is called a configuration.

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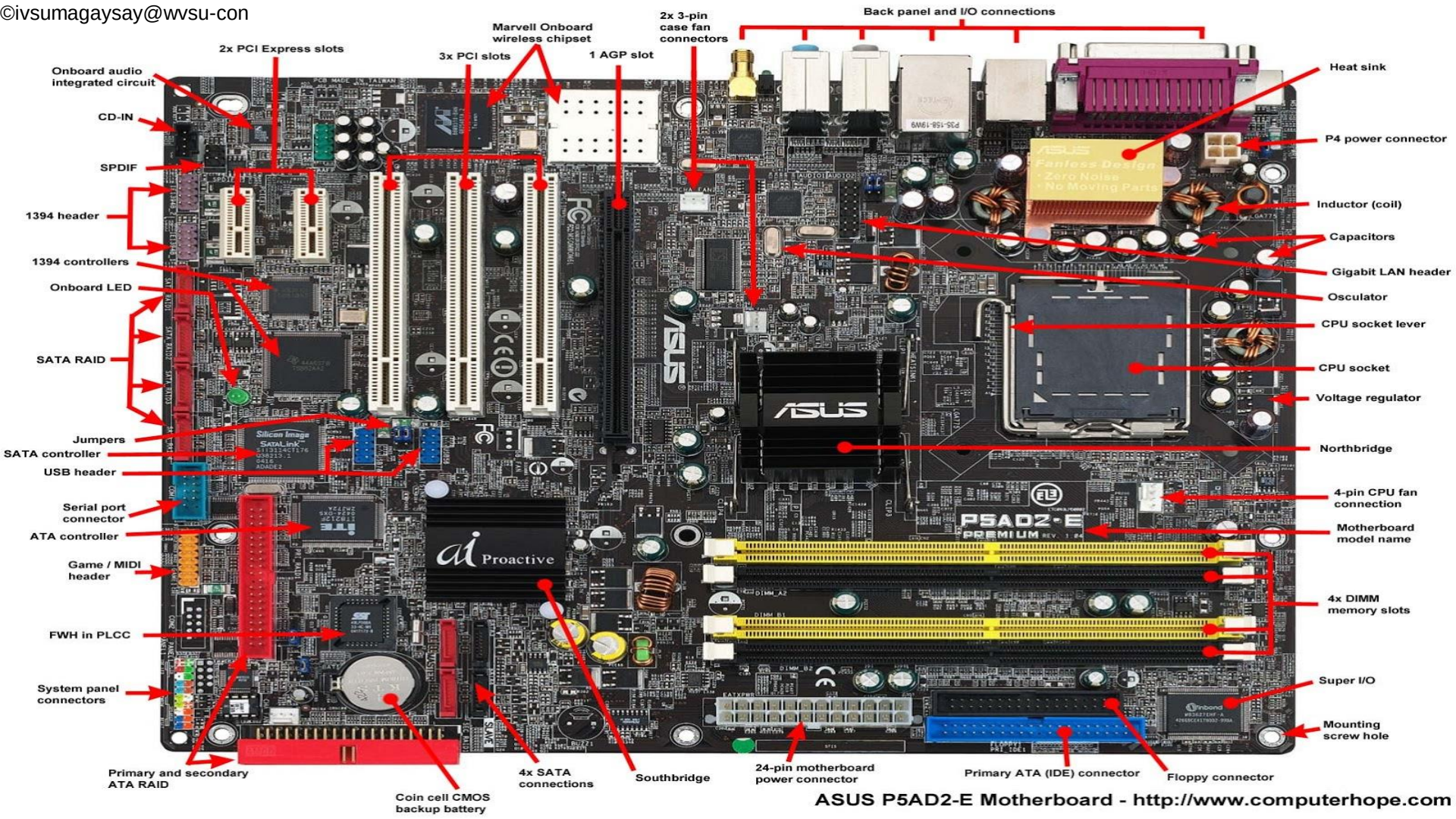
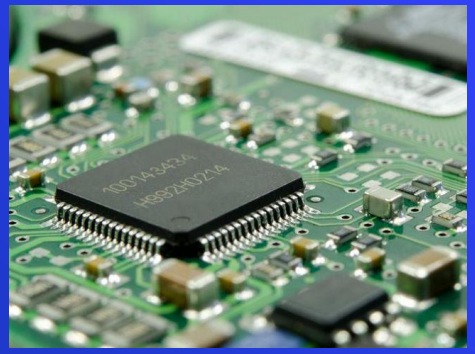
Motherboard

- The motherboard is a thin, flat sheet made of a firm, nonconducting material on which the internal components—printed circuits, chips, slots, and so on—of the computer are mounted.
- Electric conducting lines are etched or soldered onto the bottom of the board.



ASUS P5AD2-E Motherboard - http://www.computerhope.com



Types of Computer Memories

- Random Access Memory
- Read Only Memory
- Cache

Random Access Memory (RAM)

- Refers to working memory used for primary storage.
- Also known as main memory, RAM can be accessed, used, changed, and written on repeatedly.

Random Access Memory (RAM)

- RAM is the work area available to the CPU for all processing applications.
- When a user clicks on a program icon, the computer loads all or part of the program into RAM where it can be accessed very quickly.

Random Access Memory (RAM)

- RAM is called volatile memory because everything in RAM unloads (is lost) when the computer is turned off.
- The contents of RAM are erased whenever the power to the computer is turned off and made ready for new programs when the computer is turned on again.

Read Only Memory (ROM)

- It is a form of permanent storage on the computer.
- It carries instructions that allow the computer to be booted (started), and other essential machine instructions.

Read Only Memory (ROM)

- Data and programs in ROM can only be read by the computer, and cannot be erased or altered by users.
- ROM generally contains the programs, called firmware, used by the control unit of the CPU to oversee computer functions.
- ROM storage is not erased when the computer is turned off.

Cache

- A smaller form of RAM.
- Its purpose is to speed up processing by storing frequently called items in a small, rapid access memory location.
- Prior to the development of cache, all information had to be fetched from the hard drive, and then stored in RAM.

Cache

- Keeping information that will be used frequently in cache greatly reduces the amount of time needed to move data around among the memory locations.
- It is a relatively inexpensive way to increase the speed of the computer.

INPUT AND OUTPUT DEVICES

Input Devices

- These devices allow the computer to receive information from the outside world.
- The most common input devices are the keyboard and mouse.
- Others commonly seen on nursing workstations include the touch screen, light pen, voice, and scanner.

Input Devices

- A touch screen is actually both an input and output device combined.
- A light pen is a device attached to the computer that has special software that allows the computer to sense when the light pen is focused on a particular part of the screen.

Input Devices

- Some devices are used for security and can detect users' fingerprints, retinal prints, voiceprints, or other personally unique physical characteristics that identify users who have clearance to use the system.

Input Devices of Computer

Touch screen

Camera

Scanner

Microphone

Joystick

Keyboard

Mouse

Web cam

Track ball

Input Devices in Healthcare

- electrodes placed on a patient's body provide input into the computerized physiologic monitors.
- oximetry device placed on a patient's finger uses light waves to detect impulses which are sent to a computer and then interpreted as oxygen levels in the blood.


SET

Output Devices

- These devices allow the computer to report its results to the external
- Defined as any equipment that translates the computer information into something readable by people or other machines world.
- The most obvious output devices are the monitor (display screen), and printer.

Output Devices in Healthcare

- Heart monitors are output devices recording and displaying heart rhythm patterns, and initiating alarms when certain conditions are met.
- Volumetric infusion pumps output include both images on a screen and fluids infused into the patient’s body.

MONITOR

HEADPHONE

SPEAKER

Output Devices of Computer

PLOTTER

PROJECTOR

PRINTER

www.examplesof.net

STORAGE MEDIA

Hard Drive

- It is a peripheral that has very high speed and high density.
- It is a very fast means of storing and retrieving data as well as having a large storage capacity in comparison with the other types of storage.

Hard Drive

- The hard drive is the main storage device of a computer.
- Internal hard drives are not portable; they are plugged directly into the motherboard.

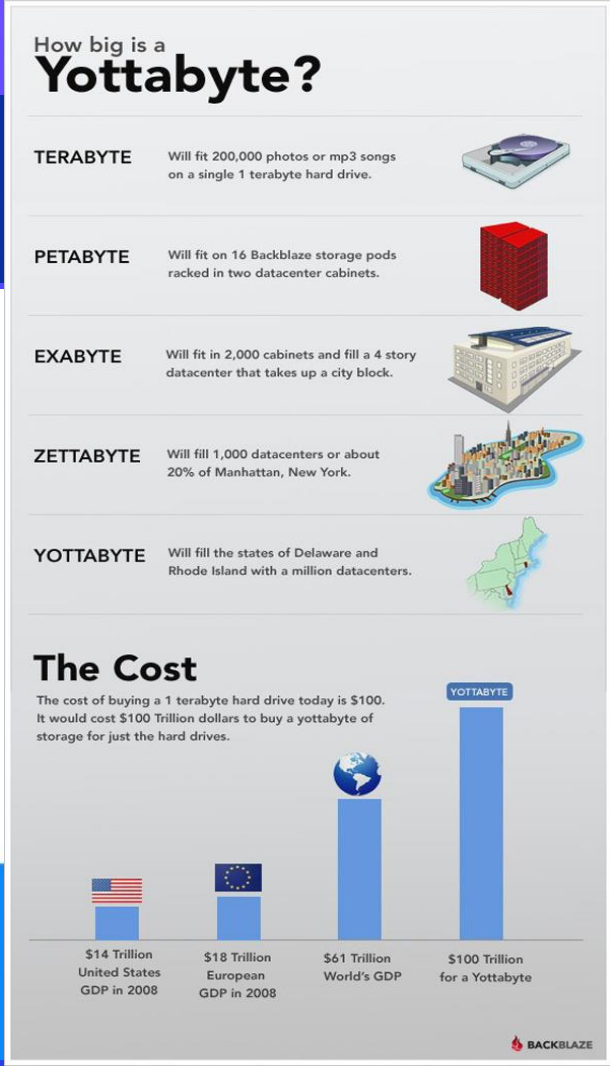
Hard Drive

- In 1990 most personal computers came with about 500 megabytes.
- In 2014, most personal computers are sold with about a terabyte (1k GB) of storage.
- On the biggest computers, storage is measured in petabytes (1M GB), which is an almost unimaginably huge number.

Hard Drive

Megabyte	1,000,000 bytes
Gigabyte	1,000,000,000 bytes
Terabyte	1,000,000,000,000 bytes
Petabyte	1,000,000,000,000,000 bytes
Exabyte	1,000,000,000,000,000,000 bytes
Zettabyte	1,000,000,000,000,000,000,000 bytes
Yottabyte	1,000,000,000,000,000,000,000,000 bytes

HOW BIG ARE THEY?



USB Flash Drive

- A USB flash drive is actually a form of a small, removable hard drive that is inserted into the USB port of the computer.
- There are many names for it, including pen drive, jump drive, thistle drive, and pocket drive.

USB Flash Drive

- Can store so much data in a package so much smaller than a CD or DVD, the convenience makes it worth the slightly higher price to many users.

Optical Media

- Include Compact Disks (CDs), Digital Versatile Disks (DVDs), and Blu-Ray.
- CD-ROMs and DVDs are rigid disks that hold a higher density of information and have higher speed.

Optical Media

- Until the late 1990s, CD-ROMs were strictly input devices, CD-ROMs were designed to store sound and data, and held about 737 megabytes of information and large laser writers were required to store data on them.

Optical Media

- As technology advanced and people wanted to store motion pictures on computer readable media, DVDs were developed and they held approximately 4.3 gigabytes of information, which will handle a regular 2 hour movie

Optical Media

- Media moved to the even higher storage capacity of Blu-Ray discs which store approximately 27 gigabytes of information or the equivalent of a 2 hour high definition movie.
- Double layer Blu-Ray discs can store 54 gigabytes or 4.5 hours of high definition motion picture media.

Cloud Storage

- An extension of the online storage service offered by individual vendors.
- Data stored in the “Cloud” is still stored on commercial computers called servers.
- Physically, enormous numbers of servers that store data are located in buildings, many warehouse sized –Data Centers.

Cloud Storage

- If one server in a data center becomes inoperable, copies of the data on that server are stored elsewhere and thus the data are not lost.
- Cloud storage is far more secure and reliable than a personal hard drive or backup drives.

MAJOR TYPES OF COMPUTERS

- Supercomputers
- Mainframe Computers
- Microcomputers (PC)
- Handheld Computers

Super Computers

- The largest type of computer.
- First developed by Seymour Cray in 1972.
- A supercomputer is a computational-oriented computer specially designed for scientific applications requiring a gigantic amount of calculations which, to be useful, must be processed at superfast speeds.

Super Computers

- Supercomputers are used primarily in such work as defense and weaponry, weather forecasting, advanced engineering and physics, and other mathematically intensive scientific research applications and are huge and expensive.

Super Computers

Mainframe Computers

- The most common fast, large, and expensive type of computer used in large businesses (including hospitals and other large healthcare facilities) for processing, storing, and retrieving data.

Mainframe Computers

- It is a large multiuser central computer that meets the computing needs large and medium sized public and private organizations.
- Mainframes are used for processing the large amount of repetitive calculations involved in handling billing, payroll, inventory control, and business operations computing.

Mainframe Computers

- The machines and software that process transactions in high volume businesses are known as transaction processing systems (TPS).
- Mainframes always have very high processing speeds (calculated in millions of processes per second, or MIPS, or in floating point operations per second, or FLOPS)

Mainframe Computers

Microcomputers (PCs)

- While mainframe computers provide critical service to the healthcare industry, much smaller computers are also an essential part of healthcare computing systems.

Microcomputers (PCs)

- Microcomputers are also found in educational and research settings, where they are used to conduct a multitude of special educational and scientific functions.
- Desktops can serve as stand-alone workstations and can be linked to a network system to increase their capabilities.

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Microcomputers (PCs)

- These computers on carts are often referred to as “WOWs” for workstation on wheels, or “COWs” for computer on wheels.
- Many nurses find these rolling workstations to be much more useful than fixed computers at patient bedsides for a variety of reasons.

Microcomputers (PCs)

Handheld Computers

- Small, special function computers, although a few “full function” handheld computers were introduced in the late 1990s.
- More popular are the palm-sized computers, including personal digital assistants (PDAs), which are the smallest of the handheld computers.

Handheld Computers

- The PDA is a very small special function handheld computer which provides calendar, contacts, and note-taking functions, and may provide word processing, spreadsheet, and a variety of other functions.

Handheld Computers

- The three most common platforms are the Apple Corporation's iPhone and iPad using the iOS operating system, smartphones, and tablets using the Android operating system (owned by Google Corporation), and the Windows operating system for smartphones and tablets from Microsoft Corporation.

Handheld Computers

Connectivity, Compatibility, and Incompatibility Issues

Connectivity, Compatibility, and Incompatibility Issues

- Communication among various hardware devices cannot be assumed.
- Different computers have different architectures, hardware configurations, and different storage schemes.

Connectivity, Compatibility, and Incompatibility Issues

- As a result of the interoperability problems, it can be economically infeasible to move data across different computers and programs.

Computer Power

- Bits and Bytes - The size of a variety of computer functions and components is measured by how many bytes they can handle or store at one time.
- The size of memory is an important factor in the amount of work a computer can handle.

Computer Power

- Large main memory is another key measure in the power of a computer.
- Most computers in 2014 are advertised with between 5 and16 GB of main memory and computers with 20 GB or more of main memory are available.

Computer Power

- Cache has also become an important variable in computer power and thus in advertising the power of computers.
- Another important selling point of a computer is the size of the hard drive that is installed in the box.

Computer Power

- The first hard drives sold for microcomputers in the 1970s were external devices that stored about 1,500 kilobytes.
- By 2014, most home and laptop computers were advertised with 1 to 2 terabyte hard drives.

Computer Speed

- There are four types of cycles, or operations of a CPU, include:
  (1) Fetch
  (2) Decode
  (3) Execute
  (4) Store

Computer Speed

- It takes time for the computer to perform each of these functions or cycles.
- The CPU speed is measured in cycles per second, which is called the clock speed of the computer.

Computer Speed

- One million cycles per second is called 1 megahertz (MHz).
- A billion cycles per second is called 1 gigahertz (GHz).
- They can be slow if their processors have insufficient speed for the work they are required to process.

Computer Speed

- For example, the original IBM PC introduced in 1981 had a clock speed of 4.77 MHz (4.77 million cycles per second).
- In 2010, home computers commonly had speed of 1.8 to 3 GHz. In 2014, advertised computers in the $1000 range have clock speeds of 2.5 to 3 GHz.

Network Hardware

- A network is a set of cooperative interconnected computers for the purpose of information interchange.
- The networks of greatest interest include local area networks (LANs), wide area networks (WANs), and the Internet, which is a network of networks.

Network Hardware

- For a computer to participate on a network, it must have at least two pieces of hardware:

a. Network adapter or network interface card (NIC)

b. Communication medium (cabling) considering Distance, amount of data transferred, how often is the transfer and availability.

Thank you..
Any Questions?

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