THE COMPUTER CORNER

No. 226: A Laptop Is Not a Small Desktop!

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That title is interesting! We use laptops to take the place of desktops all the time. They are especially useful in ham emergency communications because they are smaller, more portable, and they work even whenever the power mains are down (at least for a while) because they have built in batteries. Hook a laptop to your Winlink station and you are on-the-air even when the power fails. The same portability and battery power features make them valuable for general ham or non-ham applications. But are they different from desktops? Yep. Now, I will admit up front that some of the descriptions below are generalizations, but in general, the descriptions are true.

LAPTOPS (and smartphones, tablets and embedded devices like your new refrigerator) mainly use a computer architecture called **RISC**, standing for **R**educed **I**nstruction **S**et **C**omputing in their chips. The idea of RISC is that the hardware uses a *simpler set of instructions* that can be completed using *fewer microprocessor cycles per instruction*. In other words, lean and mean. RISC chips need fewer transistors than the next type to be described.

RISC architecture was developed in the 1980s, and was implemented back then on a bunch of types whose names would be recognized only by old guys like me. On the other hand, RISC processors are also used in modern supercomputers such as the fastest in the world in 2011 (the "K"), the second fastest in 2012 (Sequoia) and the third fastest in 2013. So, RISC is not just ancient history, even in huge, powerful computers. And there are a lot of laptops out there so it is still very widely used.

By contrast, most **DESKTOPS** use **CISC** processors. **CISC** stands for **C**omplex **I**nstruction **S**et **C**omputing. The architecture of these chips lets a single instruction execute several steps. The command MULT will multiply two numbers with just the single command. By contrast, a RISC chip needs to load one number, then the other, then multiply them, then store the result somewhere. That's four steps.

Older CISC systems were the IBM System/360 and PDP-11 computers and chips labeled the Motorola 6800, 6809, 68000 family and the Zilog Z80, Z8, Z8000 and others. Does anyone but me recognize these ancient names? The Intel x86 is the main CISC processor today. Its goal is to complete a task in as few commands as possible. This takes more transistors, and more transistors is a characteristic of these processors.

The Apple Power Macintosh used RISC-based chips, and Windows NT was RISC-compatible. Today, RISC-based chips dominate low-end and mobile systems. Apple's i-Phone and i-Pad, Microsoft Windows Phone, Nintendo Game Boy and Android-based systems are a few examples. On the other hand, Windows 3.1 and Windows 95 were designed for CISC processors and most desktops today are designed around CISC processors.

But the debate over which concept (RISC or CISC) is better continues to this day. Right now, it is said that RISC is better where less dependability on hardware (and more dependability on software) is desired and *cheap production* is the aim (most LAPTOP chip sets). CISC is better for *high performance*, less dependence on software and more dependence on hardware (most DESKTOP chip sets).

Now that I have divided the computer world so neatly, let's put it back together! Many of the chips used in computers since 2000 employ architectures that combine the RISC and CISC philosophies to some degree, as an attempt to combine the best of both worlds. It is not perfect yet, but they are still trying. Happy Computing!