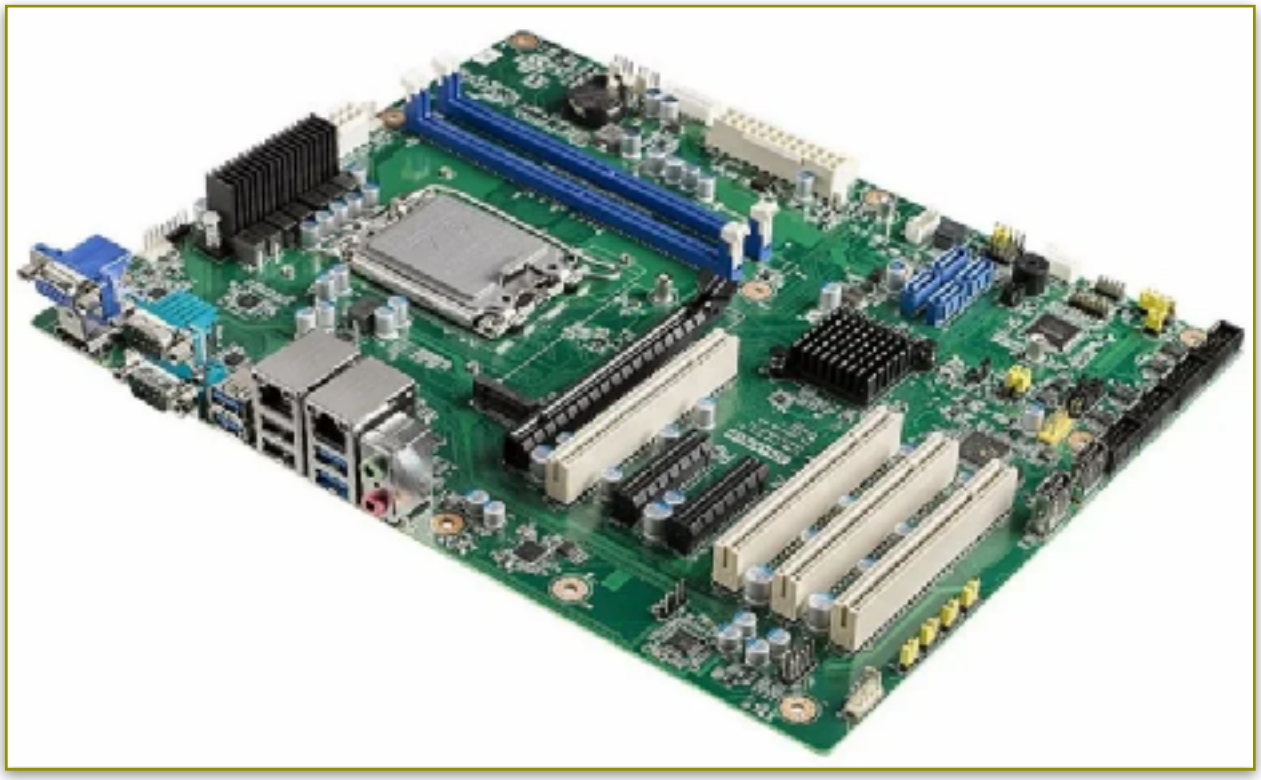
Advanced Learning

Tech Talks

The Motherboard is the platter for a computer's guts. There are numerous mysterious components that go beyond the central processing unit or chip and include memory, BIOS, interface bus connections, network connections, keyboard, mouse, and monitor connections - the list goes on. I'll talk about the biggies.



The story starts with power on. How does the computer know the user applied power? Sounds simple enough, but there is a trick. The power supply has a bit of power that is always on running a "keep-alive" circuit to power essential startup functions to bring the computer up fast and smooth. It sits there waiting for you to push a keyboard key like maybe the one that reads your finger print. It can also

listen for when you close the lid on a laptop to put the computer in sleep mode. So there is a lot going on even when you think the thing is dead or just out cold. Nope, it's watching you!

Lay of the Land

Looking at the picture on page one, it looks like a small city and in a way it is. There is a collection of ports on the edge to connect all sorts of different equipment like the monitor, peripherals, headphones, and microphone. If you have a box chassis such that additional circuit cards can be inserted, you'll have PCI slots to accept them. There are slots for RAM memory strips, power connector to the power supply, internal SATA connections to hard drives and the like. There are a lot of special ICs that interface the CPU to various serial or parallel bus protocols to unload the coding to translate from one protocol to the serial bus system the OS will be using. There are temp sensors and fan controls and anything else the designer wanted to include as feature items, but the pit boss is the BIOS chips. These memory modules have been programmed off the motherboard by the manufacturer to tell the computer processor what the feature set is and where they are addressed, where to look for the OS program, run diagnostic tests on startup, and finally activate the PC counter to load the first instruction to start loading the OS. After that, the OS takes over and we are off and running.

Keyboard Magic

The keyboard is not just a collection of push-button switches. Each key press activates a complex code to tell the processor what the key is but also whether the caps are on or shift is added or special combinations of keys that mean different things to the OS like the function keys. The keyboard unit is transmitting a series of messages not just a simple switch closure.

Mouse Tracks

The mouse or track pad also has analog to digital conversion to read the wheel movements, The X/Y position in relation to the monitor pixel pattern, etc. All the features found on the mouse need to be interpreted as much as possible so the processor doesn't waste time servicing all these features. It just gets an answer that is stored in memory where it can go look if need be, which is all the time.

Interruptions

The Central Processing Unit (CPU) is better described as a processor, because it is actually running process after process. So what's a process? A process is a collection of steps to accomplish a task. Many of these tasks are routine and run in what's called a polling interval meaning many processes run over and over again in the background checking status and making measurements like is the CPU about to blow up from over heating. But when something occurs caused by an outside input like the user hitting a key or a message hits the network interface circuit (NIC), this causes an interrupt that stops the polling cycle and jumps the OS to service the interrupt. Interrupts are regulated by priority. There are essential interrupts that alway get the attention first or lower order interrupts that are serviced after priority jobs run, but make no mistake, interrupts are really important to make the whole machine useful to the user and not just sit there and flash pretty lights. This is the area where smart design of the OS shines through and cause many software updates to correct dumb design or add a new feature or dump the old version and replace it like going from MSDOS to Windows95 to a zillion other software version attempts. In the end, most OS design comes back to the Unix/Linux basics for the kernel, which is the interface between apps and the guts of the computer. This is the file system and administrator's world of configuring the computer. If this were a power station, this would be that big room full of dials, meters, consoles of levers, lights and klaxons that blare out when the reactor rods melt down.

Summary

A computer motherboard is a land of busses and memory resources with interfaces to I/O devices all brought together for the purpose of making the OS happy. All the resources to process data from a user input or network input all gets to the CPU via the motherboard interconnectivity. The BIOS chips start the show and the clever power supply makes it all happen.