

Bigger than Huge

Forty years ago I ordered a memory-disc peripheral for my client's office computer. The unit was the size of a small microwave oven. We hooked it up, configured the drive, and stood back in awe. For an outlay of only \$5000, we now could store 5 megabytes of customer data! An easy calculation comes to 1000 bytes per dollar spent.

Today I can order a Toshiba 4-terabyte external solid-state hard drive for \$108 on Amazon. This comes to 37-billion bytes per dollar spent. The unit is less than half the size of my new book, Saturn Conundrum! We've come a long way in just 40 years.

But computing measurements on today's mammoth super computers make even these numbers seem insignificant. In May of 2022, the DOE's Oak Ridge National Laboratories installed the world's largest, fastest computer to date, the Frontier, at a cost of \$600 million. This machine holds 700 petabytes (quadrillion bytes) of storage and performs 1.1 exaflops (that is, 1.1 quintillion decimal calculations per second). Consider, a human hair is about 1/10 mm in width. A stack of 1.1 exahairs would reach from Earth to Saturn when Saturn was its farthest distance from Earth.

It is a given that the future will require even larger numbers than these. In response to this need, in November of 2022 the 27th General Conference on Weights and Measures designated two new prefixes to denote quantities a million times larger than current prefixes can handle. So now we have the following progression of prefixes, each one shown being 1000 times larger than its predecessor. The numbers in parentheses are how many zeros you would need to replace the prefix.

kilo (3)
mega (6)
giga (9)
tera (12)
peta(15)
exa (18)
zeta (21)
yotta (24)
ronna (27)
quetta (30)

Imagine something so large that its size would be measured in quetta-units, a number followed by 30 zeros. The estimated number of stars in the known universe comes to just 1 yotta. How long must we wait for computers that can perform 1-quetta calculations per second, a 1-quettaflop computer? My guess is we could be there within the next 100 years. Less if technology continues to advance along the current exponential curve. This is an incredible age to be living in. **Happy New Year!!**