MOTHERBOARD CASE STUDY

What is a motherboard?

A motherboard is the main printed circuit board (PCB) in a computer. The motherboard is a computer's central communications backbone connectivity point, through which all components and external peripherals connect.

Fig 1: ASUS P5AD2-E Motherboard (Source)

Components of the Motherboard:

1. Central Processing Unit (CPU)

Also known as the microprocessor or the **processor**, the CPU is the computer's brain. It is responsible for fetching, decoding, and executing program instructions. It also performs mathematical and logical calculations.

2. Random Access Memory (RAM)

Random access memory, or RAM, usually refers to computer chips that temporarily store dynamic data to enhance computer performance while you are working.

In other words, it is the working place of your computer, where active programs and data are loaded so that any time the processor requires them, it doesn't have to fetch them from the hard disk.

3. Basic Input/Output System (BIOS)

BIOS stands for basic input/output system. BIOS is a "read-only" memory, which consists of low-level software that controls the system hardware and acts as an interface between the operating system and the hardware.

Most people know the term BIOS by another name—device drivers or drivers. BIOS is essentially the link between computer hardware and software in a system.

4. Complementary Metal Oxide Semiconductor Random Access Memory (CMOS RAM)

Motherboards also include a small separate block of memory made from CMOS RAM chips, which are kept alive by a battery (known as a CMOS battery) even when the PC's power is off. This prevents reconfiguration when the PC is powered on.

5. Cache Memory

Cache memory is a small block of high-speed memory (RAM) that enhances PC performance by pre-loading information from the (relatively slow) main memory and passing it to the processor on demand.

6. The Expansion Buses

An expansion bus is an input/output pathway from the CPU to peripheral devices. It is made up of a series of slots on the motherboard. Expansion boards (cards) plug into the bus.

PCI is the most common expansion bus in a PC and other hardware platforms. Buses carry signals such as data, memory addresses, power, and control signals from component to component. Other types of buses include ISA and EISA.

MOTHERBOARD TECHNOLOGY: (NORTH-BRIDGE AND SOUTH-BRIDGE)

1. NORTH-BRIDGE:The High-Speed Hub
- Location: Situated near the CPU, like the central traffic circle.
- Function: Handles high-speed communication between the CPU, RAM, and graphics card.Think of it as the main highway for critical data traffic
- Components: Memory controller, graphics bus controller, and sometimes the PCI Express bus controller.

2. SOUTH-BRIDGE:The I/O Maestro
- Location: Typically below the PCI Express slots, like the bustling side streets.
- Function: Manages slower input/output (I/O) devices like hard drives, USB ports, and audio interfaces. Imagine it as the network of smaller roads connecting various destinations.
- Components: SATA and IDE controllers, USB controllers, audio controller, and various legacy interfaces.
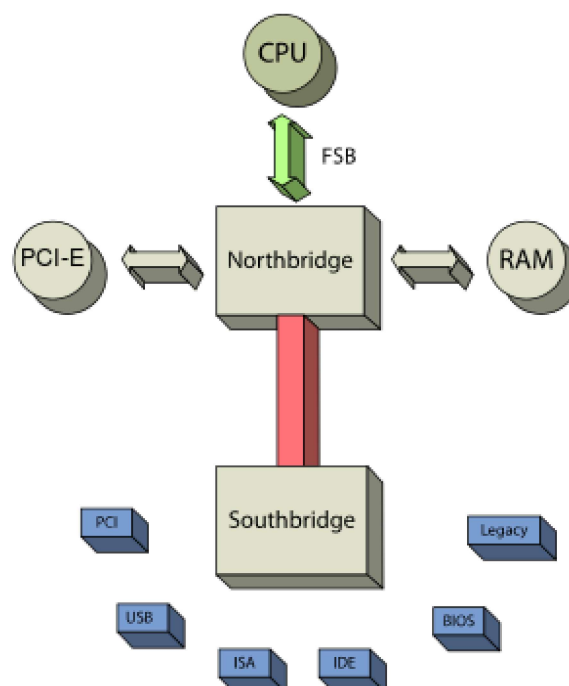

Fig 2: North-Bridge and South-Bridge Block Diagram (Source)
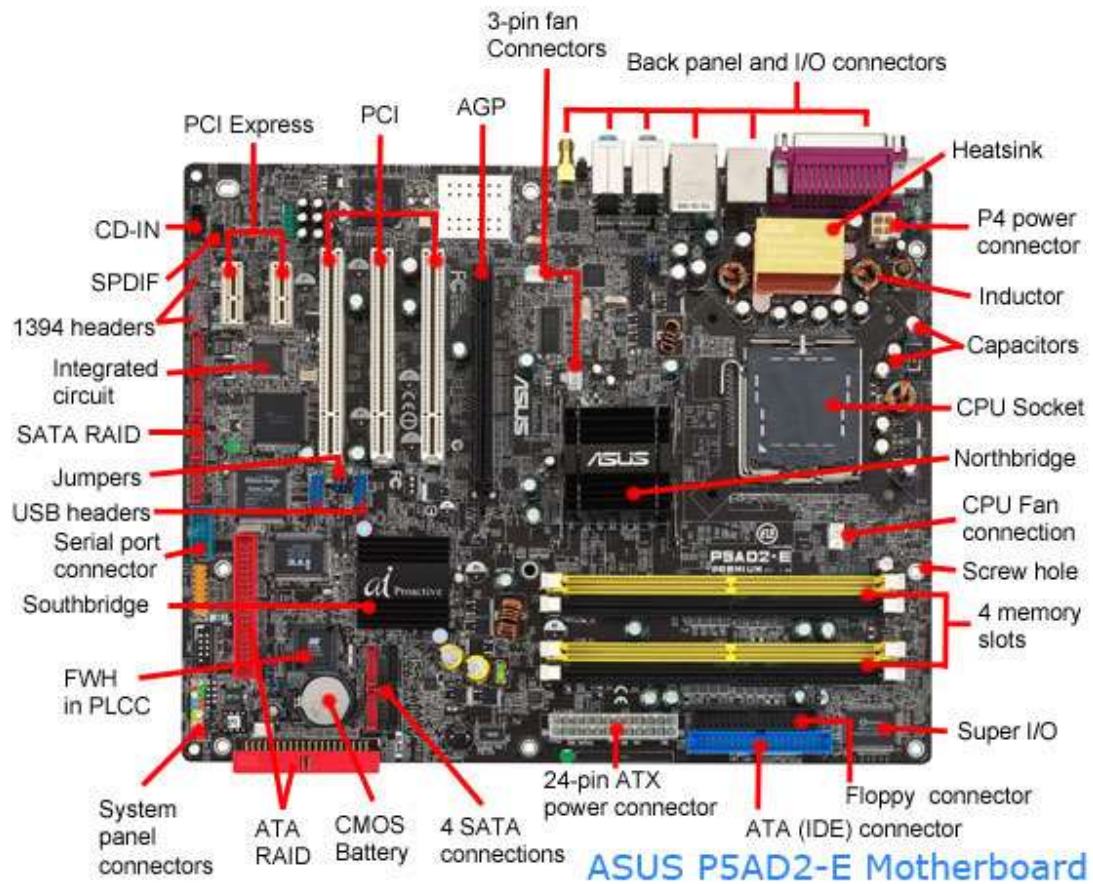
Types/Versions and Features of Asus P5AD2-E Motherboard

Fig 3:A labeled ASUS P5AD2-E Motherboard (Source)

The Asus P5AD2-E is a motherboard that was released around the mid-2000s and is based on the Intel 925XE chipset. Here are some details about the Asus P5AD2-E motherboard:

Feature	Specification
Chipset	Intel 925XE
Socket	LGA 775
Northbridge	Intel 925XE
Southbridge	Intel ICH6R
Memory	Dual-channel DDR2 533/400/333 non-ECC, unbuffered

DIMM Slots	4
Max. Memory Capacity	8GB
BIOS	2Mb AMI BIOS with ACPI, PnP, C.I. Feature, DMI 2.3
Audio	8 Channel onboard audio (ALC882D)
LAN	Gigabit Ethernet (Marvell 88E8053)
Slots	1 x PCI Express x16, 2 x PCI Express x1, 3 x PCI
Storage	4 x SATA II 300MB/s connectors, 2 x IDE connectors
Expansion	1 x Floppy connector, 1 x Parallel port, 6 x USB 2.0 ports, 1 x Firewire port
Form Factor	ATX (305mm x 225mm)
Operating System	Windows XP, Vista, 7

Table 1: Specifications of ASUS P5AD2-E Motherboard