A Bit of Understanding

When Apple released its latest operating system, called Catalina, the company also dropped support for 32 bit applications. So, what are those, you ask?

Get a mug of Ovaltine and read on…

When we count things, we use the ten digits, zero through nine—called decimal arithmetic—which is probably because we have ten fingers. And when we decide what we want for dinner, we can pick from any number of foods (NOTE: I don't like cilantro).

But Computers don't have fingers (or toes, for that matter). The only digits they can use are zero and one. It's called binary arithmetic. And forget cilantro. It's either on or off. This or that. Yes or no. (For me, cilantro=no).

We can string our ten digits together to make numbers as big as we want, like the number of stars in the universe (our Cosmology group knows how many), because we assign values—ones, tens, hundreds—to the position of each digit. So 13 means 3 ones + 1 ten and 2019 means 9 ones + 1 ten + no hundreds + 2 thousands. **Each position is 10 times the value of the neighbor to its right.**

Computers do the same, but with ones and zeros. The decimal number 13 becomes binary 1101. And the year 2019 becomes 11111100011. That's cumbersome. But computers are so fast that working with binary arithmetic is just fine, and they convert the results to decimal when they're done.

Value →	2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	Decimal
	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	13
Bits	0	0	0	0	0	1	1	1	1	1	1	0	0	0	1	1	2019
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	65,535

16-bit words

The biggest number you can represent with 16 bits is 65,535.

But while computers excel at speed, they're limited by the structure of their memory, which is organized into blocks (called "bytes" and "words") of a fixed number of "bits" of ones and zeros.

Early personal computers used 16-bit words that limited the range of the numbers they could calculate (up to 65,535) and the size of the computer's memory they could use without resorting to special arithmetic and memory address routines, which made the computer run slower.

In 1985, Intel introduced computer processing chips based on 32-bit words that could directly handle numbers and memory addresses up to 4.3 billion (4 gigabytes). And in 2000, 64-bit processors could handle numbers and memory addresses up to 256 trillion (256 terabytes).

Meanwhile, Windows and MacOS—the operating systems that handle software and data—had to accommodate software for processors that use either 32- or 64-bit words. That flexibility makes these operating systems less efficient.

This year, Apple decided that MacOS 10.15 (Catalina) would only run software written for 64-bit processors, which allowed Apple to optimize their operating system. This means that older software, like Microsoft Office 2011, which uses 32-bit words, won't work on Catalina. (Bummer.) At some point, Microsoft may do the same for Windows, but because Windows is so ubiquitous, that may not happen for quite a while.

Now you have a bit of information you didn't have until now. If you have software that won't work anymore, stop by the the Technology Lab on Tuesdays from 10:00 a.m. to 4:00 p.m., Wednesdays from 1:00 to 4:00 p.m., or Fridays from 10:00 a.m. to 1:00 p.m., and we'll help you figure out an alternative..