COMPARATIVE STUDY ON THE DIFFERENT TYPES OF MOTHERBOARDS

Bachelor of Science in Computer Science - 1
CIS 1102N (Group 6) | Introduction to Computing
Portfolio #5

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November 16, 2024

Introduction

The Motherboard is an essential component of a computer; it is the heart of the computer and also the most neglected part of the hardware. The main purpose of the motherboard is to connect all parts of a computer, such as memory, processor, disks, and other devices, better and faster (Tomljanovic et al., 2013).

The motherboard connects and allows communication among all the necessary hardware parts that a computer has, including the central processing unit (CPU), RAM, storage devices, and expansion cards. As the backbone of the system, it determines to a large extent the performance, scalability, and upgradability of a computer. The design of the motherboard determines to a great extent how well these components can perform together harmoniously and ensure that the entire system moves smoothly and efficiently.

The most important aspects of motherboard design are the form factor and chipset. It determines the size and layout of the motherboard, thereby defining how many components can be installed and how much room is available for cooling solutions. The chipset controls how your CPU could interact with the RAM, storage devices, and other peripherals, thus affecting how your system will perform in terms of compatibility with certain hardware and software. The form factor and chipset determine whether the motherboard can handle performance levels and upgrade capabilities as needed.

Another significant advantage in the long-term perspective is motherboard selection, which also allows for easy upgradability. A well-chosen motherboard will allow upgrading individual components such as the CPU, RAM, or storage without having to change the whole system. Users can adapt to new technologies and remain relevant longer without significant further investment. A motherboard may be invested in for strong compatibility, expansion options, and future-proofing-it ensures the computer keeps up with the task of fulfilling the demands of evolving technical requirements over time.

Discussion

The analysis between the different motherboard types provides insights into their evolution, features, and suitability. Each motherboard type has distinct characteristics shaped by technological advancements, user requirements, and hardware compatibility. This discussion delves into the key aspects of these motherboards, including form factors, functionality and scalability, and their impact on system performance. Refer to the table in the following section.

1. **Form Factors**
   - Motherboards are available in various sizes, depending on the needs of the user. Larger motherboards like **ATX** and **Extended-ATX** are high-performance specific and offer more expansion slots, requiring larger cases. **Mini-ITX** and **Micro-ATX**, being smaller in form, offer needed space-saving solutions without having to compromise significantly on performances to meet the needs of those who value compactness while still needing respectable capabilities.

2. **Functionality and Scalability**
   - Motherboard sizes differ depending on the functionalities and scalability of the system. Highly advanced functions, along with better features such as many PCIe slots, more memory available for RAM, and proper cooling, are catered to by highly advanced **ATX** and **E-ATX** motherboards. A **Mini-ITX** will have very few expansion slots but still be able to run high-performance components for general tasks and even gaming systems.

3. **Performance**
   - Nowadays, **ATX** is considered to be one of the most-picked due to motherboards due to its ability to scale when having to perform demanding tasks, which also supports powerful CPUs, extensive RAM, and multi-GPUs. The smallest board is the **Mini-ITX** which has been optimized in terms of compact performance, and it can perform very demanding workloads inside its constraints, though it limits the amount of upgrades due to space restrictions.

Table

Form Factor	Build	CPU Slots	Memory Slots	Chipsets	BIOS	PCI Slots	SATA slots	Builtin Features
AT Motherboard	305mm x 280mm	1	2-4	Older chipsets either from Intel, AMD, etc.	Legacy	3-5	2	- Simpler, having fewer connectors and ports - Memory Slots are next to the processor
ATX Motherboard	305mm x 244mm	1	4-8	Chipsets either from Intel, AMD, etc.	UEFI	6-8	4-6	- Works well with newer and high-end processors - Expansibility and Upgradability
BTX Motherboard	264mm x 267mm	1	4	BTX-specific Intel Chipsets	UEFI	7	2-4	- designed to decrease power needs and reduce heat
Extended-ATX Motherboard	304.8mm x 330.2mm	1-2	8-16	Chipsets either from Intel, AMD, etc.	UEFI	6-8	6-8	- Extra space for optimal airflow and cooling - Supports multi-GPU setups - Higher Ram Capacity
LPX Motherboard	228.6mm x 330.2mm	1	2-4	Chipsets either from Intel, AMD, etc.	N/A	1-2	4-6	- Expansion cards are installed via a riser card to save vertical space
Micro-ATX Motherboard	244m x 244m	1	4	Chipsets either from Intel, AMD, etc.	UEFI	2	4	- Compact form factor but very capable
Mini ITX Motherboard	170mm x 170mm	1	2	Chipsets either from Intel,	UEFI	1	2	- Low Power Consumption, great for energy-efficient computers

				AMD, etc.				
Mini-ATX Motherboard	284mm x 208mm	1	2-4	N/A	N/A	2	4	- Compact form factor but very capable
Pico BTX Motherboard	203mm x 267mm	1	2	BTX-specific Intel Chipsets	UEFI	1-2	1	- Efficient Thermal Design - Compact Design
Standard-ATX Motherboard	305mm x 244mm	1	4-8	Chipsets either from Intel, AMD, etc.	UEFI	6-8	4-6	- Works well with newer and high-end processors - Expansibility and Upgradability

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