

# The Planetary Computer

Want to tap into a 12-million-teraflop megacomputer? You've already got your own terminal. Check it out—it's right in your pocket.



NEVER MIND WEB 3.0: The next stage in technological evolution is a single worldwide computer. Collectively, we are already assembling this megacomputer from our billions of Net-connected PCs, cellphones, PDAs, and the like. As an increasing number and variety of devices are lashed to one another via the Internet and other communication systems, they form the components of what we might call the One Machine. Its circuit board encompasses the million copper wires and radio connections linking all the chips contained in the gadgets in your pocket, office, and car. Instead of being powered by a mere billion tiny transistors, as your typical personal desktop is, it runs on a billion PC chips, each with its own billion transistors. Its memory is the collective hard disks and flash drives of the world. Its RAM is the sum of all memory chips online. Every second, a Library of Congress worth of data flows through it. The program it runs—its initial OS—is the World Wide Web. Just as the One Machine's hardware is assembled from our myriad devices, its software is written by our collective online behavior. Each time a person clicks on a search result or creates a link to a



Web page, the Machine is being programmed. Each new link wires up a subroutine, creates a loop, and unleashes a cascade of impulses. As waves of links surge around the world, they resemble the thought patterns of a very large brain.

Indeed, a hyperlink is much like a synapse in the brain. Both work by making associations between nodes. Each unit of thinking in the brain—an idea, for example—grows by gaining links to other thoughts. The greater the number of synapses connecting to an idea, the stronger it becomes. Similarly, the more heavily linked a Web node is, the greater its value to the Machine. Moreover, the number of hyperlinks in the World Wide Web is approaching that of synapses in the human brain. But the Machine contains a million times more transistors than you have neurons in your head. And, unlike your brain, it's growing at a rate that outpaces Moore's law. By 2040, the planetary computer will attain as much processing power as all 7 billion human brains on Earth.

But the Machine also includes us. After all, our brains are programming and underpinning it. As much as we will come to depend on the One Machine (who needs memory when you've got Google?), it will depend on our minds for a sustaining river of input. We are headed toward a singular destiny: one vast computer composed of billions of chips and billions of brains, enveloping the planet in a single sphere of intelligence. —KEVIN KELLY

## Global Hardware

Although the One Machine gets most of its processing power from PCs, it also harnesses resources from cell phones, DVRs, and all other Net-connected devices.

- Personal computers
- Data servers
- Digital cameras
- MP3 players
- DVRs
- Cell phones
- Webcams
- PDAs

### Transistors



### RAM



### CPU speed



### Data storage



### Bandwidth



### Power consumption



# 120,000,000 DIGITAL CAMERAS

Transistors 1.2 quadrillion | RAM 3.8 billion MB | Data storage 2.9 billion MB | Bandwidth 240 million Mbps

# 1,200,000,000 PERSONAL

Transistors 1.2 quadrillion | CPU speed 960 billion MHz | Data storage 72 trillion MB | Bandwidth 446 million Mbps

# 3,300,000,000 CELL PHONES

Transistors 165 trillion | RAM 106 billion MB | CPU speed 198 billion MHz | Data storage 211 billion MB | Bandwidth 6.6 billion Mbps | Power draw 1.8 billion watts

# 220,000,000 MP3

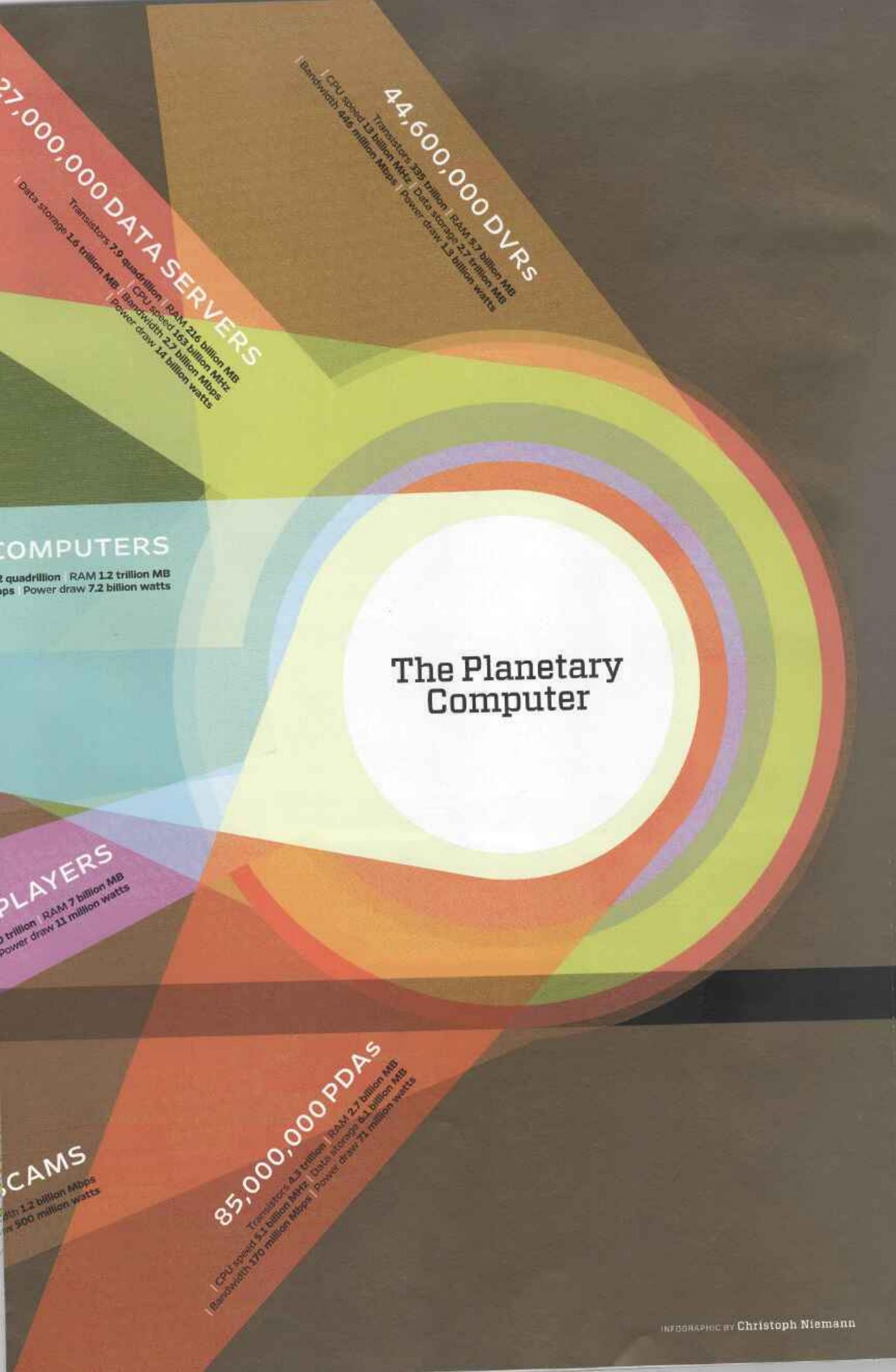
Transistors 6 quadrillion | CPU speed 17 billion MHz | Data storage 8.8 trillion MB | Bandwidth 2.4 billion Mbps



Infoporn

# 100,000,000 WEB

Transistors 100 billion | Bandwidth 100 billion Mbps | Power draw 100 billion watts



# The Planetary Computer

# How the One Machine Rivals the Human Brain

## Switches

In the brain, neurons act as elemental switches that perform calculations en masse. Transistors serve this function in the One Machine. Its billions of component devices contain 1 million times more transistors than there are neurons in a brain, yet the network still doesn't seem as smart as one person.

**Brain**  
**100 billion neurons**  
**One Machine**  
**103 quadrillion transistors**

## Connections

Synapses link neurons into a dense information network. These brain connections can be likened to the hyperlinks between Web pages—and the Machine has about half as many. But the steady growth of the Web is quickly narrowing that gap.

**Brain**  
**100 trillion synapses**  
**One Machine**  
**57 trillion hyperlinks**

## Storage

The brain is an amazingly compact data storage device, holding memories of potentially everything an individual sees, hears, and feels. All the One Machine's hard drives combined store 850,000 times more—a modest multiple, considering the sheer number of devices and their phenomenal data density. But they're not nearly as portable.

**Brain**  
**100 million megabytes**  
**One Machine**  
**85 trillion megabytes**

## Working memory

Human short-term memory is piddling; most people can't hold in mind more than a handful of numbers or other discrete elements. The One Machine, with its capacious RAM, can navigate oceans of data with dazzling speed. The brain simply can't keep up.

**Brain**  
**9 elements**  
**One Machine**  
**1.6 trillion megabytes**

## The Brain

## Speed

Measured in pure, primeval digital processing power, gray matter is about as speedy as an original Pentium chip, circa 1993. Bits flit through the global computer's Internet pipes 20 billion times faster.

**Brain**  
**70 MHz**  
**One Machine**  
**1.4 trillion MHz**

## Image handling

Large portions of the brain are dedicated to visual processing, but it's no match for the One Machine, which takes in more than 1,000 times more images than a human does. And these pictures zip through the circuitry almost 800 times faster than a human retina transmits images to the brain.

**Brain**  
**210 million impressions a year**  
**One Machine**  
**250 billion images a year**

## Text processing

A human can speak a novella worth of words daily. That seems like a lot until you consider that the One Machine chums out billions of text messages in the same period. Of course, most of those missives say little more than "Wassup?"

**Brain**  
**17,510 words a day**  
**One Machine**  
**5.2 billion text messages a day**

## Power requirement

The brain is incredibly energy-efficient. It roughly matches the One Machine's memory and number of associations, while using very little power. By contrast, the global computer is an energy hog, consuming about 5 percent of all the electricity produced on Earth.

**Brain**  
**20 watts**  
**One Machine**  
**377 billion watts**