Oranjestad, 15 august, 2012 -Computing isn't just getting cheaper. It's becoming more energy efficient. That means a world populated by ubiquitous sensors and streams of nanodata. The performance of computers has shown remarkable and steady growth, doubling every year and a half since the 1970s. What most folks don't know, however, is that the *electrical efficiency* of computing (the number of computations that can be completed per kilowatt-hour of electricity used) has also doubled every year and a half since the dawn of the computer age.

Laptops and mobile phones owe their existence to this trend, which has led to rapid reductions in the power consumed by battery-powered computing devices. The most important future effect is that the power needed to perform a task requiring a fixed number of computations will continue to fall by half every 1.5 years (or a factor of 100 every decade). As a result, even smaller and less power-intensive computing devices will proliferate, paving the way for new mobile computing and communications applications that vastly increase our ability to collect and use data in real time.

As one of many examples of what is becoming possible using ultra-low-power computing, consider the wireless no-battery sensors created by Joshua R. Smith of the University of Washington. These sensors harvest energy from stray television and radio signals and transmit data from a weather station to an indoor display every five seconds. They use so little power (50 microwatts, on average) that they don't need any other power source.

Harvesting background energy flows, including ambient light, motion, or heat, opens up the possibility of mobile sensors operating indefinitely with no external power source, and that means an explosion of available data. Mobile sensors expand the promise of what Erik Brynjolfsson, a professor of management at MIT calls "nanodata," or customized fine-grained data describing in detail the characteristics of individuals, transactions, and information flows.

To put the matter concretely, if a modern-day MacBook Air operated at the energy efficiency of computers from 1991, its fully charged battery would last all of 2.5 seconds. Similarly, the world's fastest supercomputer, Japan's 10.5-petaflop Fujitsu K, currently draws an impressive 12.7 megawatts. That is enough to power a middle-sized town. But in theory, a machine equaling the K's calculating prowess would, inside of two decades, consume only as much electricity as a toaster oven. Today's laptops, in turn, will be matched by devices drawing only infinitesimal power.

Historically, the best computer scientists and chip designers focused on the cutting-edge problems of high-performance computing, and no doubt many will still be tempted to address those issues. But continuous progress in the energy efficiency of computing is now drawing top designers and engineers to tackle a new kind of problem—one defined by whole-system integrated design, elegant frugality in the use of electricity and the transmittal of data, and the real possibility of transforming humanity's relationship to the universe.

Read entire article here: http://www.technologyreview.com/news/427444/the-computing-trend-that-will-change-everything