COMPARATIVE STUDY ON DIFFERENT TYPES OF COMPUTERS

Wayne Czar A. Ricaplaza

Start

INTRODUCTION

Computers come in various types, each designed for specific tasks and purposes. From supercomputers that solve complex scientific problems to microcomputers used for everyday tasks, these machines differ in size, power, and usage. This study compares six main types of computers: supercomputers, mainframe computers, minicomputers, servers, workstations, and microcomputers. Understanding these differences can help us appreciate how each type plays a role in modern technology.
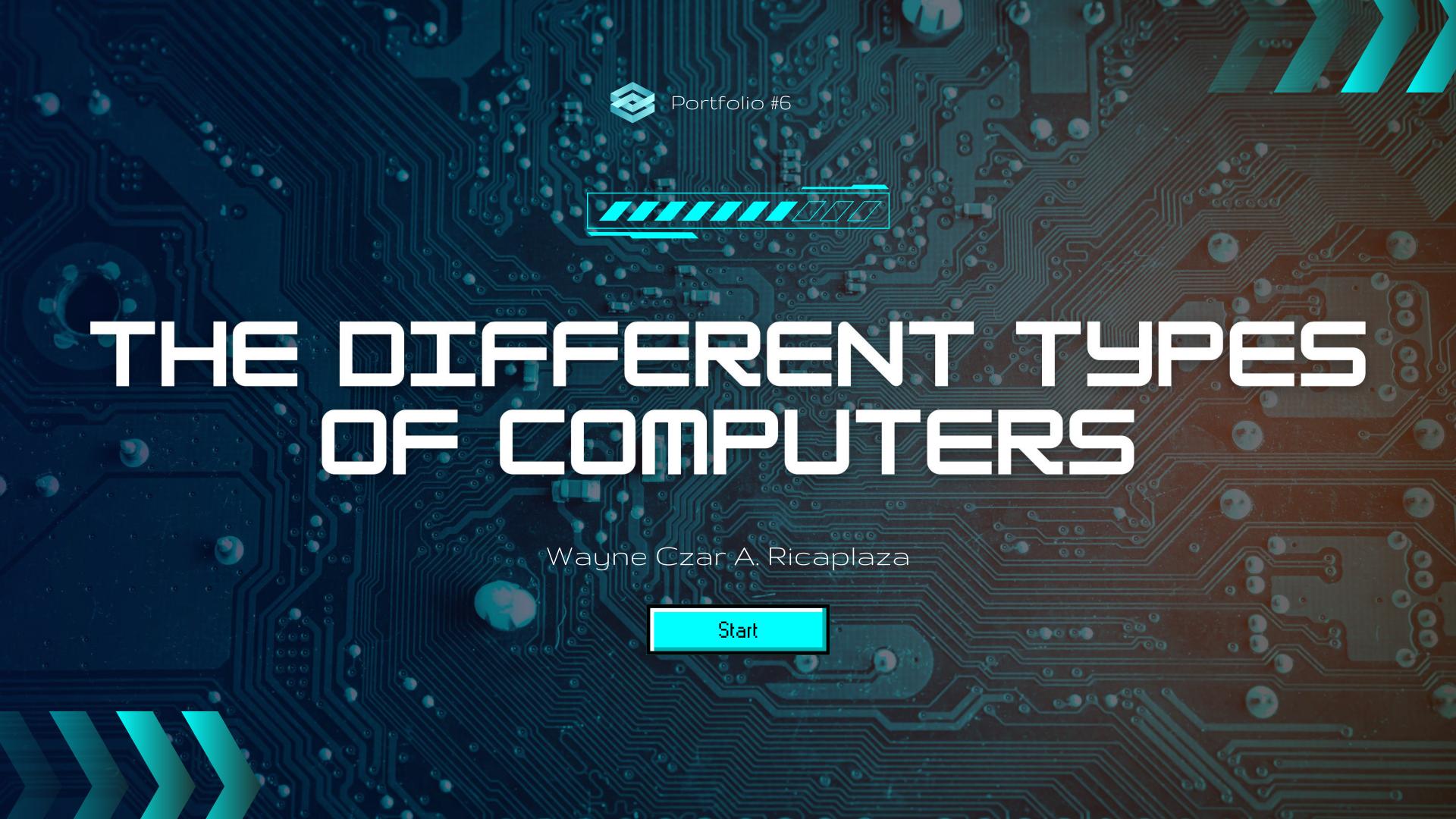
DISCUSSION

Computers are categorized based on their performance, size, and functions. Supercomputers are the most powerful, designed for complex tasks like weather forecasting and scientific simulations, while mainframe computers, though less powerful, can handle large databases and support many users simultaneously, making them ideal for banks and government offices. Minicomputers are smaller and more affordable, often used by small businesses for tasks like inventory management. Servers play a crucial role in providing services to other computers, such as hosting websites or storing network data. Workstations, on the other hand, are high-performance personal computers used by professionals like engineers and designers for tasks such as 3D modeling and video editing. Lastly, microcomputers, including desktops and laptops, are the most common and accessible, used for everyday activities like browsing, document creation, and communication. Each type serves a unique purpose, contributing to various industries and daily life.

Portfolio #6

THE DIFFERENT TYPES OF COMPUTERS

Wayne Czar A. Ricaplaza

Start

SUPERCOMPUTERS

- **Name/Brand:** Fugaku (Riken and Fujitsu)
- **Build:** Size comparable to a small building or large room, racks occupy thousands of square feet.
- **CPU:** 7.6 GHz ARM-based A64FX processors, multiple cores with billions of transistors.
- **Memory:** 32 Petabytes, HBM2 memory at high bandwidth.
- **Processing Speed:** Exceeding 442 petaflops.
- **Calculating Power:** Over 442 petaflops and millions of MIPS.
- **Working Principle:** Parallel processing with specialized hardware optimized for specific computations, highly integrated with memory and interconnects.
- **Energy Consumption:** ~30 MW per year.
- **Field of Use:** Climate modeling, simulations for quantum mechanics, nuclear research, and drug discovery (e.g., modeling the spread of COVID-19).

MAINFRAME COMPUTERS

- **Name/Brand:** IBM z16
- **Build:** Large cabinet-sized systems designed for centralized data processing.
- **CPU:** z/Architecture, 5 GHz, multi-core processing with advanced cache management.
- **Memory:** Tens of terabytes of RAM, high-speed DDR4/5.
- **Processing Speed:** Millions of transactions per second.
- **Calculating Power:** Trillions of instructions per second (TIPS).
- **Working Principle:** High reliability and throughput for batch and transaction processing; optimized for virtualization and partitioning.
- **Energy Consumption**: ~10-15 kW per hour.
- **Field of Use:** Financial systems, banking, and airline reservations (e.g., handling millions of transactions daily for credit card processing).

MINICOMPUTERS

- **Name/Brand:** HPE ProLiant MicroServer Gen10
- **Build:** Compact form factor (e.g., 4.6 x 9.65 x 9.65 inches).
- **CPU:** AMD Opteron X3216, 1.6 GHz base clock, dual-core processor.
- **Memory:** Up to 16 GB DDR4.
- **Processing Speed:** Few million instructions per second.
- **Calculating Power:** Low GFLOPS range.
- **Working Principle:** Mid-tier processing for specific tasks, operates as an intermediary between mainframes and microcomputers.
- **Energy Consumption:** <200 W.
- **Field of Use:** Small business server applications, network management, and file sharing (e.g., serving as a small-scale database server).

SERVERS

- **Name/Brand:** Dell PowerEdge R650
- **Build:** 1U or 2U rack-mounted systems.
- **CPU:** Intel Xeon Scalable processors, up to 3.8 GHz, multi-core (up to 32 cores per processor).
- **Memory:** Up to 4 TB DDR4/5.
- **Processing Speed:** High parallel throughput.
- **Calculating Power:** Tens of teraflops for general-purpose workloads.
- **Working Principle:** Manages, stores, and processes data for networked clients.
- **Energy Consumption:** 200–500 W per node.
- **Field of Use:** Web hosting, cloud storage, and enterprise database management (e.g., hosting a website for millions of users).

WORKSTATIONS

- **Name/Brand:** HP Z4 G5 Workstation
- **Build:** Mid-tower size.
- **CPU:** Intel Core i9 or Xeon, up to 5.4 GHz, multi-core (12-16 cores).
- **Memory:** Up to 256 GB DDR5.
- **Processing Speed:** 100–500 GFLOPS.
- **Calculating Power:** High precision in scientific calculations.
- **Working Principle:** Optimized for heavy workloads like CAD, video editing, or 3D rendering.
- **Energy Consumption:** ~300–500 W under load.
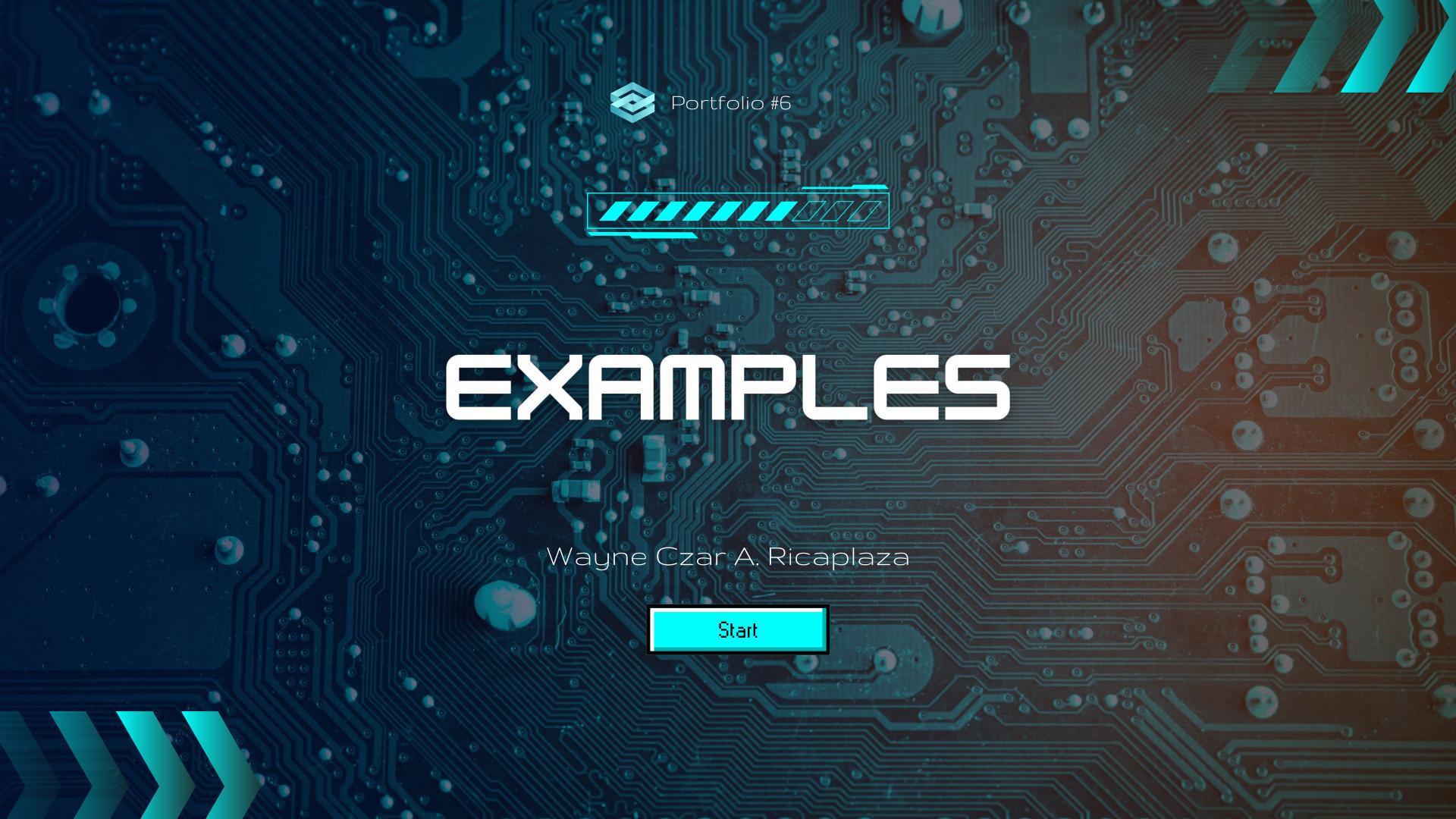- **Field of Use:** Animation, engineering simulations, and video production (e.g., rendering 3D animations for films).

MICROCOMPUTERS

- **Name/Brand:** Apple MacBook Air (M2)
- **Build:** Thin and lightweight laptop, 11.97 x 8.46 x 0.44 inches.
- **CPU:** Apple M2, 3.49 GHz, 8-core CPU.
- **Memory:** 16 GB Unified RAM.
- **Processing Speed:** Over 20 teraflops.
- **Calculating Power:** Moderate FLOPS and MIPS compared to workstations.
- **Working Principle:** General-purpose computation for individual use.
- **Energy Consumption:** ~15–30 W.
- **Field of Use:** Personal computing tasks, education, and business use (e.g., preparing reports or streaming media).

EXAMPLES

Wayne Czar A. Ricaplaza

Start

SUPERCOMPUTER

An example of a supercomputer is Fugaku, developed by Riken and Fujitsu. Supercomputers are the most powerful computing systems, capable of performing trillions of calculations per second, measured in petaflops or even exaflops. They achieve this through parallel processing, specialized processors, and high-speed interconnects. These machines are used for tasks requiring immense computational power, such as climate research, weather forecasting, astrophysics, and molecular modeling. For instance, a supercomputer can simulate complex weather patterns to predict hurricanes, helping governments and organizations prepare for natural disasters.

MAINFRAME COMPUTERS

The IBM z16 is a prime example of a mainframe computer. Mainframes are built for large-scale, critical applications, such as bulk data processing and transaction management. They can support thousands of users simultaneously and offer unmatched reliability, scalability, and security. Mainframe computers are commonly used in industries like banking, airline reservations, and government agencies. For example, a global bank relies on a mainframe to manage millions of daily ATM transactions, ensuring secure and efficient financial operations.
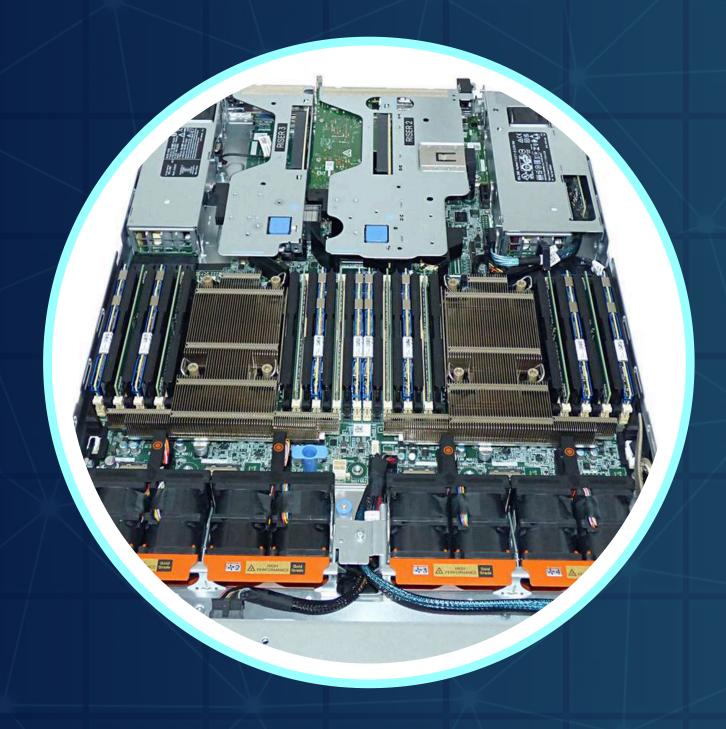
MINI COMPUTERS

A good example of a minicomputer is the HPE ProLiant MicroServer Gen10. Also called mid-range computers, minicomputers are smaller than mainframes and supercomputers, offering medium-scale computational capabilities. They are often used for specific business tasks, such as analytics, file sharing, and database management. Small organizations frequently use minicomputers to manage operations. For example, a small business might utilize a minicomputer to handle its inventory system and employee records efficiently.

SERVER

The Dell PowerEdge R650 is an example of a server. Servers are computers designed to provide resources, data, or services to other computers (clients) in a network. They range from small, rack-mounted systems to large-scale data center deployments. Servers are widely used for web hosting, cloud computing, enterprise applications, and email services. For instance, an e-commerce business might use a server to host its website, ensuring thousands of customers can access and shop online simultaneously without interruption.

WORKSTATIONS

The HP Z4 G5 Workstation is an example of a high-performance workstation. Workstations are desktop computers optimized for technical and scientific tasks, with powerful processors, advanced graphics capabilities, and large memory capacities. They are commonly used in engineering, animation, and scientific simulations. For example, an architect might use a workstation to render detailed 3D models of a building, ensuring high-quality and efficient design workflows.

MICROCOMPUTERS

An example of a microcomputer is the Apple MacBook Air (M2). Microcomputers, also known as personal computers, are compact, affordable, and versatile devices built for everyday use. They come in various forms, including desktops, laptops, and tablets, and typically feature a single-chip microprocessor as the CPU. Microcomputers are used in homes, schools, and small businesses for tasks like word processing, browsing, and multimedia. For instance, a student might use a microcomputer to research topics, write reports, and attend virtual classes.

Portfolio #6

COMPARE AND CONTRAST

Wayne Czar A. Ricaplaza

Start

PROCESSING SPEED

1. Mini Computer

Moderate processing speed, suitable for medium-scale tasks like business analytics and database management. Typically measured in a few million instructions per second (MIPS).

2. Microcomputer

Lower processing speed compared to others, optimized for everyday tasks like word processing and web browsing. Modern models like the Apple MacBook Air (M2) can exceed 20 teraflops.

3. Workstation

Lower processing speed compared to others, optimized for everyday tasks like word processing and web browsing. Modern models like the Apple MacBook Air (M2) can exceed 20 teraflops.

4. Server

High processing speed optimized for handling multiple simultaneous requests. It supports heavy workloads with multi-core processors and high parallel throughput.

MEMORY CAPACITY

1. **Mini Computer**

Medium-sized memory, typically up to 16 GB of DDR4 RAM. Sufficient for small-scale databases and analytics.

2. **Microcomputer**

Limited memory, usually between 8–16 GB. It supports personal and light professional tasks.

3. **Workstation**

Large memory capacity, often up to 256 GB, ensuring smooth performance during resource-intensive tasks like scientific modeling.

4. **Server**

Extremely high memory capacity, often reaching 4 TB of DDR4/5 RAM to support enterprise-level applications and multiple clients.

POWER CONSUMPTION

1. Mini Computer
Low power consumption, typically below 200 W, making it energy-efficient for small businesses.

2. Microcomputer
Very low power consumption, around 15–30 W, designed for personal and portable use.

3. Workstation
Moderate power consumption, around 300–500 W under load, reflecting its powerful performance for professional tasks.

4. Server
High power consumption, ranging from 200–500 W per node, especially in large-scale deployments in data centers.

MINIMUM REQUIREMENTS (SIZE AND AFFORDABILITY)

1. Mini Computer

Compact size and affordable for small organizations. Examples include HPE ProLiant MicroServer Gen10, which is small and cost-effective.

2. Microcomputer

Smallest size and most affordable, making it accessible for students, homes, and small businesses. Examples include laptops and desktops like the MacBook Air (M2).

3. Workstation

Larger and more expensive than microcomputers, often mid-tower in size. Designed for professionals needing high performance.

4. Server

Varies in size; smaller rack-mounted systems are compact, but enterprise servers can occupy entire racks. They are more expensive due to their advanced hardware and scalability.

USAGE

1. Mini Computer
Used in small organizations for tasks like business analytics, file sharing, and database management.

Example: Managing inventory and employee databases for small businesses.

2. Microcomputer
Used for everyday activities like browsing, word processing, and education.

Example: A student using it for research, writing reports, and attending online classes.

3. Workstation
Designed for professionals needing high performance in technical or scientific fields.

Example: Rendering 3D models or simulations in engineering or animation.

4. Server
Essential for hosting, managing data, and providing services to multiple clients.

Example: Hosting an e-commerce website with thousands of daily visitors.

References

Open Text BC. (n.d.). Types of computers – Key Concepts of Computer Studies. Retrieved from https://opentextbc.ca/computerstudies/chapter/types-of-computers/

Gandon, F. (1999). Types of Computers. Retrieved from https://www.cs.cmu.edu/~fgandon/lecture/uk1999/computers_types/

Built In. (2024). 6 Types of Computers to Know. Retrieved from https://builtin.com/articles/types-of-computers

GeeksforGeeks. (2024). Types of Computers. Retrieved from https://www.geeksforgeeks.org/types-of-computers/

Your Article Library. (n.d.). Computers: Micro, Mini, Mainframes and Supercomputers. Retrieved from https://www.yourarticlelibrary.com/information-technology/computers-micro-mini-mainframes-and-supercomputers-820-words/10318

THANK YOU!